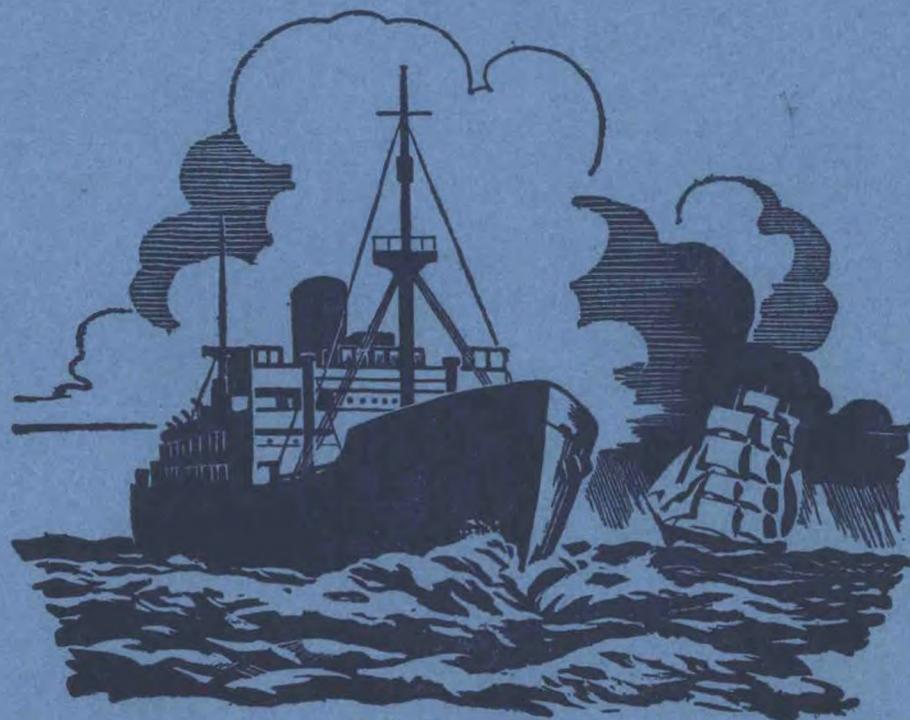


M.O. 717

The Marine Observer

*A quarterly journal of Maritime
Meteorology*



Volume XXXII No. 197

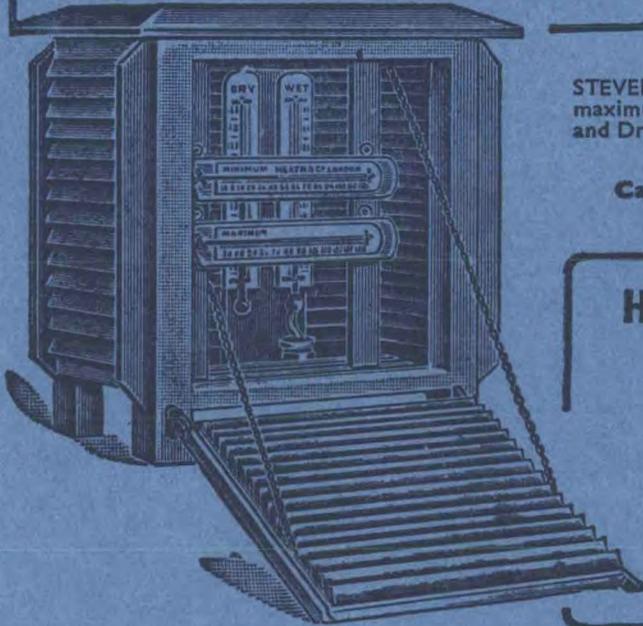
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THE MARINE OBSERVER

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

VOL. XXXII

No. 197

JULY 1962

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*Letters to the Editor, and books for review, should be sent to the Editor, "The Marine Observer,"
Meteorological Office, London Road, Bracknell, Berkshire*

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Editorial

In Athens there is a tower—the Tower of the Winds—erected about 200 B.C., the eight sides of which are orientated to the true points of the compass. On each side a sculptured figure represents one of the eight named wind directions of Ancient Greece. The primary purpose of the tower seems to have been to tell the time and for this purpose each side also contains a sun-dial of special design. The names of the eight cardinal points of the compass-rose on the Mediterranean charts of the thirteenth century were similarly those of the familiar wind directions of that region. Some of these names remain in the modern nomenclature of the Mediterranean winds—Bora from the Ancient Greek Boreas, and Sirocco and Levanter from the early Mediterranean terms Syroco and Levante. The important role of the wind in the life of the people—ashore and afloat—in these early days in the Mediterranean is thus immortalised; history, allied with climatic conditions, decreed that this region should be the cradle of the ancient navigators as well as of the European civilisations—but its seamen had no monopoly of winds. (The captains of the Arab dhows probably knew as much about the winds as anybody in those days but they seem to have left few written records of their knowledge.) And the art of navigation gradually spread to northern Europe as the use of the deep-sea sailing ship became more general and seamen gradually became more venturesome.

The sailing ship now remains mainly in the realm of sport and pleasure, but to the seaman the wind is still the most important meteorological element for the comfort, safety and economical operation of his ship—be she propelled by power or sail and whether she be large or small. And because the oceans occupy three-quarters of the world's surface and the winds are such a vital clue to the character and intensity of the various weather systems, wind is also a most important element in the radio weather message which a ship sends to the meteorologist ashore. The wind is, in effect, a check on the pressure reading. A wrongly reported wind observation from a lone ship may completely mislead the meteorologist and be the cause of an erroneous forecast—which could affect the safety of shipping and have repercussions on the safety of the reporting ship herself. The value of wind observations to the meteorologist is evident from the usefulness of observations from trawlers and 'auxiliary ships' in which the wind is an essential but pressure readings are optional; the wind is an observation which any experienced seaman makes as part of his normal job, without the aid of instruments.

The seaman and the meteorologist owe much to Admiral Beaufort—for the anemometer is an expensive instrument and finding a site for its efficient exposure aboard ship is so difficult that the Beaufort Scale remains the most effective and efficient method of indicating the wind force and direction at sea. And here nature combined with the seaman's experience plays its part—for the disturbance of the sea gives a very convenient and true measure of the wind force in the open ocean, subject to certain qualifications. Useful modifications have been made to the Beaufort Scale by the World Meteorological Organisation during recent years in accordance with recommendations made by the Commission for Maritime Meteorology. The most significant of these was the substitution of the present sea disturbance equivalents in 1939 for the old criterion of the effect of the wind upon the behaviour of a sailing ship. (Seamen had, in fact, used these sea disturbance equivalents ever since the advent of the steamer but they had not been officially classified or recognised internationally.) In 1957 the nomenclature of the Beaufort Scale was rationalised by the introduction of the terms 'near gale', 'gale', 'storm' and 'violent storm' for winds of force 7, 8, 10 and 11 respectively in place of the earlier terms 'moderate gale', 'fresh gale', 'whole gale' and 'storm'. 'Moderate' is scarcely an appropriate adjective for a gale!

Back in 1920, as a result of a long series of observations and experiments made

by Sir George Simpson at Bell Rock lighthouse, the Beaufort Scale numbers were related to the equivalent wind speeds which would be recorded by an anemometer at a standard height of ten metres. These are the equivalents which appear at present in the Beaufort Scale. Recent investigations made by Netherlands meteorologists with anemometers aboard light-vessels in the North Sea indicate that some of these wind speed equivalents are inaccurate. The present equivalents in the lower ranges are said to be too low while in the higher ranges they are too high. For example, the present equivalent limits for Beaufort 3 are 7–10 knots whereas the Netherlands experiments show that this ought to read 9–12 knots, while for Beaufort 10, the present equivalent limits of 48–55 knots ought, according to the Netherlands experiments, to read 43–48 knots. The differences in the lower ranges are thus not very great, but they are quite considerable in the higher ranges. At the last conference of the Commission for Maritime Meteorology some doubt was expressed as to the accuracy of these Netherlands figures, having in mind that the experiments were made in the North Sea, where conditions are not necessarily representative of the open ocean. It was decided that further verification was necessary (e.g. aboard weather ships) and that if no better equivalents have been derived by the next meeting of that Commission, the Netherlands equivalents would be recommended for international adoption. Some comparative readings are being made at present aboard the British weather ships; the deck officers make independent visual observations according to the Beaufort Scale, which are subsequently checked against the ship's anemometer readings. These ships carry two anemometers, one each side of the main yard, at a lateral distance of 8 ft. from the top-mast and at a height of about 50 ft. above the deck (65 ft. above the waterline). This exposure ensures, as far as possible, that the anemometer is free of the eddying effects due to the ship's hull, superstructures etc.: the wind speed reading is always made from the one on the weather side.

C. F. Brooks, an American meteorologist, who was very keen about weather observations at sea and did numerous voyages aboard merchant ships, found that the sea disturbance due to wind was much affected by sea temperature. On the edge of the Grand Banks, for example, he found that with a force 5 wind, when the sea temperature was warm under the influence of the Gulf Stream, the sea disturbance was normal and in agreement with the Beaufort Scale for a wind of that force. When the ship passed into the cold water of the Labrador current, although the wind force remained the same, the sea disturbance diminished very appreciably. In winds over force 7 it seems unlikely that this difference would be very noticeable, but that it is only in moderate winds there is a likelihood of the mariner underestimating the wind speed from the sea appearance; this is a complication against which voluntary observers at sea should be on their guard.

In the Canadian weather ships some experiments have been made to investigate other physical means of estimating wind force, for example by the feel of the wind on the face, movement of halliards and flags, and noise in the rigging. Seamen are generally aware of these, but this is the first time that detailed study has been made of them. A copy of the table which was prepared as a result of these trials is on page 138.

The sea disturbance equivalents given in the Beaufort Scale are for the open ocean and concentrate on the appearance of the sea surface created by the wind which is blowing at the time and take no account of height of waves. During daylight and on clear nights there are few occasions when the wind force cannot be accurately judged from this criterion. It is on very dark nights, particularly when the wind is light, that the observer needs to use other means to determine the wind force and direction. When the wind is aft or on the quarter it is easy to fall into the pitfall of imagining that the wind is light!

It is hoped that the sea state photographs recently published by the Meteorological Office will help the inexperienced observer in this important job of estimating wind force from this criterion.

Wave observations, which are intimately related to the wind, have assumed a new importance recently, because of the realisation of the fact that waves have the greatest effect in retarding a ship's progress through the water as well as their obvious effect on comfort and safety. Certain meteorological services have been including, in their radio weather bulletins for shipping, information about waves, and the 1960 Convention for Safety of Life at Sea recognised the value of this. Although the appearance of the sea is directly related to the force of the wind, the height and period of a sea wave depends largely upon the fetch and the depth of water and upon the length of time that the wind from a certain direction has been blowing on the locality of the observer. The presence of a swell wave, having no direct connection with the local wind, when it is associated with a sea wave causes many difficulties for the observer—particularly when the swell is running in the same direction as the wind and therefore enhances the sea wave.

International instructions to observers at sea contrive to give guidance as to the best method of making visual estimates of period and height of waves and to differentiate between sea and swell waves. But such observations are admittedly difficult from a moving ship and the instructions are difficult to phrase, but efforts are being made to improve them. Recent visual observations made aboard ocean weather ships and fishery research ships when compared with simultaneous observations of wave records have indicated that such visual observations if carefully made are reasonably accurate. A weather ship on duty at an ocean station spends much of her time stopped, which facilitates accurate wave observations.

Taking all the difficulties into consideration, the impression in the British Meteorological Office is that visual observations of wind and waves, as made by voluntary observers at sea, are usually made carefully and conscientiously and are, in general, reasonably accurate. But as with all meteorological messages, even when the observation is accurate, the possibility of coding and transmission errors arises; the work of a voluntary observing ship continues to be a joint task of the deck and the radio departments. It is just a matter of voluntary teamwork. C. E. N. F.

Report of Work for the Year ended 31st December 1961

(MARINE DIVISION AND MARINE CLIMATOLOGY SECTION OF THE METEOROLOGICAL OFFICE; VOLUNTARY OBSERVING FLEET AND OCEAN WEATHER SHIPS)

1. Voluntary Observing Ships

The British voluntary observing fleet is comprised as follows, the numbers being the monthly averages during the year 1961:

- (a) 489 Selected Ships, which are supplied on loan with a full set of meteorological instruments, and which make complete observations (code form F.M.21A) every 6 hours and transmit them by radio to selected coastal stations, wherever their voyages take them.
- (b) 47 Supplementary Ships, which make somewhat simpler observations than the Selected Ships and are supplied on loan with only a barometer, air thermometer and screen. They use abbreviated code form F.M.22A for their messages.
- (c) 109 coasting ('Marid') vessels, and one light-vessel, which make sea surface temperature observations in British coastal waters and transmit them in a special code by w/T or R/T. When in the North Sea these ships include in their messages wind, weather and visibility observations.
- (d) 13 light-vessels which make observations of wind, waves, visibility and air and sea temperatures. 11 of these send coded reports by R/T; the other 2 only record their observations for climatological purposes (reports from

Dowsing, Galloper and *Royal Sovereign* light-vessels figure in the B.B.C. '5-minute' weather bulletins for shipping).

- (e) 22 trawlers which make visual observations only (no instruments being needed) and transmit them by w/T or R/T (code form F.M.23B) to radio stations in the United Kingdom, Canada, Iceland, Norway or U.S.S.R., depending on the area in which they are fishing.
- (f) 36 Auxiliary Ships, which make and transmit visual observations similar to those made by trawlers, with the addition of pressure and air temperature readings from the ships' own instruments (using the 'Shred' code). These ships only do this work when in areas where shipping is known to be sparse (see the map on page 99).

This total of 719 ships represents 18% of the world's total of about 3,900 voluntary observing ships. (British shipping represents about 15% of world tonnage.)

The recruiting of the ships, instructing the officers in their voluntary observing duties, and supply of the instruments is the job of the Port Meteorological Officers at London, Liverpool, Southampton, Glasgow and Cardiff and the Merchant Navy Agents at Newcastle, Hull and Leith. During the year, they have, between them, done their best to visit each voluntary observing ship at least once every three months. During such visits newly joined officers are instructed as necessary in their voluntary observing duties, and a special effort is always made to see the radio officers in addition to the observing officers.

During the year a conference of Port Meteorological Officers and headquarters staff of the Marine Division of the Meteorological Office took place. These conferences, which are held at intervals of about 18 months, are for the purpose of discussing and remedying any difficulties that have become evident in connection with the meteorological observing at sea, to investigate and endeavour to rectify any complaints received about weather bulletins for shipping and to consider any improvements which might be made to publications, instruments, etc. To have these personal contacts between the Marine Division, Port Meteorological Officers, Merchant Navy Agents and the ships, supplemented by the letters to observing ships in which Lt. Cdr. L. B. Philpott acknowledges and comments upon each meteorological logbook, retains the traditional relationship between the Merchant Navy and the Meteorological Office.

During the year the Selected and Supplementary Ships have continued to make useful observations of sea surface currents and ice. Certain Selected Ships fitted with immersed logs have been making special ocean current observations with the object of assisting us to improve the accuracy of our methods of determining the surface currents, and the weather ships have also been actively engaged in this work. We have had a gratifying increase in the number of ice observations received during the year. The use of a special column in the logbook for recording aurora observations was ceased during the year, due to the decrease in sunspot activity, but voluntary observers continued to send useful and detailed manuscript reports of auroral phenomena which they observed. The Marine Observers' Log is evidence of the variety of other observations of natural phenomena which have been received during the year.

In order to assist the International Indian Ocean Expedition (see *The Marine Observer*, April 1961), twelve ships which normally spend much time in the Indian Ocean have been specially recruited to the Supplementary list, while efforts have been made to recruit as many Auxiliary Ships as possible for this area, particularly tankers.

By arrangement with the Hydrographer of the Navy and the Director of the Naval Weather Service, H.M. survey ships, using their own tested instruments, are now keeping our meteorological logbook and sending radio weather messages to the appropriate coast stations. These ships, being Naval vessels, do not form part

of the voluntary observing ship fleet, but their work lies almost invariably in the sparse areas of the world and their observations will therefore be of great value.

The British voluntary observing fleet includes ships of over 100 shipping companies and the table below shows the variety of trade routes on which they are engaged.

Numbers of British Selected and Supplementary Ships on main routes from and to the United Kingdom

Australasia	116	Atlantic coast of S. America	19
Far East	50	Pacific coast of S. America	8
Persian Gulf	22	Pacific coast of N. America	8
S. Africa	27	Europe, mainly northern Europe	40
N. Atlantic	96	Falkland Is. and Antarctic	5
W. Indies	21	World-wide 'tramping'	89

The map on page 99 shows the position of British Selected Ships in various parts of the world on 20th December 1961 (a date picked at random).

The table below gives some detail about the daily average of radio weather messages received at the meteorological communications centre at Dunstable (Bracknell after 30th September 1961) from merchant ships during the year.

Daily number of reports received from ships

(a) North Atlantic (east of 40°W and north of 35°N)

U.K. Selected and Supplementary Ships	84
Coasting vessels ('Marid' ships)	12
Foreign ships	31
Trawlers	9
Total	136

(b) North Sea (51° 30'N to 61°N and 4°W to 7° 30'E)

U.K. Selected and Supplementary Ships	9
'Marid' ships (coasting vessels)	5
Trawlers	3
Total	17

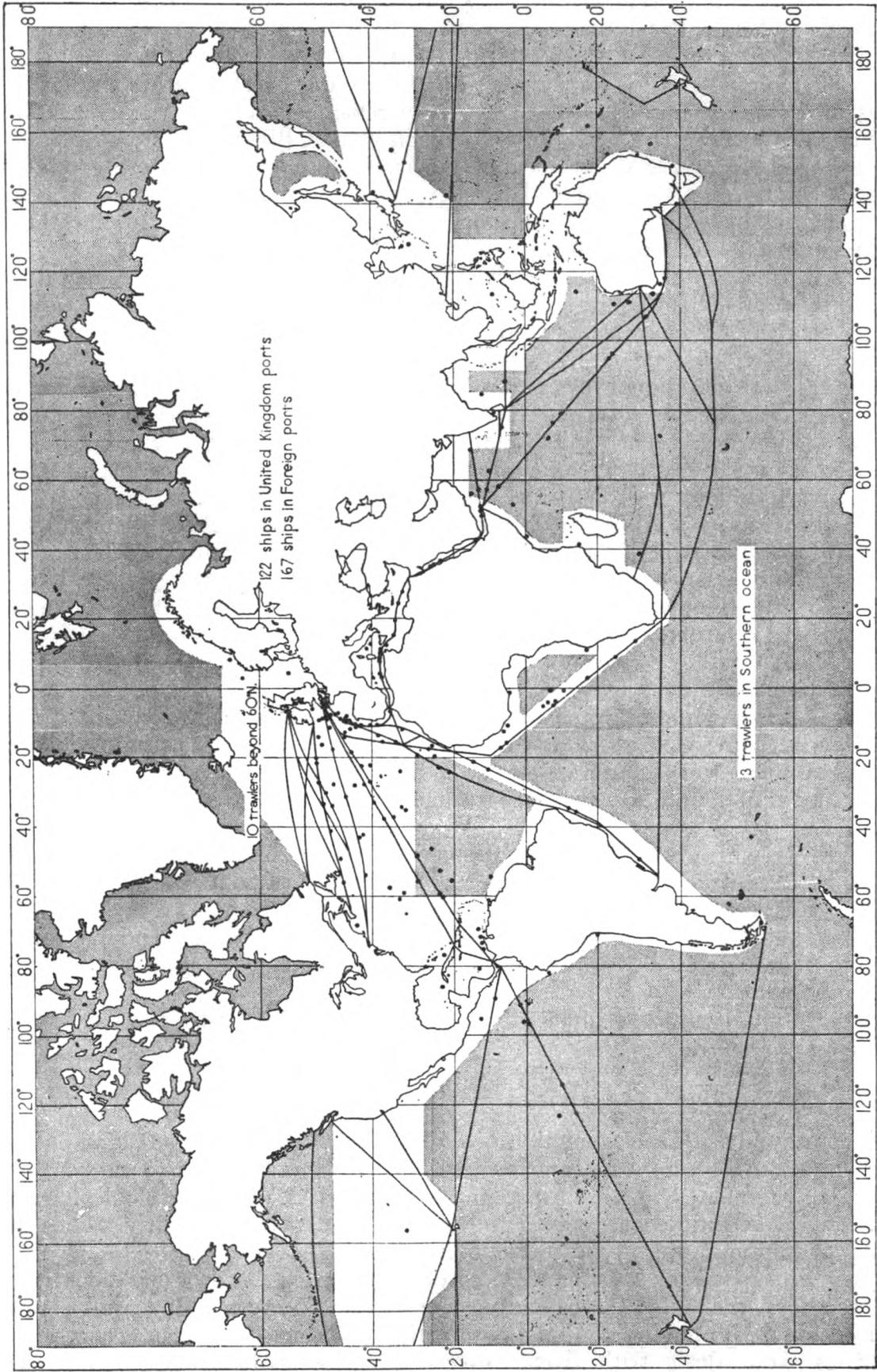
(c) Light-vessels 36

These reports, combined with those from the ocean weather ships, provide an adequate network, although there are obvious seasonal gaps and permanent gaps, where shipping is sparse.

The North Sea is an area where ship reports are very valuable, but they are never very numerous, because so much of the shipping there tends to hug the coasts. Reports from ships anywhere in the open waters of the North Sea are particularly welcome.

British trawlers have given good service during the year, in view of the difficulties under which they have to work; the number of reports received at U.K. radio stations was 353 per month, but the total number of reports they transmitted to British and foreign stations was 657 per month.

About 975 meteorological logbooks were received during the year from ships of the voluntary observing fleet, the scrutiny of which shows that a high standard of observing has been maintained. Four barographs were awarded to the masters of merchant ships for long and consistently good observing work and Excellent Awards were awarded to the master, principal observing officer and senior radio officer of the 100 best observing ships during the year.



The positions of U.K. Selected and Supplementary Ships on 20th December 1961 (a day picked at random). The shaded areas are those in which shipping is sparse, and in which Auxiliary Ships make reports.

2. Ocean Weather Ships

The British ocean weather ships completed 14 years of service in the North Atlantic during the year. *Weather Reporter*, the third of the original British weather ships (formerly 'Flower' class corvettes), was withdrawn from service in May and replaced by the former 'Castle' class frigate H.M.S. *Pevensy Castle*, now renamed *Weather Monitor*. *Weather Watcher*, the last of the older ocean weather ships, was replaced in December by *Rushen Castle*, now renamed *Weather Surveyor*. The conversion of these two ships was done by a shipyard at Blyth (Northumberland). The 'Flower' class vessels, which have now been disposed of, did a very good job and were economical to operate. Their successors are giving successful service; being larger they provide roomier and more comfortable accommodation, and their communication facilities are better.

Since 1st July, by international arrangement, surface meteorological observations have been made hourly at ocean stations 'A', 'I', 'J', 'K' and 'M', instead of three-hourly as was the case previously; this is now in line with the practice at land stations.

During a severe depression at station 'I' in September, meteorologists aboard *Weather Reporter* regularly carried on with their upper air observations, radio sonde and radar wind, when winds of 76 to 90 kt. (Beaufort force 12) were being experienced. This job involved launching a 9 ft. diameter balloon with instruments attached, a very difficult task in a small ship in such bad weather.

Special observations were made aboard the weather ships to check the accuracy of the Beaufort wind scale, and some experiments were made with a special buoy to obtain rainfall measurement at sea.

In the Birthday Honours List, Captain Sobey, who has served in these ships since 1947, was awarded the M.B.E., whilst in the New Year's Honours List of 1962 Mr. H. F. Clifton, boatswain of the *Weather Reporter*, who has served a like period was awarded the B.E.M.

Weather Adviser, while en route for station 'K' in the Bay of Biscay, visited the Isle of Man in September, when a number of visitors were shown round the ship.

Oceanographical work continued to be done for the Ministry of Agriculture, Fisheries and Food and for the Department of Agriculture and Fisheries for Scotland.

At station 'J', which is the busiest station, an average of about 1,200 aircraft per voyage of 24 days were supplied with meteorological information and navigational aids during the year; this compares with an average of about 150 a voyage in 1950. The British weather ships made about 1,000 radio contacts with merchant ships during the year, mostly in connection with radio weather messages for relay to G.P.O. coast stations.

Radar wind observations attained an average height of 60,200 ft., the maximum height being 90,500 ft.

3. Marine Climatology and Enquiries

Work continued with the tabulation of radiation records made by British ocean weather ships during the year, in a form suitable for punching on to cards. The data were also tabulated in the form required by the I.G.Y. Meteorological Data Centre. An investigation was started into the relation between hourly values of total solar radiation and the type and amount of cloud.

The new International Maritime Meteorological Punch Card, approved at the 13th Session of the W.M.O. Executive Committee (Geneva, May 1961), was introduced for the punching of ships' observations as from 1st January 1962.

Enquiries were dealt with from Government Departments, meteorological services of other countries, scientific institutions, shipping companies, commercial firms and private individuals. The number of formal enquiries into shipping casualties was larger than usual. Charges were made for supplying the information when

appropriate. The following examples give an idea of the range of the enquiries dealt with:

Details of wind, sea and cloud cover were supplied to Cable and Wireless, Ltd., with reference to the laying of a Sydney–Auckland cable link.

A firm of consulting engineers was provided with information regarding high waves on the Palestine Coast.

Information about the number of days a month when wind and sea would make it impossible to board vessels from small boats in the Channel was supplied to Shell Tankers, Ltd., from the records of light-vessels.

Humidities, and mean air and sea temperatures, were provided in connection with the carriage of timber to be stowed below deck from Singapore to Port Sudan.

Enquiries about ice conditions in areas adjacent to the North Atlantic, in particular the St. Lawrence and Great Bank, and Baltic, were dealt with; ice maps were supplied to fishing interests, merchant ships and interested scientific institutes at home and abroad.

Weather averages in the vicinity of Brunei (Borneo) were supplied in connection with the trials of hovercraft.

Data were given for the sea areas off Sheringham (Norfolk) to a film company.

4. Publications

(a) *The Marine Observer* was published quarterly.

(b) A new edition of M.O. 509, *Decode for Use of Shipping*, now entitled *Ships' Code and Decode Book*, was published. The main purpose of this edition is to provide Celsius dew point tables and instructions, and general distribution will not be made until Celsius thermometers are available for use in ships.

EXCELLENT AWARDS, 1961–1962

The July number of *The Marine Observer* once again brings us the pleasant task of congratulating the masters, principal observing officers and radio officers of the hundred ships which have sent us the most careful and painstaking meteorological logbooks during the year ending on 31st March, thereby qualifying for an excellent award. The past year's list is published on pages 102 to 104 of this issue, and below is the eighth annual short list of those ships which have sent us the best meteorological logbooks during the year:

1. *Clan Macleod* (Clan Line), Captain R. Harber.
Denbighshire (Glen Line), Captain T. R. Walker.
Pacific Fortune (Furness Lines), Captain R. Marbey.
2. *Chindwara* (British India Line), Captain M. H. Vincent.
Gloucester City (Bristol City Line), Captain E. Irish.
Sidonia (Anchor Line), Captain W. S. Thomson, O.B.E.
3. *Anno* (Mitchell & Rae, Ltd.), Captain J. C. Cowie.
Apollo (Bristol S.N. Co., Ltd.), Captain G. V. Barnes.
Gardenia (J. Robinson & Son, Ltd.), Captain J. H. Gray.
Glenroy (Glen Line), Captain D. Stewart.
Hertford (Federal Line), Captain H. C. R. Dell.
Laksa (Chr. Salvesen & Co., Ltd.), Captain L. B. Anderson.
Lismoria (Donaldson Line), Captain R. McNie.
Port Adelaide (Port Line), Captain E. W. Dingle, M.B.E.
Willowpool (Sir Robert Ropner & Son), Captain F. D. Lloyd.
Zinnia (J. Robinson & Son, Ltd.), Captain W. R. Hunter.

We congratulate *Apollo* and *Lismoria* on their third consecutive appearance in the annual short list, and *Gloucester City*, *Hertford* and *Zinnia* on appearing for the second year running. Photographs of the three best ships of the year appear opposite page 124.

EXCELLENT AWARDS (Year ended 31st March, 1962)

SHIP	CAPTAIN	PRINCIPAL OBSERVING OFFICER	SENIOR RADIO OFFICER	OWNER/MANAGER
<i>Achilles</i>	S. C. Llewellyn	B. A. Cooper	R. M. Lang	A. Holt & Co.
<i>Alsatia</i>	C. E. Smith	B. Edwards	J. S. Bishop	Cunard Line
<i>Andes</i>	G. M. Fletcher	I. S. Farquharson	G. Sewell	Royal Mail Lines
<i>Anno</i>	J. C. Cowie	J. Watt	D. Cowie*	Mitchell and Rae, Ltd.
<i>Apollo</i>	G. V. Barnes	G. J. Murphy	B. Burcher*	Bristol S.N. Co., Ltd.
<i>Australia Star</i>	H. D. Windle	J. A. H. Gray	M. Jagger	Blue Star Line
<i>Beaverdell</i>	W. J. P. Roberts	J. de L. Lewis	D. Franklin	Canadian Pacific Line
<i>Birmingham City</i>	R. Campbell	D. Simpson	J. C. Gear	Bristol City Line
<i>Bravo</i>	J. Etches	S. A. Gallon	H. Jackson	Ellerman's Wilson Line
<i>Brisbane Star</i>	J. G. Reeve	A. Carrier	W. Wade	Blue Star Line
<i>British Sailor</i>	J. H. Nelson	J. C. Wilson	R. Stewart	B.P. Tanker Co., Ltd.
<i>Cairndhu</i>	G. H. Percy	A. J. Quinan	W. P. Greaves	Cairn Line
<i>Chindwara</i>	M. H. Vincent	B. R. Sanderson	J. W. M. Lewis	British India Line
<i>City of Brisbane</i>	W. Kerr	A. J. Evans	G. Barlow	Ellerman Lines
<i>Clan Buchanan</i>	L. Jones	A. C. Smith	J. Lamb	Clan Line
<i>Clan Macdonald</i>	H. D. J. Lockyer	C. R. S. Dyer	A. W. J. McLeod	Clan Line
<i>Clan Macleod</i>	R. Harber	R. A. Milne	K. F. Plumridge	Clan Line
<i>Clan Macnab</i>	T. A. Watkinson	M. B. Fowkes	R. W. Moore	Clan Line
<i>Consuelo</i>	F. Metham	R. Blencoe	D. Leeson	Ellerman's Wilson Line
<i>Cornwall</i>	I. Y. Batley	J. McMurren	S. Adams	Federal Line
<i>Crofter</i>	R. Sutcliffe	P. G. T. Potter	J. A. L. McDonald	Harrison Line
<i>Crystal Bell</i>	E. R. Owen	P. G. Kuhnel	K. D. O'Kelly	Sugar Line
<i>Cumberland</i>	J. E. Bury	A. McCalmont-Woods	K. D. Wilson	Federal Line
<i>Dartwood</i>	W. Manson	B. Taylor	M. Lebbon	Wm. France, Fenwick & Co., Ltd.
<i>Debrett</i>	C. E. Legg	J. J. Barrowcliff	A. J. MacNeil	Lampport & Holt Line
<i>Denbighshire</i>	T. R. Walker	D. J. Metcalf	G. Kershaw	Glen Line
<i>Diomed</i>	W. J. Moore, D.S.C., R.D.	J. M. E. Leese	E. O. Roberts	A. Holt & Co.
<i>Discovery II</i>	P. T. Taylor	J. E. Higham	K. Mitchell	National Inst. of Oceanography
<i>Dominion Monarch</i>	K. D. G. Fisher, G.M.	N. Jackson	R. Crompton	Shaw Savill Lines
<i>Dorset</i>	J. S. Laidlaw	W. Killackey	A. Hirst	Federal Line
<i>Echo</i>	J. L. Jenkins	J. Trimlett	C. Wallis-Newport*	Bristol S.N. Co., Ltd.
<i>Essex</i>	S. W. Andrews	G. H. Webber	L. Sutton	Federal Line
<i>Esso Canterbury</i>	C. L. Thomas	G. Harrison	P. Barrett	Esso Petroleum Co., Ltd.
<i>Explorer</i>	E. A. Bruce	P. S. Burn	J. Steven	Dept. of Agric. & Fish., Scotland
<i>Gardania</i>	J. H. Gray	J. W. Spence	J. Griffen	J. Robinson & Son

<i>Glenlyle</i>	R. Johnston, R.D.	B. G. Lloyd	D. P. Stoker	Glen Line
<i>Glenorchy</i>	H. S. Clarke	T. G. Johnston	A. Brown	Glen Line
<i>Glenroy</i>	D. Stewart	T. A. H. Dick	J. B. Carr	Glen Line
<i>Gloucester City</i>	E. Irish	M. F. Williams	M. Brett	Bristol City Line
<i>Gothic</i>	L. J. Hopkins	C. Wynne-Eyton	B. McGovern	Shaw Savill Line
<i>Hadrian Coast</i>	W. Wyness, M.B.E.	A. Thain	P. M. Bowie*	Aberdeen S.N. Co., Ltd.
<i>Haparangi</i>	W. J. Stevens	A. J. Ward	I. Barber	New Zealand Line
<i>Hauraki</i>	D. A. G. Dickens	D. J. D. Moorwood	M. Moore	New Zealand Line
<i>Hector</i>	R. A. Hanney	J. F. Clarkson	A. Torrance	A. Holt & Co.
<i>Hertford</i>	H. C. R. Dell	M. W. Elsam	D. Mason	Federal Line
<i>Hororata</i>	C. P. Robinson	R. Bond	J. Hewitt	New Zealand Line
<i>Iron Barque</i>	D. S. Brady	B. Reid	P. Standen	Common Bros., Ltd.
<i>Jason</i>	J. Gould	G. Owen	T. Davies	A. Holt & Co.
<i>Kemignorth Castle</i>	C. E. Lorains	A. P. Caola	M. D. Evans	Union Castle Line
<i>Kenya</i>	H. B. W. Cray, M.B.E.	E. G. Rowley	J. Masterman	British India Line
<i>Laksa</i>	L. B. Anderson	J. Carnie	H. McKay*	Chr. Salvesen and Co., Ltd.
<i>Laurentia</i>	T. S. Graham	N. C. B. Campbell	D. Murray	Donaldson Line
<i>Leicestershire</i>	H. B. Peate, D.S.C., R.D.	D. R. Clayton	J. E. Unsworth	Bibby Line
<i>Lismoria</i>	R. McNie	A. Buchan	J. Limpitlaw	Donaldson Line
<i>Mandator</i>	A. B. Davies	C. Kingston	R. McMurtrie	Brocklebank Line
<i>Media</i>	W. J. Law, R.D.	C. R. Lucas	A. N. Henderson	Cunard Line
<i>Merchant Duke</i>	S. E. Hooper	W. C. Johnston	A. H. G. Wall	Drake S.S. Co., Ltd.
<i>Meta</i>	A. D. McNab	A. McIntyre	P. Driscoll	Glen & Co., Ltd.
<i>Milo</i>	J. N. Thatcher	W. G. Summerfield	S. Church*	Bristol S.N. Co., Ltd.
<i>New York City</i>	F. W. Harris, R.D.	P. W. Doble	W. Read	Bristol City Line
<i>New Zealand Star</i>	D. W. Davies	A. Moir	T. Morrison	Blue Star Line
<i>Norfolk</i>	D. B. Brittain	R. G. J. Davis	E. Perry	Federal Line
<i>Nottingham</i>	A. B. Stalker	M. J. West	B. Percy	Federal Line
<i>Novelist</i>	C. C. Heaton	A. I. McDonald	D. A. Eakin	Harrison Line
<i>Orsova</i>	R. J. Craddock, O.B.E.	M. S. Cavaghan	P. Parish	Orient Line
<i>Otaio</i>	K. Barnett, R.D.	E. B. Daubeny	M. J. Morrall**	New Zealand Line
<i>Pacific Envoy</i>	A. H. Cooke	G. A. Adams	I. Strachan	Furness Lines
<i>Pacific Fortune</i>	R. Marbey	R. G. Payne	N. S. Reeve	Furness Lines
<i>Perseus</i>	W. K. Hole	E. G. Williams	R. J. Hinchcliffe	A. Holt & Co.
<i>Pershire</i>	F. Harris	A. Ewing	P. Treharne	Houston Line
<i>Port Adelaide</i>	E. W. Dingle, M.B.E.	S. N. Hurst	C. Hill	Port Line
<i>Port Auckland</i>	C. R. Townshend	G. J. Botterill	H. Horrock	Port Line
<i>Port Hardy</i>	R. L. Hagley	D. Mason	G. Brumby	Bibby Line
<i>Port Invercargill</i>	A. S. McClounan	J. F. Sheldrake	T. Twistleton	Port Line
<i>Port Macquarie</i>	V. M. Read	M. Thwaite	G. Kerr	Port Line
<i>Port Pirie</i>	L. J. Skalles	R. H. Mitchell	R. Robertson	Port Line

* Deck Officer. ** 2nd Radio Officer.

SHIP	CAPTAIN	PRINCIPAL OBSERVING OFFICER	SENIOR RADIO OFFICER	OWNER/MANAGER
<i>Port Wyndham</i>	R. H. Finch	J. W. Gunn	J. Clarke	Port Line
<i>Rangitoto</i>	A. H. Hocken	C. C. Haffett	F. Fowler	New Zealand Line
<i>Regent Falcon</i>	L. W. Fulcher	G. J. Roberts	W. F. Shepherd	New Zealand Line
<i>Sagamore</i>	W. D. Cook	I. E. McVicar	H. Playford	Regent Petroleum Tankship Co., Ltd.
<i>Scottish Hawk</i>	G. Lindsay	J. S. Lawn	T. Scott	Furness Lines
<i>Serenia</i>	A. Mair	J. C. Attwood	D. Ambler	Scottish Tanker Co., Ltd.
<i>Shropshire</i>	J. C. Nettleship	M. J. Laws	W. P. Hunter	Shell Tankers, Ltd.
<i>Sidonia</i>	A. E. Young	J. D. Routledge	R. D. Brown	Bibby Line
<i>Silverbrook</i>	W. S. Thomson, O.B.E.	W. K. West	J. F. Gourlay	Anchor Line
<i>Southern Cross</i>	P. L. Hopkins	J. Ezley	D. A. Ellison	Silver Line
<i>Swiftpool</i>	N. H. B. Bloye, D.S.C., R.D.	P. J. Cornelius	E. Carruthers	Shaw Savill Line
<i>Tana</i>	L. H. Edmeads	D. G. Gomer	H. Matthews	Sir R. Ropner & Son, Ltd.
<i>Trecarrell</i>	E. A. Snaith	J. Landels	C. Pope	Chr. Salvesen & Co., Ltd.
<i>Trelawney</i>	J. Clark	J. V. Walgate	W. Ross*	Hain S.S. Co., Ltd.
<i>Tremayne</i>	I. M. Price	J. M. F. Barnett	M. Appleby	Hain S.S. Co., Ltd.
<i>Tremorvah</i>	W. R. Bulmer	C. K. Newton	J. Farrer	Hain S.S. Co., Ltd.
<i>Trewellard</i>	G. Joslin	J. C. Perkin	K. Brooks	Hain S.S. Co., Ltd.
<i>Venassa</i>	C. E. Pratt	J. Carmichael	W. Dobbie	Hain S.S. Co., Ltd.
<i>Waivera</i>	D. L. Lacey	W. E. Wilson	A. Lambert	Hain S.S. Co., Ltd.
<i>Welsh City</i>	P. H. Maton	S. Gleadhill	J. A. R. Savoie	Shell Tankers, Ltd.
<i>Willowpool</i>	J. O. Williams, R.D.	C. H. Swindells	J. Downie	Shaw Savill Line
<i>Zinnia</i>	S. Leebetter	A. D. Lightfoot	S. G. Whitmore	Sir Wm. Reardon Smith & Sons, Ltd.
	F. D. Lloyd	W. B. Rial	S. Duffy	Sir R. Ropner & Son, Ltd.
	W. R. Hunter	D. Mustarde	G. Cunningham	J. Robinson & Son
MARID SHIPS †				
<i>Duke of Lancaster</i>	J. Irwin	R. Gates	S. H. McKaig	British Transport Commission
<i>Lochmor</i>	D. Sinclair	J. Hodgson	D. McLean*	David Macbrayne, Ltd.

† Vessels in the short sea trades recruited for the purpose of observing and transmitting sea surface temperatures. * Deck Officer.

TRAWLERS

SKIPPER	WIRELESS OPERATOR	SHIP	OWNERS
J. E. Dobson	K. H. Massey	<i>St. Loman</i>	Thos. Hamling & Co., Ltd.
B. C. Wharam	L. Hought	<i>D. B. Finn</i>	St. Andrew's Steam Fishing Co., Ltd.

More than three hundred meteorological logbooks received during the year from Selected and Supplementary Ships were classed 'excellent' but it is only the best hundred of these who can receive an award. We can assure those who did not get quite enough marks for an award that the annotation 'excellent' has been placed against the record of their work during the year on their personal card, whilst a little more attention to detail in their next meteorological logbook—perhaps a greater proportion of temperatures read to the decimal point, greater attention to shifts of wind, more surface currents computed between stars, or the completion of the ice report in the appropriate areas even if no ice has been sighted—might well bring an 'excellent' meteorological logbook up into one of the hundred best.

A further list on page 104 gives the two 'Marid' ships (vessels in the short-sea trades taking and transmitting sea temperatures only) and the two trawler skippers and wireless operators who have rendered us the best service during the year in their respective spheres. The contribution of ships in these classes is unspectacular and often made in circumstances virtually unknown to the deep water merchant ship, but they fill what would otherwise be awkward gaps in the meteorological coverage of the oceans—the trawlers from the Arctic where literally anything meteorological might happen and where ice may frequently be met with, and the 'Marid' ships from the near waters from which sea temperatures are vital for the forecasting of fog.

The recipients of all the awards will be individually notified by letter and asked for an address to which they would like us to send it. But if any officer sees his name in the list before he receives the official letter, a decided possibility if he has changed his ship, we would be glad if he would write to us claiming the award and giving the address to which he would like it sent.

Over the years we have found that the most popular award is a world atlas, so we try to make the first award to an officer an atlas. We are not always able to fulfil this completely for we have to buy the awards several months before they are required and it is not until a few days after March 31st that we know how many 'new customers' we have. There may be a few of these who do not want an atlas anyway, but would rather have the alternative, a book. If there are, we would be glad if they would let us know.

L. B. P.

THE MARINE OBSERVERS' LOG



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.

HURRICANE 'BETSY'

North Atlantic Ocean

m.v. *Rangitata*. Captain A. Hocken. Madeira to Curaçao.

3rd September 1961. At 0645 GMT in position 20° 54'N, 46° 12'W the vessel

received the first warning of tropical revolving storm 'Betsy', in position $15^{\circ} 30'N$, $44^{\circ} 12'W$. The ship's course and speed at the time were 245° , 16.0 kt., on a collision course with the centre of the storm. The wind, which was ENE, force 4 at the time, began to veer and increase at about 1000 and by 1500 had steadied in the east. The weather was deteriorating rapidly, so the vessel was hove-to for 10 hours. Whilst the vessel was heading towards the storm, the barograph trace fell steadily, until course was altered to 180° at 0745, when the trace levelled out slightly. After the vessel was hove-to, the trace steadied and began to rise slowly, the wind force remaining unchanged. By 1900 the wind direction had veered about one point; the change of direction continued and by 0800 on the 4th the wind was SE'ly. In the evening the wind was force 4-5 from a southerly point. Very heavy confused swells were experienced during the time that the vessel was hove-to; lightning was also seen in the south, but no thunder heard. It is estimated that the closest approach to the storm centre was 140 miles.

Note 1. During the period of this account the maximum wind speed recorded in the ship's meteorological logbook was 40 kt., the maximum wave height was 26 ft. and the minimum pressure was 1008.2 mb.

Note 2. See also the article on page 128.

s.s. *Media*. Captain R. J. N. Nicholas, R.D. Liverpool to New York.

11th September 1961

GMT

1000 A hurricane warning was received that 'Betsy', estimated depth 965 mb. in $41^{\circ}N$, $46^{\circ}W$ at 0000 on the 11th, was expected to reach $46^{\circ}N$, $34^{\circ}W$ at 0000 on 12th.

1020 Acting on this information, course was altered to 270° to endeavour to keep *Media* north of the hurricane, having such short notice. Wind S'ly, force 4-5; overcast and clear. Moderate sea; heavy WSW swell. Barometer 1013.2 mb., falling. Working on Dunstable's position, *Media* would then pass approx. 120 miles to the north of the centre at about 0400 on the 12th.

Position of ship: $50^{\circ} 32'N$, $21^{\circ} 48'W$.

1200 Commenced sending three-hourly reports to Dunstable, also CQ messages.

1400 Wind backing slowly to S'E, force 6 and barometer falling rapidly.

1505 Drizzle commenced.

1700 Continuous drizzle and occasional rain.

1900 Wind veered very rapidly.

2045 Wind veered to SE, force 7. It was now apparent that the vessel was going to pass very close to the centre of 'Betsy' and that the estimated position and movement of the hurricane, as given, was much further south than the actual position.

2230 Wind moderated and became variable, force 4-5, with continuous heavy rain.

2300 Wind variable, force 3-4, but mainly SE'ly. Barometer 960.4 mb., falling.

2330 In position $50^{\circ} 30'N$, $27^{\circ} 40'W$ the expected shift of wind took place. The wind shift to NW, hurricane force (estimated at over 90 kt.), took place like an explosion. The barograph showed a slight fall after this, before beginning to rise almost vertically. A special report was sent to Dunstable giving the centre of 'Betsy'.

12th September

0000 The wind was estimated to be about 90 kt. and speed and course were adjusted as necessary to combat the sudden high sea and very heavy confused swell.

- 0100 Wind now moderated to NW'yly, force 12 (68 kt.) with continuous heavy rain throughout.
- 0110 Rain ceased; wind moderating slowly, but no change in direction.
- 0200 Wind veered to NW'W, force 10; cloud cleared; visibility good apart from spray. Barometer still rising sharply.
- 0300 Course set to 243°; working up to full speed again.
- 0900 Ceased sending three-hourly reports.
- 1000 By now the barometer had steadied. Wind WNW. Variable cloud with occasional heavy rain showers.

Note. Dr. F. W. Reichelderfer, Chief of the U.S. Weather Bureau, comments:

"A report from s.s. *Media* was included in the 0000 GMT collective received via Paris on 12th September 1961. This report was very helpful to our forecasters in locating Betsy's position, since the *Media* gave her position near 50°N, 27°W, which at that time was approximately 100 n. miles wsw of Betsy's centre. Unfortunately, we were unable to find in preceding or subsequent Paris collectives any other reports originated by the *Media*.

"m.v. *Rangitata* furnished 1200 and 1800 reports on 3rd September, as well as an 0600 message on 4th September, and 0000 and 0600 reports on 5th September. All of these reports were of much value to our forecasters in issuing advices on this storm, especially the 0600 observation of 4th September. At that time, *Rangitata* reported her position in approximately 18° 30'N, 46° 12'W, or about 150 n. miles east of Betsy, and this was the only observation received from this quadrant of the storm.

"The Weather Bureau commenced issuing Hurricane Betsy warnings at 0400 on 3rd September, when it was first reported near 15° 30'N, 44° 12'W. Warnings on this storm were issued for broadcast to ships every six hours until 14th September when Betsy, with much diminished intensity, was centred at 1800 near 62°N, 24°W.

"Please convey to the captains and ships' officers of *Media* and *Rangitata* our sincere thanks for their co-operation in furnishing valuable reports on these occasions."

TYPHOON 'NANCY'

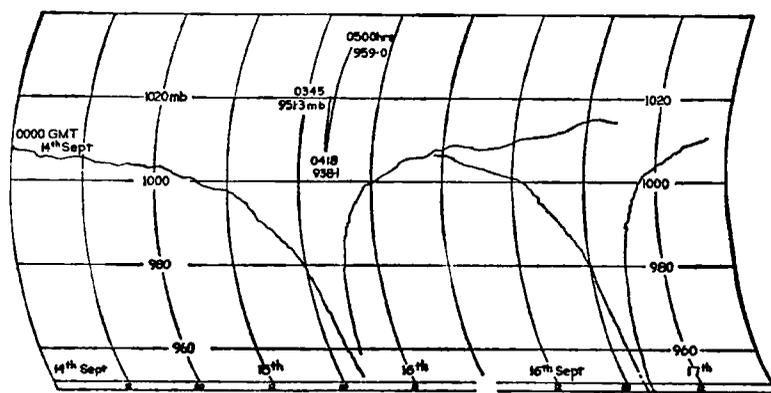
Osaka Bay

m.v. *Trevelyan*. Captain E. F. Boyd. At anchor. Observers, the Master and all officers.

12th September 1961. All vessels were evacuated from Kobe and Osaka and were anchored in Osaka Bay, the total number of ships involved being some 138.

- 13th Barometer falling at a rate of about 6 mb. in the day.
- 15th Between 1500 and 2300 GMT the wind increased from light airs to force 4.
- 16th By 0300 the wind was force 7. The sea was choppy but no swell was seen.
- 0348 : wind reached hurricane force from ssw. Engines used to ease the strain on both anchors. Visibility reduced to about 50 yd. due to light rain and sweeping spray. The clouds before the storm were type Cb., but during the height of the typhoon the cloud resembled a low haze hanging over the area.
- 0415 : the sea became exceedingly rough, with a moderate swell, the surface being a mass of white crests and foam.
- 0420 : wind began to decrease rapidly.
- 0425 : wind now force 4. Sky cleared.
- 0430 : wind died away completely then began to blow from the opposite direction. It increased rapidly, the force being impossible to estimate. Swell now was much higher. Shore bases put the wind at 120 kt., and as the centre passed very near to us, the wind was thought to have been probably about 100 kt. Swell was of the order of 20-25 ft. in height.
- 0600 : wind now began to decrease slightly.
- 0700 : wind force 5.

0800: wind now calm and only a slight swell running. The violent wind experienced after the passage of the centre of the typhoon continued for a longer time than it did ahead of the centre. The lowest reading of the barometer was 935 mb. (corrected).



Barograph traces recorded by *Romanby* (left) and *Trevelyan* (right) during typhoon 'Nancy'.

Note. At noon on 8th September 1961, typhoon 'Nancy', then developing, was centred at 90°N , 158°E and moving towards the west. By noon on the 10th, the centre lay at $11\frac{1}{2}^{\circ}\text{N}$, $145\frac{1}{2}^{\circ}\text{E}$, the direction of travel being WNW. Following a NW'ly track the typhoon centre reached 17°N , 135°E at midday on the 12th. By noon on the 14th, when the typhoon was centred at $26\frac{1}{2}^{\circ}\text{N}$, $128\frac{1}{2}^{\circ}\text{E}$, it was moving almost due north and soon afterwards it began to curve towards the NNE, reaching 30°N , $130\frac{1}{2}^{\circ}\text{E}$ by midday on the 15th. It passed across the Osaka area during the early hours of the 16th. By now the typhoon had assumed the characteristics of a very intense frontal depression, and proceeding towards the NE during the following days it reached the Bering Sea on the 20th. During its active period, the typhoon moved at a speed of 10 to 15 kt.

TYPHOON 'SALLY'

South China Sea

m.v. *Glenorchy*. Captain N. S. Clarke. Hong Kong to Yokohama. Observers, the Master, Mr. I. G. Johnston, 3rd Officer and Mr. P. R. Dew, Midshipman.

28th September 1961

GMT

- 1215 Wind 290° , force 4, increasing rapidly; barometer 994.4 mb., beginning to fall quickly.
- 1230 Wind 290° , force 7. Sea, period 5-7 sec., height 5 ft. Swell 300° , 7-9 sec., 13-14 ft. Driving rain reducing visibility to $\frac{1}{2}$ mile or less, but occasionally improving to 3 miles.
- 1400-1410. Wind dropped suddenly to 290° , force 3. Confused swell coming from 300° , 010° and 050° , height 12 ft.
- 1415 Air temp. 79°F (a drop of 8°); wet bulb $77\frac{1}{2}^{\circ}$ (1° down); barometer 986.7 mb. Rain ceased. Low cloud; C_{L7} appeared in a circle round vessel, while a bright moon shone through C_{M1} . The radar showed scattered showers in a circle of 9-10 miles radius. Position of ship at 1415 was $21^{\circ} 53'\text{N}$, $117^{\circ} 10'\text{E}$, which was estimated to be 35 miles from the centre of the typhoon.
- 1530 Barometer rising and wind backing to 190° and increasing to force 9. Heavy rain.
- 1800 Wind 190° , force 9. Moderate rain. Vis. 5 miles.
- 2000 Weather moderating. Wind decreasing and rain stopping.

Several hours before the storm, the air was heavy and humid. Quite large numbers

of 'green fly', dragonflies and the ordinary house fly were flying about the vessel, but few survived the heavy rain and high winds.

Position of ship at 1200: $22^{\circ} 00'N$, $116^{\circ} 30'E$.

Bashi Channel

m.v. *Trelevan*. Captain G. A. McKay. Keelung to Lautoka. Observer, Mr. C. Cornish, 3rd Officer.

27th September 1961

GMT

1200 Wind 340° , force 7. Barometer falling.

1800 Wind 010° , force 8. Barometer falling very rapidly.

28th September

0000 Wind 020° , force 10. Barometer still falling very rapidly.

Swell from 040° , 6-7 sec., height 9-10 ft.

0110 Wind dropped and backed through w to sw. Barometer 28.96 in. (980.7 mb.).

0115 Wind dropped from force 3 to a light breeze. Barometer 28.89 in. (978.3 mb.). Waves from NNE.

0125 Wind backed to south and started rising again. Barometer 28.89 in. (978.3 mb.). Sea waves still from NNE.

0145 Wind s'ly, force 8. Barometer 28.89 in. (978.3 mb.). Sea waves from ssw and heavy swell from same direction.

0200 Barometer began to rise steeply. Wind in squalls estimated to reach 90 kt.

Position of ship at 0000 on 28th: $22^{\circ} 12'N$, $122^{\circ} 24'E$.

Note 1. Captain William J. Kotsch, U.S.N., Commanding Officer of the Joint Typhoon Warning Centre at San Francisco, comments:

"The reports furnished by these ships proved to be invaluable last September while 'Sally' was approaching Taiwan and Hong Kong and are just as interesting now in retrospect.

"The 1200 GMT report on 28th September from the *Glenorchy* provided the key for our 1800 warning which was based on surface reports. Sally's position was furnished by radar sites in Taiwan when the *Trelevan* was in the eye, but the ship's timely report provided other data of extreme value. At times other than those of the land radar and aircraft fixes, the only information available for centre positions was ship reports such as those provided by the *Glenorchy* and *Trelevan*."

Note 2. Captain Kotsch sent us a copy of Sally's 'best track' (see page 110) and the preliminary story of her life which will later be published in his annual typhoon report. It reads as follows:

"The 1800 GMT surface chart for 19th September was the first to show the existence of an area of low pressure situated to the east of Eniwetok Atoll. As this 'low' moved towards the west, its falling pressures and increasing radius of cyclonic winds gave indications of intensification. The first tropical depression warning was issued at 1200 on 21st September. However, subsequent reconnaissance showed light winds and no organised centre and a final warning was issued at 1200 on 22nd September.

"Aerial reconnaissance continued but no apparent change was noted. A photograph of this system, showing a well defined vortex, was taken at 0047 on 24th September by *Tiros III*. The reconnaissance fix of 0455 on 25th confirmed this and reported 25 kt. winds with pressure 993 mb. The issue of tropical depression warnings was resumed at 0600 on 25th. At this time the centre was moving towards WNW at 11 kt. and intensifying slowly. The first tropical storm warning was issued at 0600 on 26th, although subsequent analysis showed that Sally actually became a tropical storm at 1800 on 25th. She started a gradual turn towards the west and continued intensifying, reaching typhoon strength at 0600 on 27th. Sally reached her maximum intensity (70 kt.) at 1200 on 27th and at this time was headed west towards southern Taiwan. She crossed the island at approximately 0600 on 28th and after weakening slightly again reached 70 kt. intensity as she entered the Chinese mainland, passing 15 miles north of Hong Kong. She had weakened to about 40 kt. at this time and continued to weaken as she

turned towards the wsw. Sally remained approximately 30 miles inland and moved parallel to the coast-line until 1800 on 29th when the final warning was issued.

"Sally travelled 2,775 miles from the first to the last warning: 1,850 miles of this distance were covered by warnings, whilst the remaining 925 miles occurred during the period when warnings were not issued. Sally's minimum was 9 kt. on 26th September and the maximum of 20 kt. occurred whilst crossing the island of Taiwan."

Note 3. Readers will note from the above, that photographs taken by the American Satellite Tiros III were used in the study of Sally. Specimen photographs taken by Tiros I, the first weather satellite, were published in the April 1962 number of *The Marine Observer*.

DEPRESSION

South Pacific Ocean

m.v. *Port Adelaide*. Captain E. W. Dingle, M.B.E. Port Chalmers to Balboa. Observers, Mr. I. Lister, 2nd Officer and Mr. S. N. Hurst, 3rd Officer.

16th–17th September 1961

GMT

1200 16th September. Position $43^{\circ} 36'S$, $151^{\circ} 00'W$; wind 270° , force 3; barometer 1007.4 mb., falling.

1300 Wind backed to 230° , force 2; drizzle commenced.

1550 Drizzle stopped; wind 280° , 5 kt.; barometer still falling erratically.

1800 Position $43^{\circ} 06'S$, $148^{\circ} 48'W$. Wind 010° , force 3; barometer 1001.8, falling; sky overcast. Position of depression by weather map $32^{\circ}S$, $157^{\circ}W$; barometer 1002 mb.

2400 Vessel's position $42^{\circ} 36'S$, $146^{\circ} 48'W$. Wind 090° , force 2/3; barometer 994.5 mb., falling; sky overcast.

0230 Wind 160° , force 6/7; barometer 985.8 mb., continuing steep fall. Air temp. $48.5^{\circ}F$; continuous drizzle and rain.

0325 Wind continued decreasing and backing until now 070° , force 2–3; swell 080° , about 6 ft. Barograph levelling, 983.8 mb., having fallen 23.6 mb. in approx. 15 hours. Air temp. 52.5° , which is a 4° rise in 20 min.

0400 The following additional report was sent to OBS Wellington.

16423 45204 90504 95515 83452 9XXXX 15670 00152 10624, with the following plain language message—"0320Z wind 160° , 27 kt., backed to 070° , 7 kt. Temperature rise 4° suggests centre approximately $41^{\circ}S$, $145^{\circ}W$, note pressure 983.4 mb."

This was transmitted via ZLB at 0431 on frequency 12622 mc/s.

0555 Whilst making out the synoptic report the wind changed from light and variable NE to 250° , 30 kt., which increased to 35 kt. by 0600, temperature etc. as in report. As vessel must have passed through the centre the following plain language message was added to this report—"apparently passed through or very close to centre".

0605 Wind now 240° and increased to 45 kt.; sea and swell increasing quickly; barometer rising.

1100 Wind 290° , force 6; the sky varied between cloudless and overcast with light rain, these conditions following one another quite rapidly.

1430 Ship's position by observation $41^{\circ} 07'S$, $142^{\circ} 03'W$. The Wellington weather situation for 0600 on 17th gave the central pressure of this low as 989 mb. in position $41^{\circ}S$, $144^{\circ}W$.

Note. Dr. M. A. F. Barnett, Director of the New Zealand Meteorological Service, comments:

"The reports received by this Service from several ships in the neighbourhood of the storm at different times are yet another example of the extreme value of weather reports from ships in general, and in these waters in particular. They also show that the dimensions of storms of this sort can be quite small, and their intensity could remain unsuspected if there happened to be no ship in the immediate vicinity of the centre.

"The storm reported by the *Port Adelaide* had its origin as a shallow depression of 1019 mb. about 1800 GMT on 12th September, some 100 miles southeast of Lord Howe Island. It moved slowly eastwards, deepening gradually, and at 0600 on 15th was located about 250 miles southeast of Kermadec Islands, with a central pressure about 1007 mb. From this position it moved southeast into an area from which no weather reports were received, and its position and intensity could only be surmised. Up to this time no reports of strong winds had been received, but a special message in plain language from the *Slamat*, 35° 30'S, 164° 48'W at 2030 on 15th—"Lowest pressure 993 mb., severe rain, force 8 to 9 winds"—indicated that the depression had deepened and become intense. The following reports from the *Batu* also confirmed this:

1800, 15th: 35° 18'S, 161° 24'W. NE, 10 kt. 1009.6 mb., falling.

0000, 16th: 35° 30'S, 163° 12'W. W, 40 kt. 999.1 mb., falling rapidly.

"For some days past a front lying southeastward from Fiji had been almost stationary and a series of wave-depressions had been moving along it. Although the storm under discussion had no connection with this front there is little doubt that its approach to the frontal zone, the development of a wave-depression a few hundred miles to the north, and the intensification of the storm were closely related developments. (The depression to the north was the one referred to in the *Port Adelaide's* entry at 1800 on 16th September.)

"The valuable information received from the *Slamat* and *Batu* enabled this Service to issue gale warnings at 0000, 0600, and 1200 on 16th for the general area of the storm. Its movement and intensity could not again be determined with any accuracy, until the detailed reports from the *Port Adelaide* were received later on 17th September.

"It is fairly evident that at about 1200 on 15th a small but intense centre formed within the area of the previous shallow depression, moved ESE at a speed of about 30 kt. and as it passed close to the three ships mentioned, gave rise to rather sudden changes in pressure, wind, and weather. It appears almost certain that the centre of the storm passed over or near the *Port Adelaide*, but the log shows that the structure of the storm was not simple. However, in the absence of other reports from the neighbourhood at the same time a unique explanation of the details of the sequence of events cannot be offered."

WATERSPOUT

Fehmarn Belt, Baltic Sea

m.v. *Crinan*. Captain W. Tawse. Lulea to the U.K.

17th July 1961. At 1725 GMT a disturbance on the water was seen about half a mile away, two points to port. At the same time it was seen that the cloud base began to travel downwards forming a spout. The disturbance on the surface was seen to have an anticlockwise, circular motion and at first heavy spray rose to a height of 70 ft. Before dying away at 1735 the spray was about 60 ft. in height. The waterspout was travelling from WNW to ESE. Cloud, Cb. at 1,000–2,000 ft.; wind NW'W, force 3–4. Air temp. 61°F, wet bulb 58.5°, sea 60°.

Position of ship: 54° 27'N, 11° 39'E.

Note. Waterspouts are unusual in the Baltic. This one was probably generated by an outbreak of cold Arctic air flowing southwards over a warm sea.

HAILSTORM

Persian Gulf

s.s. *Afghanistan*. Captain D. Calvert. At anchor off Umm Said. Observers, the Master and all deck officers.

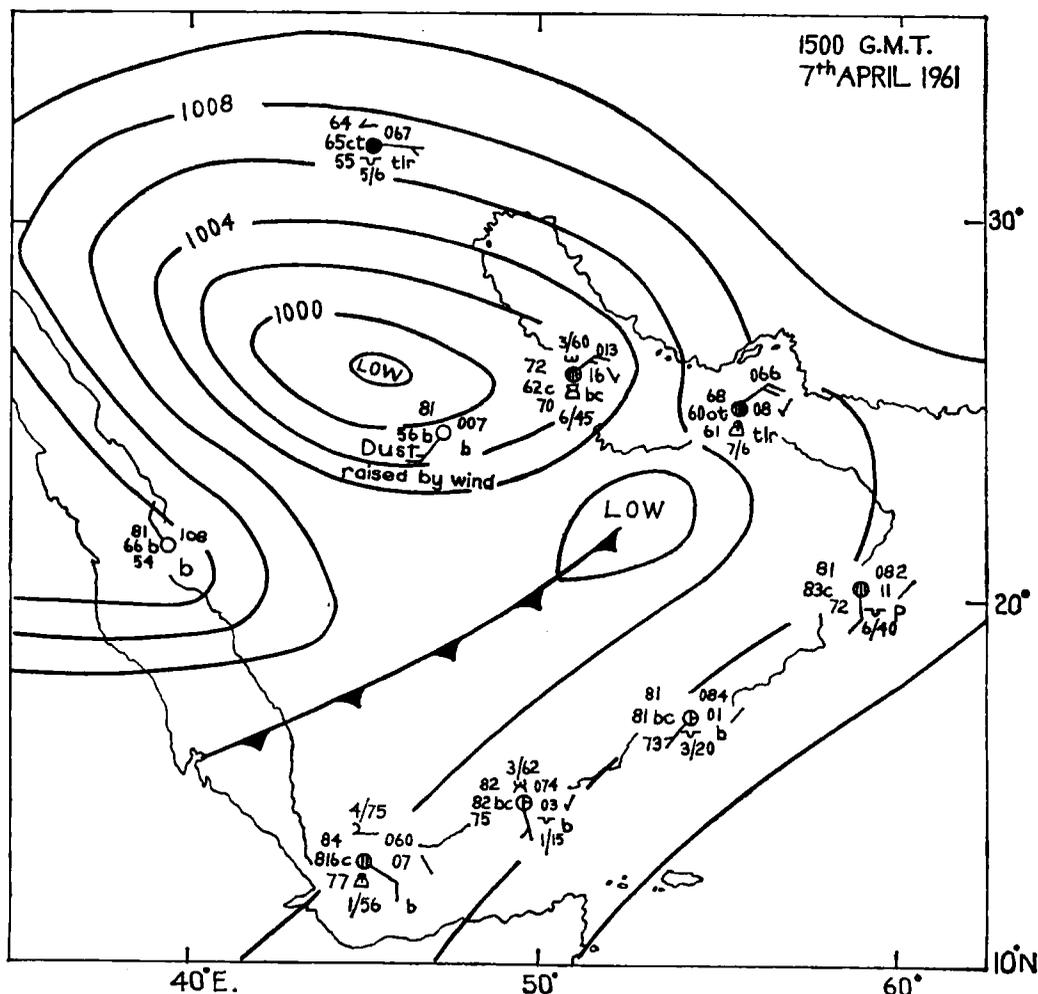
7th April 1961. At 1445 GMT the wind veered from ENE, force 3, to ESE, force 4, and precipitation in the form of heavy hail commenced; within a few minutes the hail was very dense and of a size larger than tennis balls, some hailstones being estimated to be at least 5 in. in diameter. The visibility by this time had decreased to about 350–400 yd. By 1500 GMT the hail had given place to torrential rain and visibility had fallen still further to about 100 yd.; the wind had increased to about force 8 with gusts up to force 12. The air temp. was 75°F and the sky was covered with Cb.

At 1510 GMT the wind backed to NE, force 9–10, but by 1512 it had decreased

to force 6. Patches of blue sky appeared and the rain became intermittent, although still heavy. Much lightning had been visible for the previous 2 hours and it was seen to the eastward for the following 7 hours, during which time the wind was backing and veering between NW and E through N, finally becoming E, force 5.

The size of the hail may be judged from the fact that the sea was a mass of white foam caused by the splashes from the hail, the splashes being from 2 to 3 ft. high; the damage done to the brass binnacle covers for both gyro and magnetic compasses, which were dented to a depth of $\frac{3}{4}$ in., is another indication. Over 80 holes were found in the boat covers the following morning.

Position of ship: $24^{\circ} 56'N, 51^{\circ} 36'E$.



Note 1. The Chief Meteorological Officer, Middle East Command, comments:

"The synoptic situation at 1500 GMT on 7th April is shown above. A depression which was believed to be multi-centred was moving in a generally south-easterly track to the south west of the Persian Gulf. The observations from *Afghanistan* suggest that a small but intense thundery depression moved within the general circulation.

"The weather appears to have been unsettled over a wide area, but nothing comparable with the conditions described above was experienced by reporting stations. Bahrain reported heavy thunderstorms with rain. There was hail at 1130 GMT, but the size of hailstones was reported as diameter 5 to 9 mm. The maximum wind speed at Bahrain was a gust to 35 kt. At Sharjah there were also heavy thunderstorms with rain, but no hail. The highest gust there was 40 kt. An aircraft in flight at 14,500 ft. in the Persian Gulf area (precise position uncertain) reported hail on the afternoon of the 7th, but without comment on the size of hailstones."

Note 2. Some reports of large hail have been received, but the hailstones of 5 in. diameter now reported must be near the record. The *Meteorological Glossary* quotes "stones as large as grapefruit" as the largest observed anywhere.

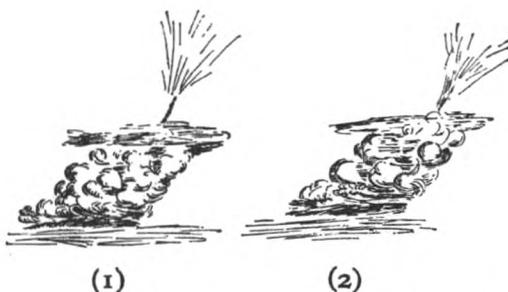
The observation has been noted for future use when the Persian Gulf Pilot is revised (see "Ships' Reports and the Pilot" in the July 1961 number of *The Marine Observer*).

LIGHTNING

Malayan waters

m.v. *Glenfinlas*. Captain H. K. Martin. Singapore to Bangkok. Observers, Mr. A. Stimson, 3rd Officer, Mr. R. Marsh, Supernumerary 3rd Officer and Midshipman R. Laphorne.

10th May 1961. Between 1230 and 1300 GMT lightning was seen flashing almost continuously from moderately well developed Cb over the island of Pulau Tioman (3,383 ft.) which was 24 miles away. Forked lightning was seen at irregular intervals leaping skywards to a considerable height from one particular section of the cloud mass, the flashes breaking up into a fanlike explosion of light which shot even higher. This was seen to happen six or eight times from the one particular cloud and, although lightning flashed very frequently from other clouds in the vicinity, no skywards discharge was observed to take place from them. The flashes varied in height and in form and were of an intense whiteness; they were also inclined to be thicker than normal lightning discharges. The explosion, or break-up, of the flashes resembled a plume of steam and although very much fainter than the flash itself was easily seen since each lasted from 1 to 3 sec. The majority of the flashes



were of the type shown in Fig. 1, but on two occasions the plume effect illustrated in Fig. 2 was seen. Air temp. 83°F, wet bulb 78°, sea 85°; wind N, force 1.

Position of ship: 2° 44'N, 104° 37'E.

Note. Sir Basil Schonland, an authority on lightning, comments:

"This report on upward lightning discharges is extremely interesting as providing, in more detail than usual, some evidence for this exceptional phenomenon. It would seem likely that these were discharges to the upper atmosphere which are suspected but rarely seen.

"I would hope that other mariners may obtain further information of this kind, for though the effect is not often reported it is suspected to be frequent. It would be particularly valuable to know

(a) the estimated height to which the discharges reached

(b) their relation in time to the flashes to earth from the same cloud.

"Photographs, however imperfect, would be most valuable."

SAND HAZE

North Atlantic Ocean

m.v. *Aragon*. Captain T. W. Stevens, R.D. Rio de Janeiro to Las Palmas. Observer, Mr. R. Burnett, Junior 3rd Officer.

17th August 1961. There had been a slight haze for some time during the evening, and at 1900 GMT it was noticed that there was a fine red dust in suspension in the air; some of it settled on the paintwork of the vessel and it was then seen to be a red-brown powdery substance. The sun, which had been veiled by haze during most of the afternoon, was lost to view when its altitude decreased to 15°. Weather at 1900: air temp. 73°F; wind N'W, force 4. No cloud.

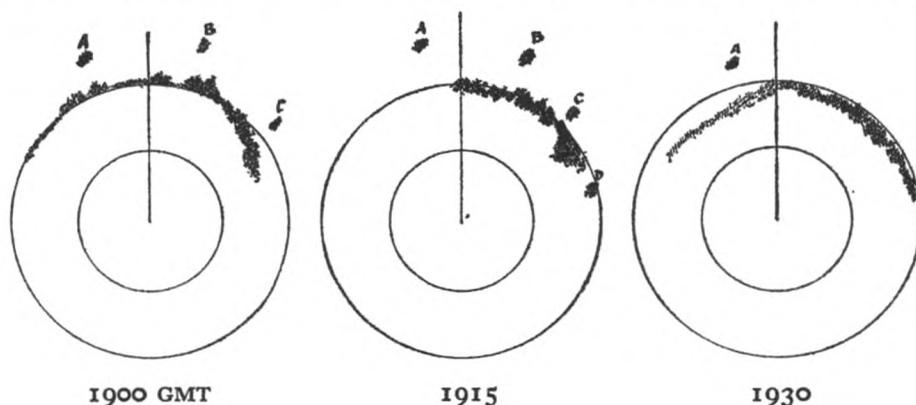
Position of ship: 24° 40'N, 17° 00'W.

Note. Although the wind in the vicinity of the ship was from a northerly direction, it had earlier been travelling in a curved path over the N.W. Sahara, as a NE'ly wind carrying the sand with it.

Red Sea

m.v. *Glenorchy*. Captain H. S. Clarke, Aden to Suez. Observers, Mr. I. G. Johnston, 3rd Officer and Midshipman C. F. Basker.

4th July 1961. A sand haze was experienced at 1700 GMT which reduced visibility to 2 miles; it persisted until 1830 when the visibility improved to 12 miles. Although it was possible to distinguish ships at this distance, their lights were blurred and it was not until they were within about 9 miles that they became clear and distinct. The diagrams reproduced below show the appearance of the radar screen at 1900, 1915 and 1930. The ships had a blurred appearance and were two or three times the size of a normal echo. When it was first observed, at 1845, the belt of sand haze



The range rings represent distances of 5 and 10 miles, and A, B, C and D indicate ships.

was 12 miles distant and vaguely semi-circular in shape, but the distance quickly decreased to 10 miles and the shape became more definite. At 1940 the sand-area disappeared and the vessels which had been lying beyond it were then seen a little more clearly, but nevertheless still slightly blurred. The approaching ships, when once on the beam, produced sharp echoes. Air temp. 89°F, wet bulb 83°, sea 90°; wind NNE'ly, force 3. Course 331°; speed 17 kt.

Position of ship at 1900: 18° 16'N, 39° 53'E.

Note. Captain F. J. Wylie, R.N. (Retd.), of the Radio Advisory Service, comments as follows:

"Since ships' lights were blurred it is just feasible that a similar cause was producing the enlarged echoes on the PPI beyond the ranges of the sand haze. However, there is far too little evidence available on the effects of dust and sand storms on 3 cm. radar performance to be categorical in one's comments at the present time. I will pass on the information to the propagation experts of the Department of Scientific and Industrial Research as I have done in the past; up to now they have said that they can only guess at a solution. At the present rate of receiving reports of this kind it will be a long time before a satisfactory theory and explanation can be evolved."

FOREST FIRE EFFECTS

North Atlantic Ocean

s.s. *Lismoria*. Captain R. McNie. Glasgow to Montreal. Observers, Mr. R. Brewster, Auxiliary 1st Officer and Mr. N. F. Woodger, Apprentice.

30th July 1961. A long line of dark brown cloud appeared on the SW horizon at 1550 GMT and gradually covered the sky in a broad band lying from SW to NE: it was overhead at 1630, the height being estimated as approx. 200 ft. The sun, visible through the cloud, was a light copper colour, while the sea was a dark brown hue. The northern, northwestern and southern parts of the sky, visible between the horizon and the edge of the cloud, were a bright blue-grey colour of more than normal intensity. These conditions existed until 1745 when the sky cleared from the SW. Visibility throughout the day was very good. At 2030, St Johns (Newfoundland) commercial radio reported in a news broadcast a large forest fire in Trinity Bay area.

Position of ship: 54° 40'N, 44° 40'W.

m.v. *Manchester Venture*. Captain J. E. Askew. Manchester to Grand Bank, Newfoundland. Observers, Mr. D. Gregson, Chief Officer and Mr. W. Glanville, 2nd Officer.

3rd August 1961. At 0600 GMT, when the vessel was approximately 600 miles off Newfoundland where forest fires were occurring, a strong smell of burning was noticed in the air. Next day, when 300 miles distant from Newfoundland, the smell of burning wood was very strong and persisted for two hours; the sun looked pale and had a bluish tinge. On the first occasion, the wind was WSW, force 3 early but it later became WSW or W, force 7-8; on the following day the wind was NW'ly, force 5 at first, later SSE'ly, force 3.

Position of ship at 0600 on 3rd: $52^{\circ} 03'N$, $38^{\circ} 41'W$.

s.s. *Andria*. Captain A. E. Austin. Quebec to London.

12th August 1961. At 1130 GMT a smell of burning timber was noticed, assumed to be from the Newfoundland forest fires about 300 miles away. The wind was calm and there was thick fog. Air temp. $48\frac{1}{2}^{\circ}F$, wet bulb $48\frac{1}{2}^{\circ}$, sea 48° .

Position of ship: $52^{\circ} 16'N$, $51^{\circ} 27'W$.

Note. Conditions over the Atlantic, east of Canada, were mainly anticyclonic during the first half of August 1961. The atmosphere was stable and the gradient wind mainly westerly. There were, however, some active depressions west of Newfoundland, associated with the northward movement of warm maritime air. Thick fog is not unusual when warm maritime air flows over the cold Labrador Current, as in *Andria's* case, but the smell of smoke suggests that the warm maritime air causing the fog had a complex history and must have spent some time inland over areas of forest fires. It can only have had very little exchange with other air masses during its complex history.

These three ships' observations provide interesting examples of stable air retaining a conservative property like smokiness over great distances. *Lismoria* observed the smoky air mass when it was aloft, while she was probably in clearer maritime polar air.

SEA FOG

Equatorial Atlantic

s.s. *Braemar Castle*. Captain D. W. Sowden, R.D. Cape Town to Las Palmas. Observers, the Master, Mr. B. Oliver, 2nd Officer and Mr. P. F. Butler, 4th Officer.

22nd July 1961. Fog was encountered when crossing the equator. At first, the fog appeared as a thin layer above the sea, reaching a height of about 60 ft. This occurred at 0400 GMT and at the time the sky above was still visible and quite clear. At 0500 however the fog thickened considerably and visibility was down to 60 yd. with the sky obscured. The sun rose at 0622 and at 0712 the fog began to clear. By 0800 the visibility had greatly improved, there being only a slight horizon haze. $\frac{3}{8}$ Cu. was present.

At 0600: Air temp. $69^{\circ}F$, wet bulb $68\frac{1}{2}^{\circ}$, sea 69° ; wind, SSE'ly, force 3.

Position of ship at 0600: $0^{\circ} 00'S$, $7^{\circ} 19'W$.

Note. This observation of sea fog occurred where the South Equatorial Current converges with the Guinea Current. Upwelling of cold water occurs frequently off the African coast near where this observation was located, and widespread upwelling occurs in the Benguela Current flowing northward off West Africa south of the equator. The fog was probably associated with a mass of cold water. As there are likely to be rapid changes in sea temperature, the thickness of the fog is likely to vary greatly; and as the fog would be associated with a temperature inversion, a rise in sea temperature or an increase in wind could cause the fog to lift off the surface and become low stratus, or disperse.

SUDDEN ONSET OF SWELL

Red Sea

s.s. *City of Lucknow*. Captain B. T. Wortley. Djibouti to Suez. Observer, Mr. D. Oldfield, Junior 2nd Officer.

27th July 1961. At 1930 GMT the wind veered from 330° to 060° and increased to force 4; the air temp. dropped from 89°F to 86° and a shower was seen near the ship. A sudden swell, 5 ft. in height, came in from 300° with a period of 5 sec. It arrived in four or five lines at a time, then died down for about 30 sec. to 1 min., after which interval it again moved in. This cycle kept repeating, though with decreasing height of waves, until 2120. Throughout the day the wind had been light and variable.

Position of ship: $18^{\circ} 25' \text{N}$, $39^{\circ} 58' \text{E}$.

Note. We are advised by the National Institute of Oceanography that there is no standard explanation for this phenomenon. From a meteorological point of view it was associated with the atmospheric division between dry northern hemisphere air and the more humid southern hemisphere air.

CURRENT RIP

North Atlantic Ocean

m.v. *Trecarrell*. Captain I. M. Price. Cape Town to Dakar.

14th August 1961. A current rip lying 030° – 210° was observed at 0845 GMT, the depth of water below the ship being 43 fm.; at 0900 the vessel crossed the 100 fm. line. The rip was very pronounced, with a fairly deep swell on one side and a more or less rippled sea on the other, but steering was not affected. Wind NW'y, force 3. Sea temp. 79°F .

Position of ship: $10^{\circ} 25' \text{N}$, $16^{\circ} 39' \text{W}$.

Note. This current rip occurred in the area of complex flow where the North Atlantic Equatorial Countercurrent impinges on to the West African coast becoming the Guinea Current. Large-scale vertical exchanges within the sea occur off this coast.

Indian Ocean

s.s. *Stratheden*. Captain P. G. Lawrence. Singapore to Colombo.

29th September 1961. At 1100 GMT, a marked line of choppy water was seen extending from horizon to horizon, ahead of the vessel, lying from SSE to NNW. On passing through, it was found to be some 200–300 yd. in width, with the wave crests breaking at right angles to the true wind as observed from the ship. As no change of wind was observed at the time of passage, the reason for this is not understood. The charted depth was 2,120 fm. and the echo sounder was in use at the time of observation. Course 270° ; speed $17\frac{3}{4}$ kt. Sea temp. at 1200 GMT, 82°F (same as at 0600).

Position of ship: $5^{\circ} 55' \text{N}$, $90^{\circ} 25' \text{E}$.

Note. This current rip occurred where water flowing north-westwards through the Straits of Malacca converges with east-going water of the Equatorial Countercurrent.

LINE OF DEMARCATION

near Galapagos Islands

m.v. *Hinakura*. Captain N. L. Warren. Balboa to Auckland. Observer, Mr. R. E. Barnard, 2nd Officer.

21st July 1961. At 2100 GMT the ship steamed across a well-defined line of demarcation at the edge of the Peru Current. The line, lying from 270° – 090° , was about 200 yd. wide and was marked by a confused sea, heaped up against the wind which was S, force 3 at the time. There was a fall of sea temp. from 78°F to 67° .

Position of ship: $1^{\circ} 00' \text{N}$, $94^{\circ} 12' \text{W}$.

Note. We get frequent reports of current rips and rapid changes of sea temperature off Peru and towards the Galapagos Is. (see report of m.v. *Port Wellington*, below). They are all of interest and will be used in building up data that will make possible a statistical investigation of phenomena related to the upwelling of the sea off Peru. Some mariners have used these

phenomena as aids to navigation, e.g., the fall of temperature has been found sufficiently dependable for a ship homeward bound from New Zealand to take a Great Circle course as far as the equator in 83°W and as soon as the Humboldt Current (Peru Current) was reached (sea surface temperature falling abruptly) to set course for Malpela Island (see *The Marine Observer*, April 1955, page 95).

CHANGE IN SEA TEMPERATURE

North Pacific Ocean

m.v. *Port Wellington*. Captain C. A. Hodson. Balboa to Auckland. Observer, Mr. J. W. Gunn, 3rd Officer.

23rd July 1961. The sea temp. at 1800 was 74°F and during the next three hours it fell 6½°, to 67½° when the vessel entered the Peru current. Wind s'ly, force 3-4; low swell from SSE.

Position of ship: 0° 20'N, 96° 23'W.

ICEBERGS

off Southern Greenland

s.s. *Birmingham City*. Captain J. R. Campbell. Churchill to Swansea. Observers, the Master and deck officers.

27th August 1961. Between 0900 and 1215 GMT five icebergs were sighted in the following positions:

(1) 58° 36'N, 43° 32'W. (2) 58° 36½'N, 43° 31½'W. (3) 58° 31½'N, 43° 27'W. (4) 58° 33'N, 42° 56'W. (5) 58° 32½'N, 42° 55'W. The region is 70 miles S'E of Cape Farewell. These positions can be considered to be accurate and were obtained by using radar bearings and distances from the vessel. The ship's position was fixed by stellar and sun observations. Berg (1) was measured by sextant angles and found to be 245 ft. long, with pinnacles at each end of 45 and 57 ft. in height. Berg (4) was measured as 295 ft. in length. It was a rounded hummock in shape, with a clearly defined rippled surface: there was one pinnacle 95 ft. high. This berg was surrounded to windward by many small growlers and bergy bits. It is presumed that gale force northerly winds which persisted for several days, and the action of the East Greenland and Irminger Currents caused the bergs to drift to those positions. Another large berg was passed at 1345 in position 58° 41'N, 42° 17'W. Wind NW'W, force 7; air temp. 46.6°F, wet bulb 44.6°, sea 47.2°; sea from the NW, period 5-7 sec., height 5 ft.; swell confused, height 10 ft.

Note. The locations of these icebergs are consistent with abnormally strong and frequent N'ly and NW'ly winds. It would be of considerable interest to confirm that icebergs rounding Cape Farewell do not all travel northwards along the west coast of Greenland. Ships' reports of icebergs off southern Greenland are therefore of particular interest.

WHALE

White Sea

m.v. *Greathope*. Captain R. Cook, M.B.E. Grimsby to Archangel. Observer, Mr. J. W. McLean, 3rd Officer.

12th July 1961. At 0815 GMT, in perfect weather conditions with light airs, smooth sea, and maximum visibility, the vessel passed a small white whale—about 20 to 30 ft. in length—at a distance of about ¼ mile. The whale was first sighted blowing (probably just surfaced) about four points on the starboard bow, and was clearly visible basking on the surface for about 8 min.

Ship's position: 65° 45'N, 39° 50'E.

Note. Mr. S. G. Brown, of the National Institute of Oceanography, comments:

"While albino whales of various species have occasionally been recorded, this record probably relates to the White Whale (*Delphinapterus leucas*). This animal grows to a maximum length of about 18 or 19 ft. and is distinguished by the absence of a dorsal fin and by being,

when adult, pure white without any other markings. It is an Arctic species, circumpolar in distribution, and is hunted commercially in various regions of the Soviet Arctic including the White Sea where it occurs in numbers and is caught during the summer in nets set in the mouths of rivers."

UNUSUAL BEHAVIOUR OF FISH

Ceylon

m.v. *Sacramento*. Captain H. Grunnill. At Trincomali. Observer, Mr. B. G. Wright, Chief Officer.

19th August 1961. At 1010 GMT, while we were heaving up the anchor in China Bay, a length of the cable seemed to have some fine white mud sticking to it. This, when it dropped off into the water, appeared to attract a myriad of unidentified small fish which, on contact with the mud-tainted water, apparently went berserk, swimming around at a furious rate in all directions and even leaping out of the water at times. After the water cleared the fish disappeared and no more of this type of mud was seen on the anchor or cable.

Position of ship: in China Bay.

Note. This observation has been passed to the Natural History Museum.

PHOSPHORESCENCE

Gulf of Aden

s.s. *Esso Cambridge*. Captain S. P. Snewin. Mena-al-Ahmadi to Suez. Observer, Mr. I. Westworth, 3rd Officer.

28th August 1961. When the sea-temperature bucket was brought inboard at 1800 GMT a number of specks of phosphorescence were seen floating in it. These were giving off a brilliant green light although there was no sign of any phosphorescence in the sea, which was quite dark. One of the specks was caught and on being brought into the light appeared similar to a flea in size and shape, but not in colour, which was pink. When prodded, the organism wriggled vigorously and the light which it was emitting faded away after about 5 min.

During the day the vessel had been steaming through an area where the sea was orange-brown in colour with a strong smell of marine life. Sea temp. 81°F; wind SSW, force 3-4; sea slight.

Position of ship: 13° 26'N, 47° 23'E.

Javanese Waters

m.v. *Sarpedon*. Captain J. A. Dougall. Japan to Fremantle. Observer, Mr. J. Bathgate, 3rd Officer.

31st August 1961. At 2019 SMT (1249 GMT), whilst on a course of 160° at 15 kt., the ship crossed a slightly irregular but clearly defined line on the sea surface. Beyond the line, which lay approx. E-W, the surface seemed to be a uniform grey. No effect on the steering was noticed but the sea temp. dropped from 81°F at 2000 to 76° at 2030. As the ship proceeded, the grey colour gradually brightened to a milky shade and even seemed to glow faintly. It was at its brightest at 2050 approx., when it seemed that the air was reflecting a little radiance. At no time did the ship become illuminated by the glow; in fact it seemed darker by contrast.

Around 2050 some of the more usual forms of phosphorescence appeared: 'spangles' and 'underwater explosions' in the ship's wash. The main phenomenon was unaffected by the disturbed water except that the edges of the wash looked dark as though the milky colour was all on the surface and was being pushed aside to show the normal colour underneath. After the peak of brightness was passed the colour changed rapidly to a dull grey but it was not until after 2300 that the last traces disappeared. By this time the sea temperature had risen to 78°. A sample was taken at 2040 and was found to contain hair-like objects, khaki in colour, about ½ in. long. They were not thickly clustered.

When the phenomenon was first observed the ship was 20 miles from the 100 fm. line, in a charted depth of 1,200 fm. A westerly set of $\frac{1}{2}$ – $1\frac{1}{2}$ kt. was experienced that night and the following day.

Position of ship: $7^{\circ} 20'S, 105^{\circ} 17'E$.

Note 1. m.v. *Sarpedon* is a ship of the Australian Voluntary Observing Fleet. This observation was sent to us by the Commonwealth Bureau of Meteorology. It had already been examined by Dr. K. Sheard of the CSIRO Fisheries Department in Western Australia, whose comment was as follows:

“From the log information and the sample I am of the opinion that the phosphorescence was due to the free-swimming alga, *Noctiluca spp.*, which is common in marine phytoplankton of many seas. My interpretation of the log extract is that the phosphorescence in that area was caused by an upwelling of cooler water from the depths bringing to the surface a higher concentration of nutrients which could boost the reproduction rate of the *Noctiluca* and thus give the milky coloration to the water and the phosphorescence as described by Captain Dougall.

“It was not possible to identify positively the presence of *Noctiluca* in the unpreserved sample but small bodies present may have been this organism. I would recommend that personnel of vessels interested in sampling marine life should carry formalin on board and add 34 millilitres to each pint of liquid sample, or preserve large specimens in 6% formalin-seawater mixture. Most marine organisms deteriorate rapidly if not so preserved.”

Note. 2. Will intending observers of this and similar phenomena please note that any Port Meteorological Officer in a U.K. port will supply bottles, preservative and instructions on request.

PHOSPHORESCENT WHEELS

Indian Ocean

m.v. *Glenorchy*. Captain H. S. Clarke. Aden to Penang. Observer, Mr. A. Bridson, 2nd Officer.

9th September 1961. At 0230 SMT three large phosphorescent wheels about 80 ft. in diameter appeared under the bow: they disappeared before the vessel had travelled 500 ft. The wheels were apparently moving towards the NE. Several rain squalls were near the ship at the time. Sea temp. $82^{\circ}F$; wind SW, force 3–4. Sea slight to moderate; moderate s'ly swell. Speed of vessel 17 kt.

Position of ship: $7^{\circ} 40'N, 74^{\circ} 17'E$.

Note. Prof. Dr. K. Kalle, of the German Hydrographic Institute, who is an authority on this subject, comments:

“This observation is especially interesting because it is the first one to be made from the deep ocean (the depth is 1,500 fm. at the position given). All observations recorded (more than 30 within the period between 1900 and now) so far came, without exception, from shallow waters with a maximum depth of about 100 fm. Perhaps in this case the conditions causing the phenomena were particularly favourable.”

UNIDENTIFIED OBJECTS

Arabian Sea

m.v. *Benvannoch*. Captain K. H. Montgomery. Aden to Penang. Observers, the Master, Mr. J. Mitchell, 1st Officer and Mr. G. Walker, 2nd Officer.

5th July 1961. At 1100 GMT while approximately 30 miles north of Socotra Island we passed many red coloured, jelly-like, sausage-shaped objects of various lengths from about 5–10 ft. and having diameters of from 1–2 ft. These were seen frequently until sunset, usually in threes. During the period the wind was force 7–9 and the sea was very rough, but when the objects tumbled over on the crest of a wave, they maintained their shape. They were floating at a depth of about 3 ft. below the surface and appeared to have no means of propulsion: no openings on their surface were seen. The objects were observed frequently from noon to sunset from north of Socotra to $12^{\circ}N, 65^{\circ}E$. Sea temp. $81^{\circ}F$.

Position of ship at 1200 GMT: $13^{\circ} 12'N, 53^{\circ} 42'E$.

9th September. On the homeward run, in the same area, a watch was kept for any of the objects described above, but none were seen.

Gulf of Aden

s.s. *Mandasor*. Captain J. C. Long. Aden to Calcutta. Observers, the Master and Mr. I. R. Poole, 2nd Officer.

28th July 1961. Five cylindrical-shaped objects consisting of some jelly-like substance were seen floating on the surface of the sea around 1030 GMT. They were red in colour, about 1 ft. in diameter and 6 ft. in length; even though the sea was rough, the objects did not lose their shape. Sea temp. 78°F; wind SSW, force 7.

Position of ship: 12° 40'N, 54° 50'E.

Note. Miss A. M. Clark, of the Natural History Museum, comments:

"The size of the objects in both the above observations is remarkable and the details from m.v. *Benwanno* are particularly interesting. The objects themselves must be colonial Tunicates of the genus *Pyrosoma*. These form hollow cylinders with an opening at one end out of which passes a continuous current of water. The individuals of the colony lie in the gelatinous wall and each one constantly draws in water from outside and ejects it into the central cavity, producing a sort of jet propulsion by their combined efforts. Some kinds of *Pyrosoma* are said to be soft and pliable but others are more nearly rigid, as these were. The red colour is not common but several species have been described as pink.

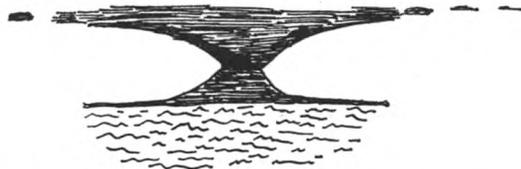
"A characteristic of most species of *Pyrosoma* is that they are strongly luminous. Since the second observation says that the objects were seen until sunset but does not follow up with a subsequent note on luminous bodies in the water, it seems likely that the species concerned was *P. spinosum*, of which some colonies have been found to lack luminous organs. The John Murray Expedition collected some large colonies of this in the Arabian Sea, but unfortunately these were in fragments by the time they reached the laboratory. The expedition observed a large red *Pyrosoma* on the surface 'resembling a motor tyre' (or part of one), estimated at about 5 ft. in length. Another expedition has recorded colonies up to 4 m. long (or over 12 ft.)."

ABNORMAL REFRACTION

Table Bay

m.v. *Port Phillip*. Captain W. J. Williams. Cape Town to Lagos. Observers, the Master and Mr. W. J. Starley, 2nd Officer.

25th September 1961. At 1500 GMT the horizon was observed to be grossly distorted in places, mountains 25-30 miles distant appeared inverted, as shown in the



sketch. Dassin Island Lighthouse (155 ft. high), which was 20 miles away, looked as clear as if only 4 or 5 miles from the ship. The actual island, which is low lying, was plainly visible at 15 miles. At this time the radar was showing echoes of vessels at a range of 48 miles. Air temp. 65.1°F, wet bulb 59.2°; wind S'ly, force 2; 2/8 Ci. cloud.

Position of ship at 1800: 33° 00'S, 17° 42'E.

Note. This appears to be abnormal refraction caused by a temperature inversion created in the lower layers of the atmosphere by cold sea water. In the vicinity of Table Bay warm Indian Ocean water converges with the colder Atlantic water.

NEW COMET

Japanese waters

s.s. *Orsova*. Captain A. E. Coles, R.D. Hong Kong to Kobe. Observers, the Master and all deck officers.

26th July 1961. At 1830 GMT (25th), while the vessel was proceeding northwards through Kii Suido, a comet with a very long tail, which had the appearance of a searchlight, was clearly seen in a NNE'ly direction at an altitude of about 30°. The

sighting was quite unexpected, as those on board had no previous knowledge of the existence of the comet. The weather was fine and clear at the time of observation and the first traces of daylight were just visible.

Position of ship: $34^{\circ} 08'N$, $134^{\circ} 57'E$.

Note 1. Mr. H. B. Ridley, Director of the Meteor Section, British Astronomical Association, comments as follows:

"It sometimes happens that a bright comet becomes suddenly and unexpectedly visible because it has been approaching the earth from the other side of the sun, and it is not till it swings rapidly round the tight curve of its closest approach that it enters the region of visibility. The present comet is a case in point, and could have been discovered by anybody capable of recognising it who happened to be looking at the sky just before dawn on 23rd July 1961, provided of course that the sky was clear and the horizon free from artificial light. It is usual to assign to a new comet the name of its discoverer, and the credit for this one has gone to Mr. A. S. Wilson, Navigating Officer of a Pan-American jet airliner, who saw the comet at 1135 GMT on 23rd July while on passage from Honolulu to Portland, Oregon. It is known as Comet Wilson, 1961d. It is now known that it was seen at least nine hours earlier by a South African Airways hostess, Miss A. Das, while over Libya, and it is quite likely that many other observers anticipated Mr. Wilson, but their reports did not reach the right quarters in time to establish priority.

"Comet Wilson was not outstandingly bright, the head being equal to a star of the third magnitude, but it had an extensive tail, as much as 30° in length, and photographs have revealed that it also had a short anti-tail or sunward spike, similar to that of the celebrated Arend-Roland of 1957, though less pronounced. Excellent photographs of the comet have been published in the September and October issues of *Sky & Telescope* (Sky Publishing Corpn., Harvard, Mass.) together with detailed accounts of the discovery and subsequent observations. Now [Oct. 1961] a telescopic object (12th Magnitude), the comet will probably never be seen again since it has passed beyond the reach of our instruments, for the orbit around the sun is either an hyperbola or an ellipse of enormous size; until all the observations have been closely analysed it will not be possible to distinguish between the two possibilities, but in either case we have seen it for the first and last time. The reason for the comparative brightness of the comet was the closeness of its approach to the sun at perihelion: it passed the latter at a distance of about a million miles but it never came nearer to the earth than about 60 million miles.

"It would be interesting to know how many ships logged this comet before its discovery was generally known; s.s. *Orsova* reported it on 26th July at 1830 GMT, but others may have noted it even earlier than the accredited discoverer."

Note 2. Comet Arend-Roland, 1957, referred to above was visible for several weeks and was reported in the meteorological logbooks of 54 voluntary observing ships. An account of the comet appeared in the April 1958 number of *The Marine Observer*.

SCINTILLATION

North Atlantic Ocean

s.s. *Gardenia*. Captain J. H. Gray. Port Arthur (Ont.) to Ipswich. Observer, Mr. J. W. Spence, 2nd Officer.

18th September 1961. The planet Venus was observed rising at 0645 GMT and while low on the horizon it changed at regular intervals of 1 sec. from blood red to white; it actually resembled a shore flashing light. The colour changes continued until an elevation of about 4° was reached. When the planet attained this altitude, a fairly bright triangular ray of light was observed to move from it down to the horizon. This persisted for about 2 min. and then faded out; no more flashing was seen, the planet shining with a white light which flickered slightly for a short time. Air temp. $47^{\circ}F$; visibility exceptionally good; sky cloudless; wind SW'ly, force 4.

Position of ship: $52^{\circ} 15'N$, $51^{\circ} 55'W$.

Note. Scintillation is due to irregularities in the density of the air in the lower layers of the atmosphere, causing bending of the rays of light from the planet, so that they travel along slightly different paths to the observer's eye. In the case of a planet, scintillation occurs when the changes in direction of its light rays are of the same order of size as its apparent diameter. We are at a loss to account for the triangular ray referred to in the observation.

CREPUSCULAR RAYS

South Pacific Ocean

m.v. *Rangitane*. Commodore R. G. Rees. Balboa to Papeete. Observers, Mr. I. M. Green, 2nd Officer and Mr. E. M. Smith, Junior 3rd Officer.

21st August 1961. At sunrise, 1555 GMT, rays of light were seen radiating from a point about 5° below the horizon, on the reciprocal bearing of the sun which had attained an altitude of 5° . They passed between several fair weather cumulus clouds and faded out at approximately 7° altitude. Visibility was excellent but there was a slight grey-pink haze on the horizon in the direction of the rays. Air temp. 78°F , wet bulb 73.5° ; wind E'N, force 3.

Position of ship: $14^{\circ} 02'S$, $141^{\circ} 27'W$.

Note. Crepuscular rays are seen when minute scattering particles are present in the air, producing a purple light at twilight. The rays in the east and west of the sky correspond exactly, and in reality run across the whole sky, but normally only the ends are seen. They are really parallel, the converging effect being due to perspective.

RADIO FADEOUT

North Atlantic Ocean

m.v. *Runswick*. Captain J. S. Pinkney, O.B.E. Copenhagen to Baie Comeau. Observer, Mr. A. N. Marsden, Radio Officer.

1st and 2nd July 1961. From about 2300 GMT on the 1st to 0130 on the 2nd unidentifiable noises were heard on the ship's main radio receiver. They were of a definite electro-magnetic nature, having the sound of waves breaking on the sea shore and peaking between 5 and 8 sec. intervals. They were received between 6 mc/s. and 17 mc/s., reaching maximum amplitude about $13\frac{1}{2}$ mc/s. and causing interference with signals from NSS (Washington). At peak amplitude of the noise signals the frequency of NSS signals drifted both up and down the band. The amount of drift varied with the intensity of the noise signals, being up to 1 kc/s. in the heaviest noise signal. This effect occurred on both of the ship's receivers, one on mains power and one on battery power, using various antennae. The noises had been noticed, though to a lesser extent, at about the same time on the previous night.

Position of ship at 0000 on 2nd: $53^{\circ} 54'N$, $49^{\circ} 12'W$.

17th–20th July. Baie Comeau to Avonmouth. Heavy atmospheric disturbances during this period gave rise to great disruption of short wave working, except from 0800–1250 on 20th July, when conditions improved on the bands above 8 mc/s.

Position of ship at noon on 20th: $53^{\circ} 36'N$, $30^{\circ} 00'W$.

Note. Mr. G. O. Evans, of the Post Office Engineering Department, comments:

“At the present phase of the declining sunspot cycle Dellinger fadeouts would be expected to occur infrequently. The month of July 1961, however, has proved to be unusual in this respect, as five fadeouts were reported on circuits incoming to the United Kingdom. These fadeouts, two of which occurred on July 20th and the remaining three on the 11th, 12th and 18th, were associated with two sunspots that were visible on the sun's disc between the 8th and 20th and between the 19th and 31st.

No definite explanation can be advanced for the unidentified night-time noises noted on 1st July by m.v. *Runswick*, although this apparent variation in noise level could have been associated with a very localised ionospheric disturbance.

m.v. *Saxon Star*. Captain T. D. Brewster. Cristobal to London. Observer, Mr. D. W. Bradbury, Radio Officer.

20th July 1961. Between 1555 and 1615 GMT a complete radio fadeout occurred on all short wave bands: loud heterodyne whistles were heard on 17 mc/s. and 8 mc/s. Small sunspots were observed at the time.

Position of ship: $39^{\circ} 00'N$, $41^{\circ} 12'W$.

Note. See Note to above observation.

AURORA

The following notes have been received from Mrs. Mary Hallssey, of the Aurora Survey:

Reports of aurora from ships for the three months 1st July–30th September 1961 are shown briefly in the following list. This has been compiled at the Balfour Stewart Auroral Laboratory of the University of Edinburgh from logbook data forwarded by the Meteorological Office. We are most grateful to all who are in any way connected with observing, recording, extracting and passing on the information.

DATE (1961)	SHIP	GEOGRAPHIC POSITION		Δ	ϕ	I	TIME (GMT)	FORMS
11th May	<i>Toronto City</i>	49°46'N	40°24'W	040	64	+74	0540	R
5th July	<i>Camellia</i>	46°10'N	60°12'W	010	58	+73	0240	HA
10th	<i>Esso Manchester</i>	44°00'N	15°39'W	060	50	+62	0330	G
13th	<i>Esso Manchester</i>	53°01'N	00°30'E	080	56	+69	0015	L
14th	<i>Woodford</i>	47°20'N	62°05'W	010	59	+74	0300–0630	HA
15th	<i>Woodford</i>	46°40'N	54°28'W	020	58	+72	0300–0630	HA, RA, R
16th	<i>Beaverdell</i>	49°00'N	61°00'W	010	61	+75	0200–0600	All forms
17th	<i>Beaverdell</i>	51°30'N	55°00'W	020	63	+75	0300–0440	HA, RA, F, P
18th	<i>Beaverdell</i>	52°48'N	46°48'W	030	63	+74	0300–0500	HA, R, S, P
	<i>Lakonia</i>	52°34'N	50°00'W	030	63	+74	0130–0400	HA, RB, DR, C
1st Aug.	<i>Weather Adviser</i>	62°06'N	33°18'W	050	70	+76	0215	R
2nd	<i>Weather Reporter</i>	59°02'N	19°02'W	070	65	+73	0135–0215	HA
	<i>Hauraki</i>	48°18'S	173°20'E	270	-50	-70	1045–1130	RA, R, G
7th	<i>Weather Monitor</i>	61°53'N	33°30'W	050	70	+75	0300	HA
26th	<i>Weather Monitor</i>	60°02'N	24°00'W	060	70	+74	2345–0050	RB, P
28th	<i>Marengo</i>	53°45'N	50°30'W	030	64	+74	0250–0300	R
30th	<i>Weather Watcher</i>	58°42'N	18°36'W	070	65	+73	0145	RA
31st	<i>Weather Watcher</i>	58°48'N	18°00'W	070	65	+73	2250–0245	HA, RA, RB, R
12th Sept.	<i>Essex</i>	49°00'N	68°50'W	360	61	+77	0230–0700	G, DR
	<i>Beaverdell</i>	53°30'N	45°00'W	030	64	+73	0400–0500	HA, RA, R, F
16th	<i>Athelfoam</i>	29°18'N	71°18'W	350	41	+64	2345–0015	G, S
	<i>Aaro</i>	56°40'N	07°38'E	100	58	+71	0107–0126	G, HA
	<i>Weather Reporter</i>	52°20'N	10°25'W	060	59	+69	0148–0320	G
17th	<i>Gardenia</i>	50°19'N	59°11'W	010	62	+75	0100–0730	All forms
20th	<i>Sagamore</i>	58°42'N	03°18'W	080	61	+71	2215–0230	G, S
30th	<i>Dunera</i>	58°35'N	05°15'W	080	62	+72	2100–0128	All forms

KEY: Δ = geomagnetic longitude, ϕ = geomagnetic latitude, I = inclination, G = glow, HA = homogeneous arc, HB = homogeneous band, RA = rayed arc, RB = rayed band, R = rays, S = surfaces, DR = drapery or curtain, P = pulsating, F = flaming, L = auroral light seen but no other details available.

The greatest activity occurred on the last night of the period, 30th September–1st October, and some of the reports will be in the October list to be published in the next issue of *The Marine Observer*. Cloudy conditions probably prevented observation of the display in many areas, but in view of the size of the display we are hoping that there may be more reports still to come, as there is understandably quite a time lag before the reports are received in Edinburgh. *m.v. Dunera*, rounding Cape Wrath, was able to record the full display and land observers from the north of Scotland to Belgium sent in reports, though, again, many areas, including Shetland and E. Scotland, were cloud covered.

We are pleased to acknowledge reports from three Canadian ships—*s.s. Imperial St. Lawrence*, *s.s. Suva* and *s.s. Lakonia*—and we hope that they will continue to send observations whenever possible. The report from *s.s. Lakonia* for 18th July 1961 is given here along with that from *s.s. Beaverdell* to illustrate how observations can be fitted together to show as fully as possible the progress of an auroral display. Both ships were in the area geomagnetic longitude 030, geomagnetic latitude 63.

s.s. Lakonia. 18th July 1961, 0130 GMT. "Two narrow arcs, both at an altitude of 5°, and bearing NE'E and W'S respectively. Both arcs meeting overhead and broader at the base than at the zenith. Lights were streaked but steady and gradually changed to a haze of light with the zenith moving south to about 60° from southern horizon. Formation changed again to a 'bell tent' formation; the southern part had a hazy characteristic but the northern side of the 'tent' became a weaving curtain of brilliant lights in soft shades.

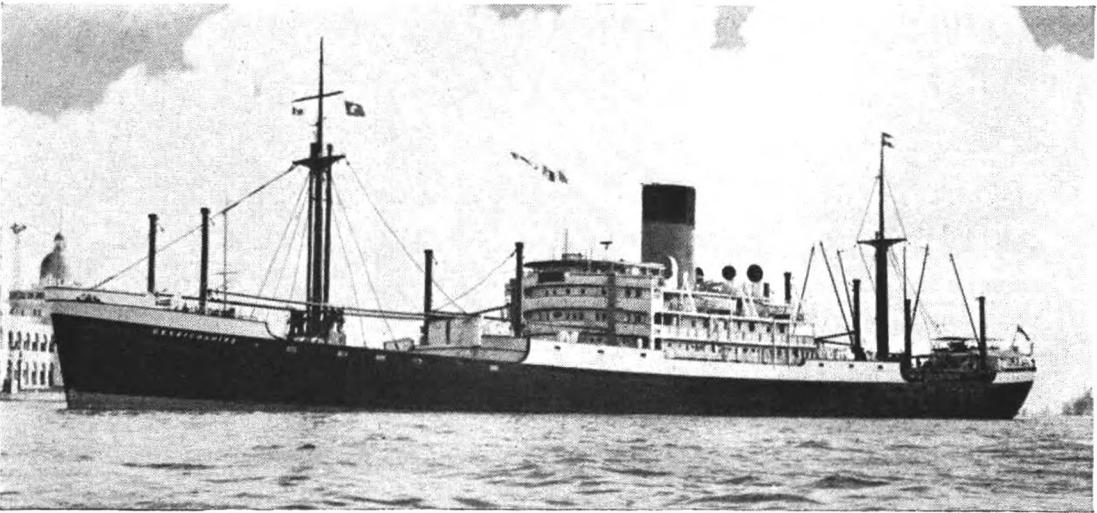
"0400 GMT. Sky became overcast. No longer able to ascertain presence of phenomena."

s.s. Beaverdell. 18th July 1961, 0300 GMT. "Three arcs of light were observed; their extent was approximately 060°–270° along the horizon and maximum altitude 120° (i.e. beyond the observer's zenith, to the south); near the horizon the light was of greater intensity and the arcs narrower, at the horizon they were about 8° width and over 20° width at their widest. Slight flaring observed and partial interruption from clouds.

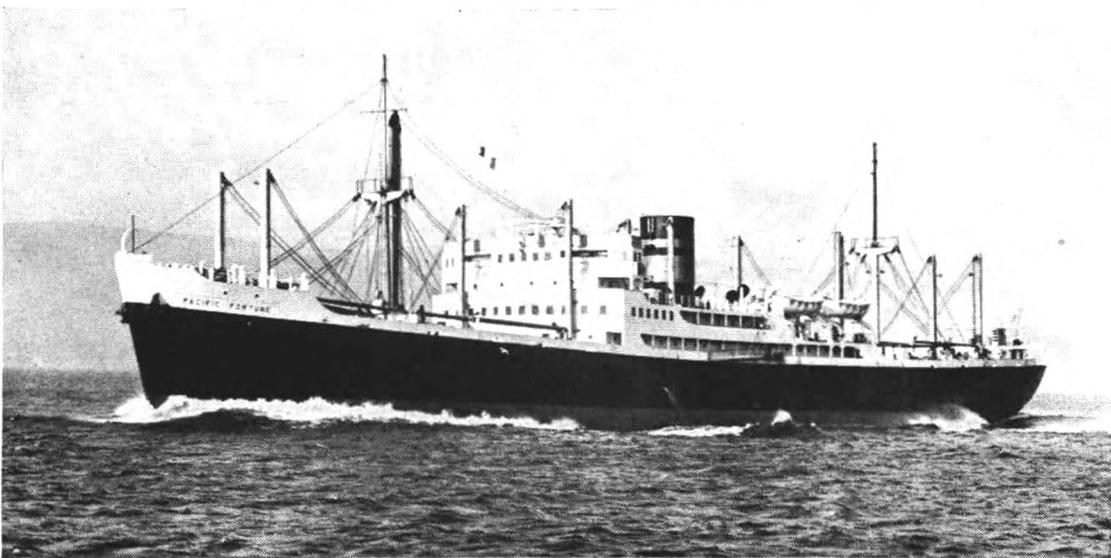
"At 0330 the arcs had gradually faded, to be replaced by vertical stripes of light in the sky, stretching from the horizon to points which appeared to coincide with the maximum altitude



*By courtesy of W. Ralston, Ltd. (Photographers), Glasgow C.2
Clan Macleod (Clan Line), Captain R. Harber.*



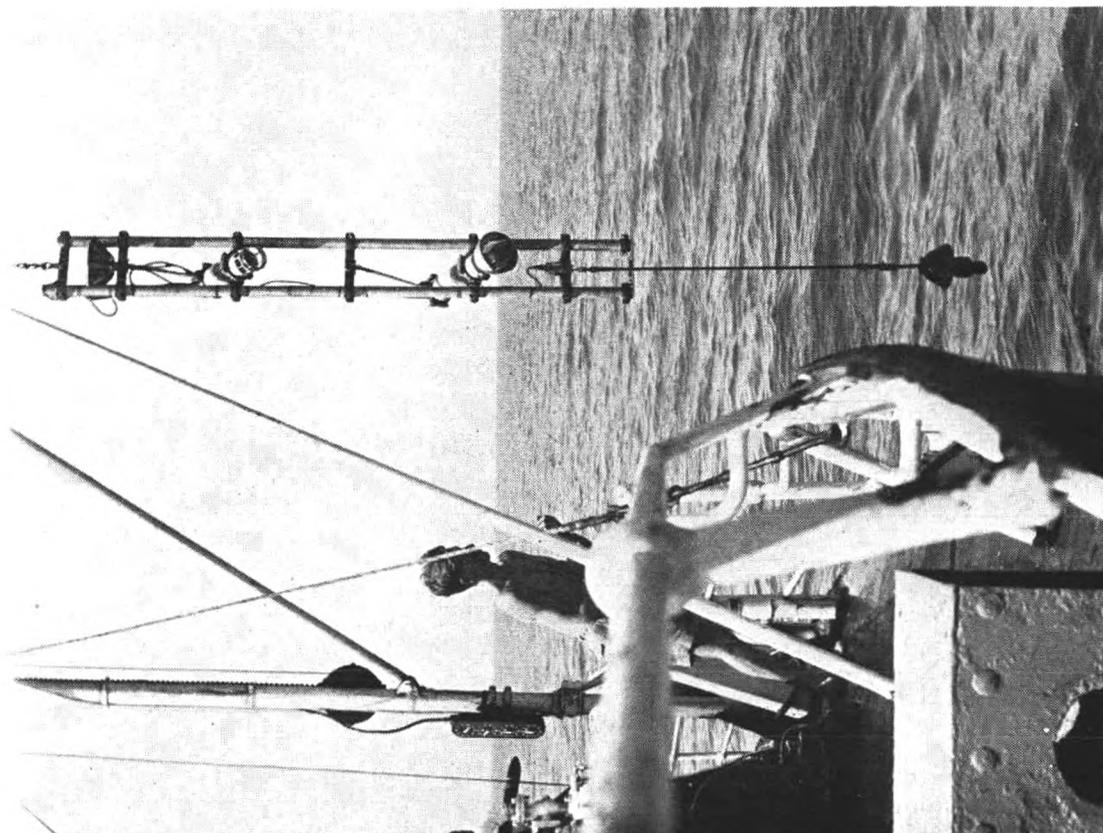
Denbighshire (Glen Line), Captain T. R. Walker.



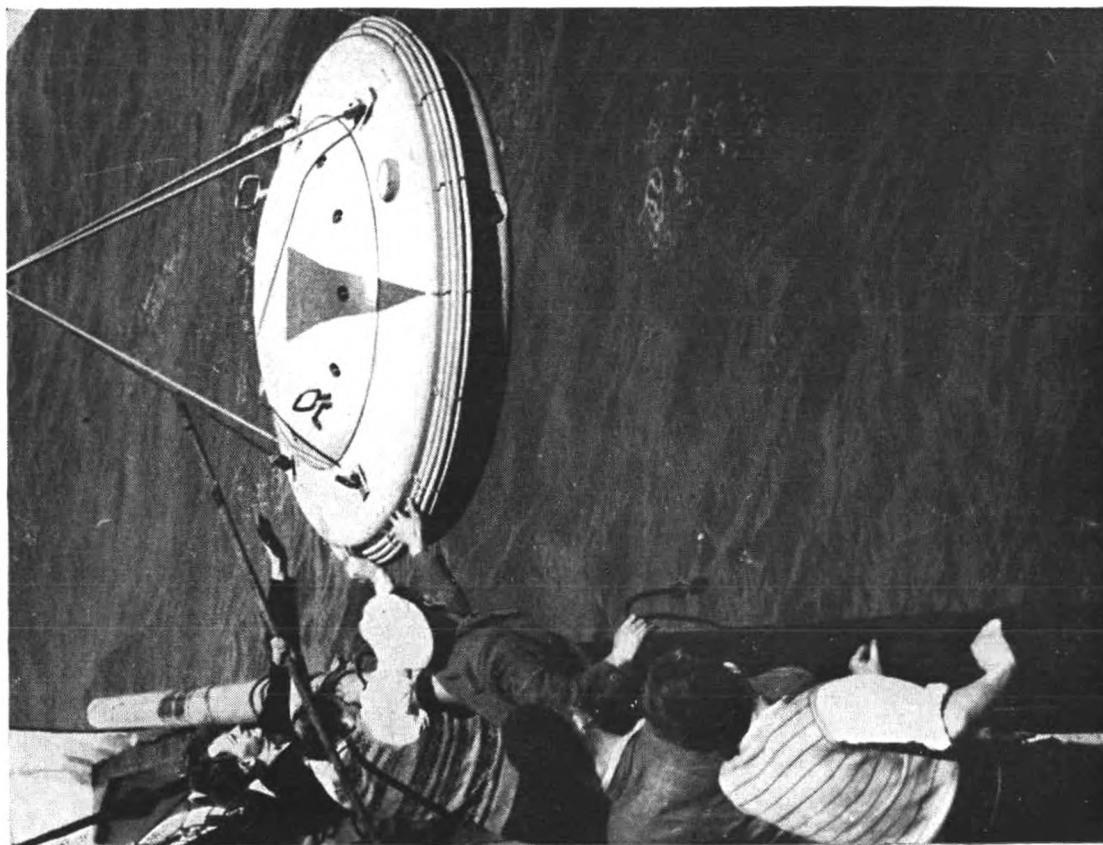
*By courtesy of W. Ralston, Ltd. (Photographers), Glasgow C.2
Pacific Fortune (Furness Lines), Captain R. Marbey.*

THE FIRST THREE SHIPS IN THE EXCELLENT AWARD LIST (see page 101).

(Opposite page 125)



National Institute of Oceanography
An underwater camera being lowered from R.R.S. Discovery II.



National Institute of Oceanography
A wave-recording buoy being lowered from R.R.S. Discovery II
(see page 126).

of the arcs. These stripes lasted only a short time and were replaced in their turn by irregularly pulsating patches of light, whose positions moved slightly and appeared to have no significance in relation to the arcs and stripes.

"At 0500 the lights were fading and disappearing, although the patches of light were giving off light of great intensity when edges of cloud interrupted them. This is difficult to understand and does not appear to be an optical illusion: the cloud in question was of altocumulus type (although this was difficult to be certain of) and whenever it coincided with the patches of auroral light, it seemed to intensify the auroral light many times."

Several reports of aurora have not been included here since, though the phenomena described suggest auroral forms, other evidence, mainly of geomagnetic disturbance, indicates that auroral activity at these times and in these places was extremely unlikely. Many other optical phenomena, for example crepuscular rays, can be very like auroral rays. We hope, however, that observers will continue to report and supply drawings of everything that looks like aurora, even though they may themselves have doubts. We wish to record every occurrence. Sketches are often very valuable in assessing the nature of the observed phenomenon and we should like to thank observers in s.s. *Gardemia* and s.s. *Imperial St. Lawrence* for such sketches.

551.46:06.055.5

The National Institute of Oceanography

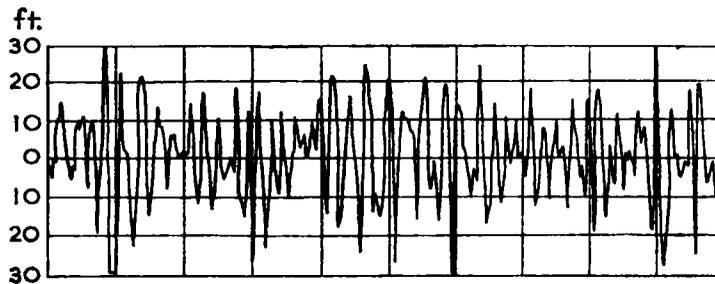
By G. E. R. DEACON, C.B.E., D.SC., F.R.S.E., F.R.S.

(Dr. Deacon is Director of the Institute; he is also President of the Institute of Navigation)

Every year *The Marine Observer* prints a short summary of the Annual Report of the National Oceanographic Council, which was founded by Royal Charter in 1949 to advance all aspects of oceanography (*The Marine Observer*, Vol. XXI, No. 152, p. 101). Most of the Council's work is done in the National Institute of Oceanography and in the Royal Research Ship *Discovery II*. The Institute is situated on a hill near the railway to Portsmouth, half way between London and the sea; R.R.S. *Discovery II* is based on Plymouth.

Seamen will no doubt hesitate to admit that University men can help them to understand the oceans, but scientists are specially trained to measure things and to seek reasonable explanations for what they find: they generally achieve something. Many of those at the Institute have spent longer at sea than at the University. The first mathematicians and physicists at the Institute were recruited from the Admiralty Research Laboratory where, since 1944, they had been studying waves. They had developed wave-recording equipment for use, in coastal waters, on the end of submarine cables, and this was followed by the development of an automatic wave recorder to be fitted in ships. The instrument records variations of pressure through a small hole below the water line, and if the ship did not heave, roll and pitch this would give a record of the waves running along the ship's side. To get the necessary information about the up and down movement of the ship the measuring unit includes a vertical accelerometer mounted in two sets of gimbals. The records of varying vertical acceleration integrated twice by suitable electronic circuits give a reliable measure of the up and down movement of the unit, and when the variations of pressure are added the instrument produces a good wave record. To allow for further possible errors two measuring units are used, one on each side of the ship. In some ways the instrument is a compromise: it would be better to measure actual heights of waves against the ship's side instead of the varying pressures, and to use gyroscopes instead of gimbals, but the equipment has to be kept as simple as possible so that it can run for a year or so without attention.

Some thirty shipborne wave recorders have been made, and perhaps most of them are in fairly frequent use in ships ranging from aircraft carriers to fishing trawlers. The highest wave which has so far appeared on a record was at Station 'J' (52° 30'N, 20°W), where O.W.S. *Weather Reporter* experienced one about 67 feet



Wave record from O.W.S. *Weather Reporter* ($52^{\circ} 36'N$, $19^{\circ} 55'W$) on 12th September 1961 during the extra-tropical depression which developed from hurricane 'Betsy'. This record was made at about 0900 GMT and covers a 10-minute period.

high on 12 September 1961 in the middle of an extra-tropical depression, formerly hurricane 'Betsy'. Over 60 feet has also been measured at Station 'I' ($59^{\circ}N$, $19^{\circ}W$). The reputation of the Bay of Biscay is maintained by the new recordings: R.R.S. *Discovery II* recorded waves over 50 feet high there on three separate days during the first fortnight of February 1957.

But it is not from such monsters that all the necessary information is obtained. Records from a very wide range of meteorological situations have been subjected to spectral analysis. It was found that the waves from a particular generating area could be treated as a continuous spectrum, whose upper limit is decided by the greatest strength of the wind and where component wavelengths travel away from the generating area with speeds proportional to the square root of their wavelengths. The longer swell races farther and farther ahead of the shorter swell, so that it is the first to appear, as ground swell, on distant coasts, where it gives warning of the approach of the higher, shorter, swell which contains most of the energy. Spectral analysis of waves and swell at Land's End sometimes reveals long low swell which can be traced back to the neighbourhood of Cape Horn. Very sensitive methods recently used on the coast of California have picked out swell from the neighbourhood of New Zealand, and even from the Indian Ocean, by the great circle path south of Australia.

Such separation of sea and swell and closer study of the products of individual storms in relation to the intensity and duration of the wind have brought improved methods of wave prediction. Shipowners in some countries are beginning to use optimum routes, based on meteorological forecasts made four or five days ahead, to avoid the worst wave conditions.* Such precautions adopted by 1,000 ships of the U.S. Navy's Military Sea Transportation Service in the stormy latitudes of the North Atlantic and North Pacific oceans are judged to have saved as much as 10 per cent of their time at sea, as well as bringing increased safety of cargo and passenger comfort.

Further statistical treatment shows that a remarkably precise description of a complex wave pattern, showing the percentage of various wave heights and steepnesses, can be obtained by a few simple measurements of a wave record. Measurements of the directional distribution of the wave energy have been made from records of the movements of a floating buoy (see photograph opposite page 125), and these advances have been followed by similar studies of ship motion which have brought research on the sea-keeping qualities of ships to a new and very promising stage of development. It is beginning to be possible to work out how ships of different sizes, shapes, speeds and loadings will behave in complex wave patterns, and to calculate the probability of critical accelerations and stresses. When such computations have been well tried and matched against a wide range of experience they should promote greater economy and safety for shipping.

There are other potentially important uses for the recent work on waves. It includes studies of the varying transport of water in waves of different height running on to beaches of different slope. If relatively small waves travel on to a

* See *The Marine Observer*, July 1960, pp. 139-144.

steeply sloping beach there is likely to be a small lowering of mean water level close to the shore, but when large waves, travelling over a gently sloping beach, lose a lot of kinetic energy by breaking there is likely to be an appreciable rise in water level near the beach. Closer investigation of such processes is fundamental to better understanding of beach currents, coastal erosion and silting, dangerous currents in the surf, and of the surf beats (long waves caused by alternation of groups of high and low waves) which probably produce most of the energy causing range action in harbours on ocean coasts. A good deal of research is being undertaken into the effect of meteorological disturbances on the tides and water level. One of the most important applications is to the prediction of storm surges.

Scientific study of ocean currents may be useful to navigation. The quarterly charts of average currents (prepared by the Meteorological Office) are about as good as they can be, but where they show strong variable currents it would be useful to have a closer understanding of how the current changes are related to changes in wind and other factors. As well as making some direct studies the Institute has done some pioneering work on the flow of water at great depths in the ocean, by tracking acoustic-signalling devices made to float at predetermined depths. The deep ocean has been shown to be not so still as it was thought to be. There are unexpectedly rapid and variable movements, sometimes greater at the bottom than they are half way down, and speeds up to 20 miles a day have been observed at depths of $2\frac{1}{2}$ miles. U.S. oceanographers have recently found sub-surface currents flowing at $2\frac{1}{2}$ knots towards the east below the equator in the Pacific and Atlantic oceans, and a joint U.S.-U.K. expedition found a counter-current of $\frac{1}{2}$ kt. two miles below the Gulf Stream. Meteorologists always stress the importance of upper air winds to what goes on at the surface, and oceanographers are beginning to take the same line about the deep flow in the ocean. We can scarcely hope to understand what goes on at the surface till we know something about the causes of the large and variable deep water movements.

There are close relationships between oceanography and meteorology. The atmosphere and winds largely control the movements in the oceans, but the oceans in their turn help to determine where most heat is fed to the atmosphere. They store vast amounts of heat and there is plenty of evidence that temperature conditions in the surrounding oceans have a marked influence—perhaps not always as simple as might be expected—on the temperature of the adjacent land. The idea and effect of a stream of warm water flowing from the tropical seas towards our shores has perhaps been exaggerated, but it is also clear that too little attention has been paid to the effect of the different rates of heating and cooling of neighbouring ocean and land surfaces, and to the effect of transfer of heat from the ocean.

The National Institute makes studies of the deep sea floor, particularly of the abyssal plains which fringe our western approaches, and of the physical and geological processes that have formed and modify them. The new echo-sounding equipment which records soundings at great depths to the nearest fathom has made it much easier to draw maps of the deep ocean floor and to find things on the bottom. Detailed maps of one or two small areas made it possible to get a fix there with an echo-sounder. Biological research is one of the main tasks of the Institute. Basic studies are being made of the factors which have made some parts of the ocean more fertile than others, and of those which have concentrated different species of plankton and fish into particular parts of the ocean. The Institute gets a regular supply of biological material from the Antarctic whaling fleets, and keeps track of the changing condition of the stocks of whales.

There are still plenty of things we do not know anything about: one of the most intriguing is the so-called phosphorescent wheels, extravagant exhibitions of the ordinary luminescence of organisms in the sea, often reported in nautical publications. Perhaps the most likely hypothesis is that they are associated with water disturbances produced by submarine earth tremors, but the idea has to be pursued in greater detail.

Some notes on Tropical Storms—'Betsy', 'Carla', 'Debbie' and 'Esther'

By JANET M. OLIVER

(Marine Climatology Section, Meteorological Office)

Although the North Atlantic had one hurricane, 'Anna', in July 1961, it was not until September that the hurricane season really got under way. During the first twelve days of this month, five tropical storms were located in rapid succession in the regions near the Caribbean and North Atlantic Ocean in about 20°N, four of which developed into hurricanes, namely 'Betsy', 'Carla', 'Debbie' and 'Esther'. On the synoptic chart for 0000 GMT on 13th September, 'Carla', 'Debbie' and 'Esther' are all present as tropical storms and the intense extra-tropical depression south of Iceland developed from hurricane 'Betsy' (see Fig. 2). The tracks that the hurricanes and storms pursued are shown in Fig. 1.

HURRICANE 'BETSY'

Hurricane 'Betsy' was located in the North Atlantic in 26°N, 52°W at 1200 GMT on 5th September and moved slowly NW on the west flank of a stationary warm anticyclone near the Azores. It approached a quasi-stationary front which became engaged in the circulation of 'Betsy' during the 9th. At the same time, the track of 'Betsy' took a sharp turn to the right and it rapidly accelerated ENE'ward (the direction of the isobars in the warm sector), becoming an intense extra-tropical depression. As is typical of such a depression, its track gradually turned more towards the north as it occluded, and it finally filled up when south of Iceland around 15th September.

'Betsy' was confined to the Atlantic Ocean and did not affect any mainland. Many ships encountered gale force winds and rough seas. The observations of s.s. *Media* and m.v. *Rangitata*, with the remarks of Dr. Reichelderfer, are on pages 105-7. Mean winds of 76 kt. and gusts in excess of 90 kt., with waves 45-50 ft., and a maximum wave height of 68 ft., were recorded instrumentally by *Weather Reporter* at Ocean Weather Station 'J' (52° 30'N, 20°W) on 12th and 13th September. (See articles on pages 125 and 130.) Some equipment was damaged on the *Empress of Canada* on 13th, during her voyage across the Atlantic.

HURRICANE 'CARLA'

'Carla' developed on 6th September in the Caribbean and moved slowly across the Gulf of Mexico on a NW course. At this stage, there was a stationary warm anticyclone over the eastern half of the U.S.A., but as this moved slowly eastward, Carla turned towards the north, crossed the Gulf coast near Galveston on 12th September and continued to move slowly northward on the west flank of a warm anticyclone. Having lost its water vapour supply, it began to fill up rapidly over the land during the 12th and 13th. However, with the engagement of an active quasi-stationary frontal system in its now weak circulation in the 13th, it became transformed into an extra-tropical depression which deepened rapidly and moved NE'ward, eventually filling up in the Davis Strait.

One of the most powerful storms ever to reach the Gulf Coast, Carla caused havoc in the states of Texas and Louisiana, killing about 40 people and making 500,000 people flee from their homes. Winds of 150 kt. were recorded. One macabre effect of the hurricane was a plague of rattle-snakes in Texas City; as flood water reached a depth of 8 ft. the snakes competed with human beings for places of safety.

A tornado travelling in the wake of Carla struck Galveston, Texas, on 13th September, killing at least six people and injuring scores. On that day the hurricane was centred 200 miles inland, but it was still leaving a trail of damage.

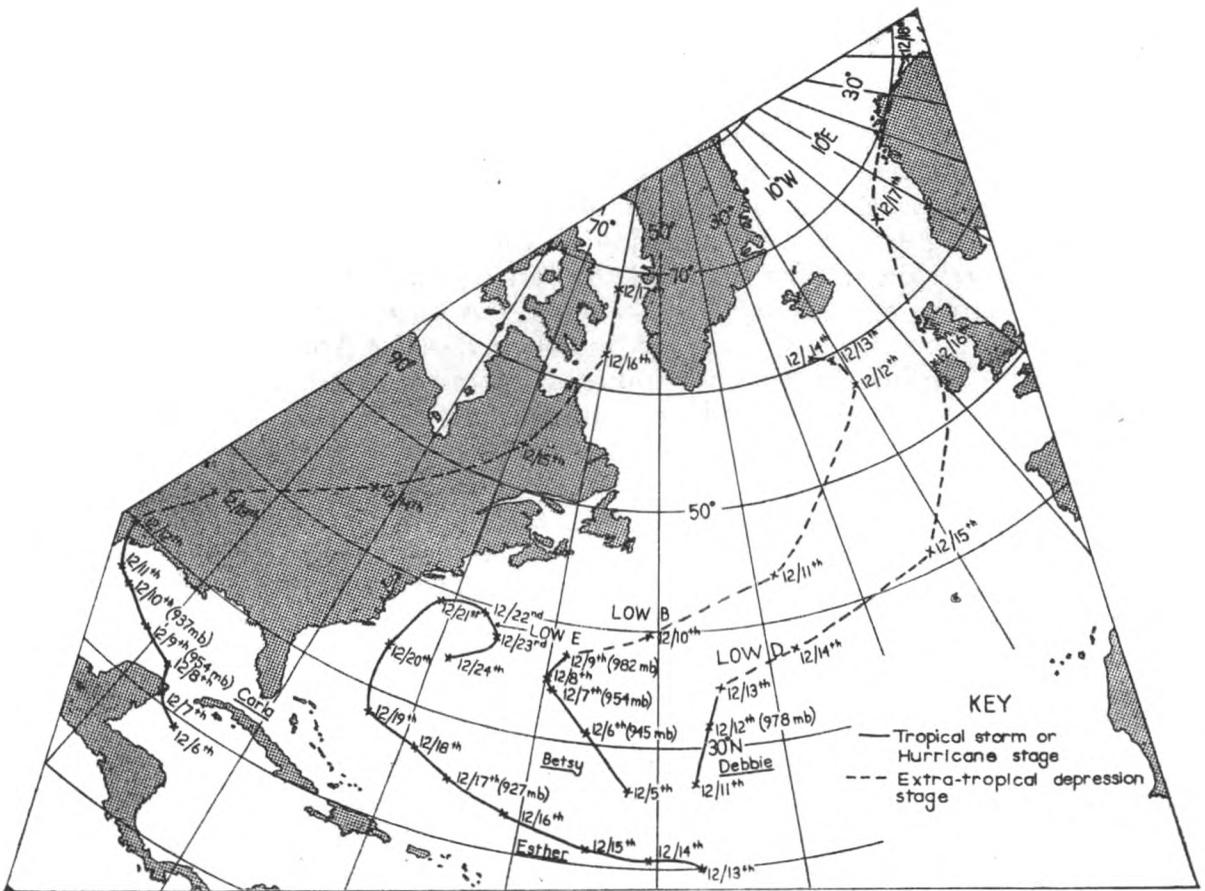


Fig. 1. Tracks of hurricanes and extra-tropical depressions.

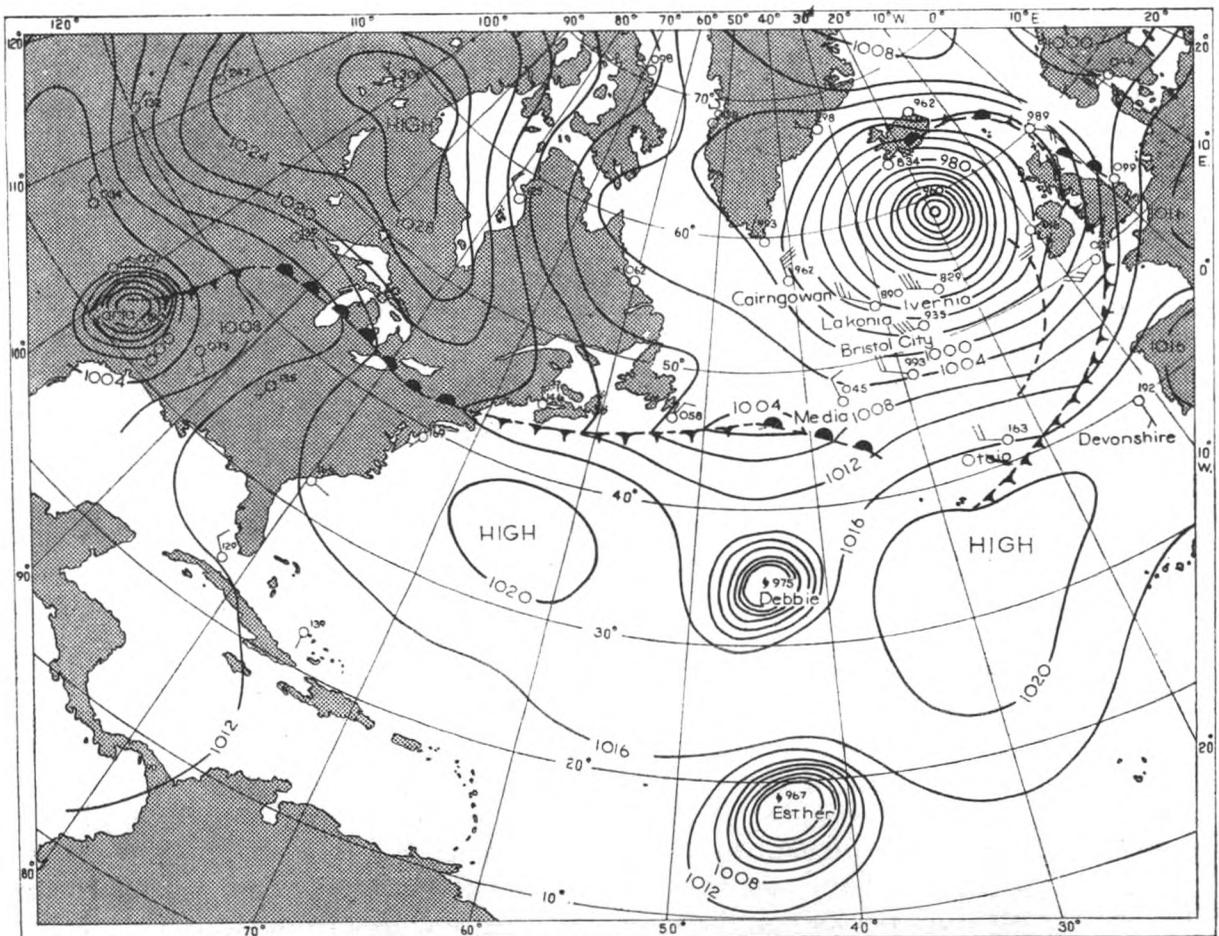


Fig. 2. 13th September 1961, 0000 GMT. (In hurricanes 'Debbie' and 'Esther' the central isobars have been omitted because of the tightness of the gradient; pressure values at the centres are given in figures.)

HURRICANE 'DEBBIE'

'Debbie' was located in mid-Atlantic, in 27°N , 47°W , at 1200 GMT on 11th September and moved NNE on the west flank of a warm anticyclone south of the Azores, slowly approaching a quasi-stationary front on the 13th. However, the deepening of a vigorous wave depression on this frontal system on the 13th, only 12° latitude north of Debbie, delayed the full engagement of the frontal system into the circulation of Debbie until the 15th, but once this was achieved (in the vicinity of the Azores), Debbie moved quickly across the Atlantic in a NE'ly direction, deepening rapidly to become an intense extra-tropical depression. The latter skirted the west coast of Ireland on 16th September with a central pressure of 963 mb. Gusts of 102 kt. were recorded in Ireland, where eleven people were killed by flying debris. Seven members of the crew were lost when the Icelandic trawler *Helgi* capsized about 150 miles from the Butt of Lewis in the Hebrides and three people aboard the Dutch freighter *Heron* were drowned when the vessel sank after striking a reef off Jersey. s.s. *Birmingham City* reported winds of force 12 (about 68 kt.) and gusts up to 90 kt. on 16th September, in a position 70 miles west of Valentia.

HURRICANE 'ESTHER'

'Esther' developed in mid-Atlantic on or about 13th September, further south than Betsy and Debbie, and moved WNW at a rate of 10 kt. On the 19th, it turned towards the north and travelled slowly NNE just off the east coast of the U.S.A., but was gradually weakening in intensity. The synoptic situation was such that at no stage was the hurricane able to engage an active frontal system. It therefore remained slow-moving throughout, weakening gradually, and in its final almost stationary stage was embedded in a very extensive belt of high pressure covering the U.S.A. and the central part of the North Atlantic.

Esther was the first tropical storm ever to be detected in the first instance by a weather satellite, in this case the American satellite Tiros III. The U.S. Weather Bureau ordered hurricane warnings to be raised from North Carolina to the Virginia Capes on 18th September, as Esther approached the mainland with winds of 130 kt. On 19th September, thousands of people were evacuated from New York as a precaution against the hurricane and on 21 September warnings of 70-80 kt. winds were given in Canada's Atlantic provinces. However, on the following day Esther drifted slowly away from the coast and ceased to be a threat to the mainland.

591.515.2:656.61

Reflections on 'Betsy'

By R. BASINGTHWAIGHTE

(Ocean Weather Ship *Weather Reporter*)

As mentioned in the article on page 128, hurricane 'Betsy' was transformed into an intense frontal depression during 9th September 1961. Its approach towards station 'J' ($52^{\circ} 30'\text{N}$, 20°W) during September was viewed by all on board *Weather Reporter* with the same outward calm normally evident at the approach of storm conditions. For those who have wintered with the Ocean Weather Service, similar conditions must have been experienced at least once previously: indeed, during the approach of Betsy, most of the conversation turned upon the particularly severe storm encountered on station 'I' during January 1961 which in retrospect was considered by all those present to have been worse than Betsy.

Prior to the arrival of the storm, its latest position and track were relayed to the office by the off-duty personnel, these details being obtained from reports contained in the newscasts relayed over the ship's rediffusion system. For those in the office a constant watch was kept on the barograph trace for the first signs of a downward trend. When these signs appeared at noon on the 11th, the main focus of attention

soon switched to the wind indicators, details of wind direction and strength being supplied to the numerous enquirers calling the ship.

During the early hours of the 12th, when the wind was steadily gaining in strength, and the accompanying seas began to have their effect on the ship's motion, the working conditions entered the trying phase. In the office it is necessary, under these conditions, to anchor oneself to the working position to avoid being thrown around; once established in a safe position, each pencil, paper or other item in use must be returned to a conveniently safe place before the next item is brought into use; failure to do this results in frequent searches under the benches for the offending item.

By 0300 GMT on the 12th the seas outside had reached 20-30 ft., their presence being announced to the occupants of the office by the constant surge of water over the decks outside, coupled with the noise produced by the water taken aboard expending its energy against the balloon shelter/meteorological office bulkhead.

At this stage, due to the violent motion of the ship's stern, a constant watch had to be kept on the instruments mounted on the office bulkheads: vibration, and rapid movements up and down, both combined to search for the weak linkage in even the more robust instruments.

At the height of the storm, mean winds of 76 kt. and gusts in excess of 90 kt. were recorded, and the accompanying seas were 45-50 ft. (see reproduction on page 126 of the trace on the wave recorder). The making of routine observations in such conditions became a severe test for even the most experienced of the observers. True assessment of the weather factors from a position on the open wing of the bridge, with driving spray and rain multiplying the normal difficulties of night time observation, proved a very difficult task.

Balloon filling and launching during the period of the storm were accomplished without mishap, due primarily to the experience gained by the staff in similar conditions. During the filling of balloons the staff engaged on the task have to be constantly alert for seas coming aboard: at the first signs a leap to a vantage point on top of the hydrogen cylinders usually ensures a dry escape, though on occasions even this is not sufficient. After a brief waiting period the water drains away sufficiently to allow a descent to the deck and the filling process can be resumed. Quickness is essential at the stage of securing the transmitter to the balloon rig, for to be caught at this time occasions considerable damping of the spirit and body, with the accompanying total ruination of the rig.

Our successful completion of the programme during this period can be attributed to the good teamwork of all the staff.

551.506.2(261):551.553.8:656.61

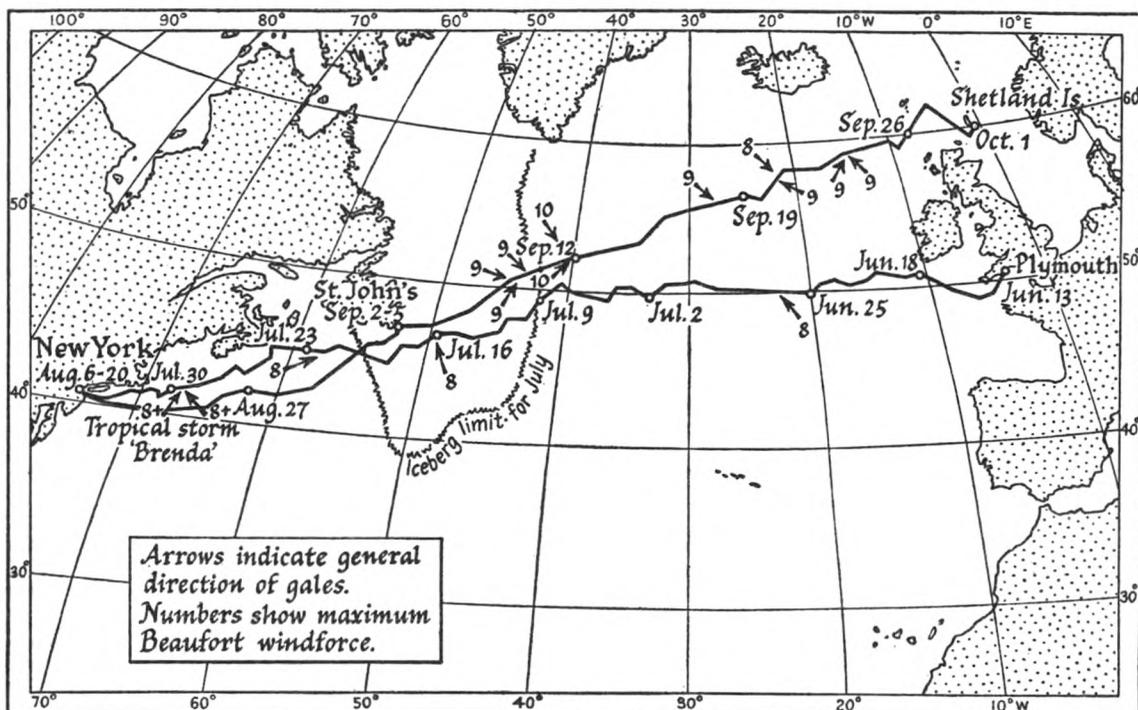
Notes on Heavy Weather in the Atlantic (1960) and North Sea (1961)

By DAVID H. LEWIS, M.B., CH.B.

(These notes on heavy weather have been extracted from a series of contributions on the subject published in the April 1962 number of *The Journal of the Institute of Navigation*.

The observations were made aboard the 25 ft. 5-ton sloop *Cardinal Vertue*, which Dr. Lewis sailed single-handed in 1960, and with a companion in 1961. The wind speeds were read from hand instruments, checked with Daily Weather Reports when possible and for 1961 by B.B.C. forecasts.)

Sailing to New York in 1960, the wind only briefly reached gale force on 26th June, 16th July and 22nd July. However, on 30th July when I was in $41^{\circ} 32'N$, $67^{\circ} 07'W$, the centre of tropical storm 'Brenda' passed some 50 to 100 miles NW of me during the evening and early hours of 31st July. I was in the right-hand semi-circle and experienced gale-force SE winds which veered SW and dropped to a calm before morning. The sea throughout was confused and the motion exceedingly violent. At first I could make some progress to windward close-reefed. I then attempted to heave-to under close-reefed mainsail but violent flogging which made me fearful for the mast made me lie ahull. I was sick and exhausted. The storm passed by quickly.



Cardinal Vertue's routes.

The U.S. Weather Bureau report states that at 1700 EDT on the 30th 'Brenda' was centred in $42^{\circ} 03'N$, $72^{\circ} 07'W$ (80 miles west of Boston) and moving NE at 28 m.p.h. (24 kt.). Highest wind was 35 kt., with gusts of 50 kt. within 200 miles of the centre in the right-hand semi-circle.

During the voyage from St. Johns, Newfoundland to Lerwick, Shetland Isles, from 5th September to 1st October 1960, I experienced gale-force winds on six occasions. The Daily Weather Reports of the British Meteorological Office and reports from O.W.S. (Ocean Weather Station) 'I' ($59^{\circ}N$, $19^{\circ}W$) for 21st September have helped fill in the picture.

8TH SEPTEMBER 1960

At noon I was in $50^{\circ} 35'N$, $45^{\circ} 15'W$. The wind was sw, force 9; the barometer was 996 mb. (Daily Weather Report: 1004 mb.)

A warm front extended from Nova Scotia across Newfoundland to an area of low pressure halfway to Kap Farvel. The nearest ship was 100 miles north of me and reported winds of force 8 (37 kt.) and a barometer reading of 1004. The waves were in long lines of majestic marching seas. When the wind reached force 8 at 1000 GMT, I estimated the height of the seas at 10 ft., and 150 ft. long. I ran under staysail, steering with the vane with the wind on the quarter. At noon, when the wind had reached 43 kt., and again at 1230, I was pooped. On the second occasion all the brass fastenings of the canvas dodger sheered.

At 1300 the wind was 43 kt. The staysail sheet pulled a fair lead out of the deck. I lowered sail. The seas were curling over and breaking (with considerable shock whenever they broke over the ship). I streamed 20 fm. of warp in a bight and attempted to steer before the wind. The ship at once became almost unmanageable and ran across the seas in the trough. When I did succeed in steering before the seas, each breaking wave would carry the warp alongside. So at 1530 I lay ahull and so remained for $5\frac{1}{2}$ hours. The ship tended to fall off when ahull, but to 'give' before the breaking seas. She would be hove over up to 50° as one crashed over her and would slide sideways or spin around.

9TH SEPTEMBER

My noon position was $51^{\circ} 07'N$, $43^{\circ} 33'W$ when a new gale blew up during the afternoon and reached force 9 (43 kt.). There was no ship within several hundred miles and the nearest weather ship was 450 miles ENE. She reported moderate

winds but seas $17\frac{1}{2}$ ft. high, an indication of a gale in the area. Away to the NW of my position, O.W.S. 'B' was logging 19 ft. waves, an indication of the gale that was approaching, and which reached me on 11th September.

There was a confused cross sea in the gale of 11th September, quite different from the conditions of the day before. The yacht was repeatedly broached-to and thrown aback both before and after lying ahull (12 hours). This time there was a tendency to luff.

11TH SEPTEMBER

By noon a new area of low pressure had formed not far to the NW of me and a fresh front was approaching. My position was $52^{\circ} 20'N$, $39^{\circ} 50'W$, 150 miles west of O.W.S. 'C', which was at $52^{\circ} 50'N$, $35^{\circ} 30'W$. At noon this O.W.S. reported a SW gale, force 9 (42 kt.) and seas 14 ft. high. I was also logging a SW gale, force 9, at noon. By 1800 GMT the waves at the O.W.S. had reached $17\frac{1}{2}$ ft. in height. I ran under staysail until early afternoon when first a fairlead, then a sheet parted. I then steered before the seas for a while under bare poles. The yacht 'surfed' on the seas, water spouting high each side, then curling over and pouring into the cockpit, whence it arched out over the stern. It was partly 'bucked out' by the motion as well. The indicator read 8 kt. as she surfed. I then lay ahull, the ship tending to luff. Later in the gale she fell off before the seas.

Between 1615 and 1830 the wind reached 50 kt., force 10.* The whole sea was white; the waves seemed flattened, and the tops to be blown right off. After the wind decreased again to force 9, the sea continued to get up and to break with more fury. The impact was so fearful when those seas broke over the yacht that I feared she would be stove-in. I shackled the sea anchor warp to a $\frac{1}{2}$ in. diameter wire strop which I had previously led round the stern. This seemed ineffective in holding the yacht end-on. In fact she seemed to be held up to the pounding. Sometimes waves would dash across the line of the seas. I was too tired to attempt to steer or to take in the drogue. The wind quickly moderated but I lay to the sea anchor all night. In the morning I found the wire warp chafed half through, the covering board split and cleats torn from the stern. At Lerwick we found that the paint had cracked where the transom had been pulled bodily backwards.

18TH SEPTEMBER

There was a NW gale of 42 kt. (force 9). The D.W.R. shows a cold front having just passed my position.

20th-21st SEPTEMBER

My noon positions were $57^{\circ} 25'N$, $21^{\circ} 50'W$ and $58^{\circ} 08'N$, $20^{\circ} 24'W$ respectively. O.W.S. 'I' was at $59^{\circ}N$, $19^{\circ}W$, approximately 150 and 90 miles NE of my two positions. A low pressure system with winds of force 9 had appeared to the SW on the 18th and moved NE to cross directly over my position on the 20th-21st.

On the 20th an ESE gale began. At noon a ship to the southward reported a wind speed of 37 kt. (force 8) and at the time I was logging force 7. During the early evening the wind reached force 9 for a time. In the night the wind dropped to a light breeze for three hours, the glass remaining steady at 992 mb. I was able to keep going to windward under close-reefed main and reefed stay-sail until the wind reached force 9. I then hove-to under close-reefed main alone. The gale recommenced from NW, reaching force 8, but moderating before noon. A ship north of me was still experiencing force 8 (37 kt.) winds at noon, but O.W.S. 'I', now 90 miles NE of me, was logging the same wind strength as I was (28 kt.)—force 7, westerly. This had been preceded at the O.W.S. by a SE gale of force 8, which blew from midnight to 0615 GMT. The sea at noon was confused and 13 ft. high (at the O.W.S.). I estimated the seas from the rigging as 14 ft. high, also at noon. In both cases the wind was force 7 at the time.

* Dr. Lewis obtained a wind speed of 50 kt. from hand instruments, but his description of the waves suggests force 11 rather than force 10.—*Editor*.

23RD SEPTEMBER

In $58^{\circ} 48'N$, $14^{\circ} 50'W$, a gale began in the SE blowing at force 8 and later veering to SW, whence from 1800 GMT to 2100 it blew at force 9. The sea in this gale was remarkably even, considering the veer. I was able to keep going, first under reefed main and reefed staysail and after the veer under reefed staysail alone. The yacht steered by the vane but was frequently broached-to or thrown bodily aback. The D.W.R. shows that the centre of a depression passed approximately over my position about noon on the 23rd. Next day a ship to the NE, which was near the centre of the disturbance at its new position, reported force 9 winds.

4TH-5TH JULY 1961

In sea area Fisher in the North Sea, where I was bound south from Stavanger to the Thames, noon position $56^{\circ} 35'N$, $5^{\circ} 15'E$ on 4th, a severe (force 9) northerly gale was forecast. At 0830 BST on the 4th the gale came on suddenly in a line of white water at 36 kt. (force 8). I lay ahull for 14 hours. At 1130 it was blowing force 9 (42 kt.); seas confused; period 7 sec.

In spite of the helm being lashed down the ship tended to fall off. We got under way at 2230, the wind being then force 7. It blew at force 7, and sometimes force 8 next day. In the early hours of the following morning, the seas as measured from the rigging were still 8 to 9 ft. Though this gale occurred in soundings, as little as 16 fm., the seas did not seem steeper than in the Atlantic gales. They seemed smaller, but this was purely a subjective impression.

Discussion

In each gale the wind seemed to behave differently and so did the yacht. I did not know whether she escaped serious damage because of, or in spite of, any action on my part; nor did I realise the power of the waves until something gave way. A deep keel yacht with outside ballast, a self-draining cockpit and everything battened down, is self righting. There seemed no danger in broaching-to or being thrown aback in such a vessel.

I would have gravely over-estimated the height of the seas from the cockpit; only from the rigging was it possible to be accurate. Figures from several standard works used by yachtsmen give high figures for the heights of waves in gales. However, the fetch is taken as unlimited and the time the gale has been blowing also unlimited. I never experienced such conditions, as the fetch was from the centre of the disturbance causing the gale—often 200 to 300 miles—and the gale commonly changed direction after 12 hours or so. Dr. G. E. R. Deacon in a personal communication says he would expect waves whose highest third would average 12 ft. and maximum 18, with a wind of 30 kt. (force 7). This was about my experience (see 20 to 21st September), allowing for the rather complex conditions.

Eroll Bruce in *Deep Sea Sailing* gives tables of wave heights, most of whose material, he tells me, is from an Admiralty Paper of 1945. He mentions that Rachel Carson in *The Sea Around Us* concludes that "waves higher than 25 ft. from trough to crest are rare in any ocean* . . . mariners stubbornly describing higher waves". My own limited experience is in line with Eroll Bruce's tables. The greatest mean height of waves recorded by an O.W.S. in my vicinity was 17 ft. 6 in. This would give occasional maximum waves of 24 ft.

What to do in a gale? It is probably safe to lie ahull in a well found yacht up to force 9 to 10. In stronger winds the vessel may be burst asunder or rolled over. I fortunately had no experience of these conditions, but would think that if a change of helmsman were available, steering dead before the wind with warps astern might be best when running in gales. I do not think the shape of the boat's stern is important, but the *whole* of her underwater lines determines how she lifts and how she runs.

* Statistics from a wave recorder aboard Ocean Weather Ship *Weather Explorer* in the North Atlantic during the years 1953, 1954 and 1959 showed that 11% of maximum waves were over 25 ft. high during March to August, and 43% were over 25 ft. high from September to February during those years. (See *The Marine Observer*, January 1962, pp. 35-36.)—Editor

A Report from the Arctic

By CAPTAIN R. R. WAESCHE

(Captain Waesche is commanding officer of the U.S. Coast Guard cutter *Northwind*.)

Today's icebreakers with their heavy hulls, powerful engines, modern equipment and crews are a far cry from the vessels used by the early Arctic explorers. As floating laboratories for the evaluation of meteorological and oceanographic data, the present-day ships are well stocked with food and other supplies needed for extended operations. Their officers and men know few of the physical discomforts and dangers which were the everyday companions of Scott, Peary, Nansen, Shackleton and other famous polar explorers of the past century. Yet in spite of the cruel mental and physical rigours of the polar regions, these early explorers managed to amass a great quantity of accurate meteorological and oceanographic data. The quality of this information reveals careful, thorough, continuous effort and attention to detail and the highest devotion to scientific research principles.

Unlike the vessels of an earlier era, modern icebreakers are aided by helicopters and long-range aircraft, cargo ships for logistic support, manned bases on the ice throughout the year and nuclear submarines capable of operating in any season. This has made possible a year-round, large-scale, high-quality collection and evaluation of the daily evidences of nature's forces and changes in the polar regions.

Nevertheless, modern expeditions are scarcely Sunday-school picnics. In the eternally frozen domain of the Arctic, natural forces are still overwhelmingly powerful, and ice operations are still exciting and challenging.

United States vessels employed in arctic operations are of the 'Wind' class (see photograph opposite page 136). They are 269 ft. long, 63 ft. in beam, draw 29 ft. of water fully loaded, displace 6,500 tons, and have $1\frac{1}{8}$ in. steel hull plating. With diesel-electric drive, twin screws, and pilothouse control, the two 5,000 h.p. motors drive the stubby hulls at 16 kt. With two helicopters aboard, they have far reaching eyes. The U.S. Navy has four of these ships, the U.S. Coast Guard three. The U.S. Coast Guard, one of the United States' armed forces, is also its principal maritime safety agency. With ships and small boats, an air arm, and extensive shore facilities, it combines in one organisation a number of the functions of Trinity House, H.M. Coastguards, the Royal National Life-boat Association, the Ministry of Transport, the various port authorities, and the search and rescue duties of the R.A.F. and Royal Navy.

C.G.C. (Coast Guard Cutter) *Westwind*, stationed in New York, assists the Navy every summer in supply, exploration, and oceanographic missions in the Arctic between Greenland and Northern Canada. C.G.C. *Eastwind*, stationed in Boston, goes south every winter with her Navy sister ships to the Antarctic. C.G.C. *Northwind*, based in Seattle, Washington, carries out the annual Bering Sea Patrol (law enforcement on the high seas, medical and dental care for the Aleutian Island natives and Alaskan Eskimos, protection of the fur seals, patrol of the salmon and halibut fishery areas), and oceanographic research in the Bering, Chukchi (just north of the Bering Strait), and Beaufort Seas, and the Arctic Ocean.

In 1960, *Northwind* began a new type of ice operation—oceanographic and meteorological survey and research in the Arctic in the late fall. This is the latest phase of attack against the elements. It requires stubborn persistence against bad weather to build a supply of information supplementing the data gathered during many summers. Since all other ships leave the Pacific Arctic and the upper reaches of the Bering Sea by 1st October, *Northwind* goes north alone.

For the second successive year, the icebreaker departed Kodiak, Alaska, on 6th October 1961, after a three months Bering Sea Patrol, en route to the Chukchi Sea and Arctic Ocean, and pounded southwestward to Unimak Pass, then north through the Bering Sea.

Due to the increasing number of storms at this time of year, the ship required six days to beat her way to the Arctic Circle, a normal four day (1250 nautical miles) run. The route goes through Bering Strait, 43 miles wide, guarded in the middle by Little Diomedede Island (U.S.) and Big Diomedede Island (U.S.S.R.) only $2\frac{1}{2}$ miles apart. On board was a five-man team of civilian oceanographers from the U.S. Naval Electronics Laboratory, San Diego, California, and the University of Washington at Seattle, Washington. In addition, the Coast Guard's own four-man team of aerologists continued the weather forecasting and chart service which began when the ship first left Seattle on 30th June for the Bering Sea Patrol.

As in the case of the previous year's trip, the programme involved measuring temperatures and salinities of the ocean at various depths and in many places. Bottom samples are obtained by the Schleger corer and 'orange-peel' dredge, while plankton samples and samples of air and water are tested for carbon 14, and other components.

Heading northward at 13.5 kt. the ship pushes her way towards the ice. The temperature goes down and sea traffic disappears. If she should be trapped in the ice, there will be no one to help her, no ship of any kind in the Arctic Ocean or within a thousand miles—no ship of her size or capabilities in this hemisphere except the Navy sister ship, U.S.S. *Staten Island*, undergoing overhaul in Seattle, 3,000 miles away.

In this lonely situation and at this time of the year, weather changes are critical. Weather reports and forecasts are examined and re-examined. The ship's aerographers are continually busy. When the ship is east of Pt. Barrow in the fall, she is in constant danger of being caught in the ice, for a wind shift to a northerly quadrant will bring the polar pack tight against the coast in a matter of hours. No ship yet built is able to break through this wind-driven heavy pack ice in the fall or winter. Once the wind changes from its summer southerly-prevailing direction to its late-season northerly direction, the chances of getting back to Pt. Barrow are slim indeed.

The importance of good weather information and accurate forecasting is obvious. Unfortunately, this information and forecasting is of doubtful value and accuracy in this part of the world since there are so few weather-reporting stations. A small number of Siberian stations and two or three Russian and U.S. manned 'ice islands' in the Arctic Ocean provide the only reports from the west and north. Small wonder, then, that we are often surprised by what tomorrow's weather brings.

The *Northwind's* examining and reporting programme includes surface observations every three hours and radiosonde observations every twelve hours. In the ice, special ice observations are taken every three hours. All of the information is forwarded to Fleet Weather Central, Kodiak, Alaska, and Weather Observer, San Francisco, California. Weather charts are received by facsimile machine from the U.S. Navy unit at Kodiak, Alaska, and weather reports by radio teletype from the same source. When radio communications are good, these forecasts and reports are received twice a day. But often communications become so difficult—so much static in the atmosphere—that six, twelve, or eighteen hours without radio contact to other stations and units is not uncommon.

The *Northwind's* new oceanographic research programme is taking place while the weather is getting colder, with new winter ice forming. Since no other ship has been into the Arctic polar pack and out again at this time of year, special precautions have been taken to provide for emergency wintering-in. Spare parts, equipment, adequate fuel, stocks of food supplies for the needs of two hundred officers and men for a nine-month period are extensive.

The last of the commercial ships left Nome, Alaska, southbound, about 1st October. *Northwind* pushes northward, alone, past Herald and Wrangell Islands to find the ice. This year, strangely, the ship passes from the Arctic Circle to 72°N without encountering any ice. A hint of this unusual condition was given in the summer report of U.S.S. *Staten Island's* Arctic operations—"a mild ice year." Finally, on 16th October, in position $73^{\circ} 10'\text{N}$, $175^{\circ} 00'\text{W}$, the first 'grease' ice,



New winter ice forming in Chukchi Sea on 20th November 1961 (see page 137).



C.G.C. *Northwind* lying in new winter ice near Arctic Circle and Bering Strait on 23rd November 1961 (see page 135).

(Opposite page 137)



U.S. Coast Guard

Knocking off the heavy accumulation of ice formed from spray over the bow, on 10th November 1961 (see page 137).



U.S. Coast Guard

A piece of shelf-ice, and pancake ice (see page 137).

looking like heavy oil on the water, is found. As the ship drives into the oily swell, the grease ice turns to small 'lily pads', then 'pancake' ice (see lower photograph on opposite page), then new winter ice stretching from horizon to horizon.

Soon the polar bears appear—lords and masters of this world, seal and walrus their food. Many are sighted—mothers with one or two growing cubs, big males by themselves. The ship doesn't frighten them very much but the helicopters hovering overhead give them a good scare.

Northward the ship drives, using four of her six 2,000 h.p. diesel engines to drive the main motors. The temperature drops swiftly from 20° to -7°F. The winter ice increases in thickness from four inches to a foot. The ship slows down. Six engines are put on the line on pilot house control—10,000 h.p. driving 6,500 tons of steel smoothly through 18 inches of solid ice. In 74° 52'N, a new record for this time of year by a ship under her own power, we reach the polar pack—large chunks of old, very old ice, hundreds of feet long and twenty to forty feet thick. *Northwind's* progress is slowed to one half knot. We receive daily radio messages from Arlis II, one of the U.S. encampments on an ice island, only 90 miles north of our record position.

After lying in this area overnight, and sending the helicopters out next morning to scout for leads without success, the ship holds demolition tests in the ice with T.N.T. charges, then turns south to continue the oceanographic programme. Our programme this year does not include how far north we can go, or how much of the polar pack we can penetrate.

Now the real oceanographic survey programme begins, using a complicated and accurate grid plan of the area. The oceanographers are busy 24 hours a day. The bad weather, strong winds and snow from northerly, westerly, and southerly quadrants has little effect on us in the ice. But as we work closer to Herald Island, the big swells begin to reach us, penetrating 50 to 100 miles of the new ice, causing our round-bottomed stubby ship to roll her main decks under.

Day after day the work continues. The weather is overcast, windy, snowing, for thirty consecutive days. Twice we see the sun; twice the stars. Every ten days the ship rolls her way to the U.S. Air Force station at Cape Lisburne on the Alaskan Coast at 69°N to get mail and essential supplies.

On 18th November comes the weather break for which we've been hoping. The air temperature, which has been hovering between 10° and 20°F, drops to zero. The wind dies, the sun comes out, and at night the full moon gleams. In forty-eight hours the entire Chukchi sea area between Herald Island and Bering Strait freezes over, two to six inches of ice in two days covering more than 20,000 square miles of ocean. (See photograph opposite page 136.)

It's beautiful, fantastic, but true. The surface of the sea, at a temperature of 28.5°F, has been waiting only for a calm day. It freezes so fast you can almost see the ice form. The ship's operations are now much more comfortable but more dangerous. Work to the north and west is curtailed—the ice is too heavy, and possibilities of getting ice-bound are increased.

However, the work is nearly done. We have taken thousands of soundings over thousands of cruising miles as well as scores of water samples and temperatures from various depths and large numbers of bottom samples. They have all been collected for examination, diagnosis, and report, and will contribute to a broader understanding of the oceanography of the Arctic Ocean.

The aerographers have expended more than 100 balloons and radiosonde transmitters, and have sent in more than 400 surface observations. In spite of a few bad forecasts, their work has been helpful and important.

Thus concludes another investigation of nature's mysterious forces and actions in the far north. Fall Arctic operations will probably become a yearly occurrence, for the seasonal variations in weather and oceanography must be studied thoroughly to provide an ever increasing capability for long range weather forecasting and oceanographic projection.

On Thanksgiving Day, the ship lies quietly in the ice. A holiday is declared. The traditional Thanksgiving dinner is followed by ice skating and games. All hands take a well-deserved break in the work routine.

The 25th of November is the final day. The ship's helicopters fly the scientific team ashore at Nome. *Northwind*, ice encrusted and a bit battered, turns southward.

EFFECTS OF THE APPARENT WIND ON SHIPBOARD

The following table, taken from the manual of marine weather observing (*Manmar*) supplied to Canadian voluntary observing ships, is reproduced here by kind permission of the Director of the Canadian Meteorological Branch. Marine observers may find this a useful adjunct to the 'sea criterion' of the Beaufort Scale.

BEAUFORT NUMBER	WIND SPEED (KT.)	EFFECTS OF APPARENT WIND ON SHIPBOARD
0	less than 1	Smoke rises straight up.
1	1 to 3	Barely perceptible smoke drift.
2	4 to 6	Wind barely felt on face. (A tendency to overestimate wind needs to be avoided when the temperature is below 32°F.) Smoke rises at 80°.
3	7 to 10	Wind felt on face (same note as above). Smoke rises at 70°. Taut halliards shake slightly. Pennant extends and flaps.
4	11 to 16	Slight pressure of wind felt on face. Smoke rises at 50°. Slack halliards curve and sway but do not assume fixed bent position. Taut halliards do not bend but whip slightly. No noticeable sound in rigging. Flapping of pennant more marked at fly end. Heavy flag flaps limply but does not extend.
5	17 to 21	Wind felt on face as if close to ordinary electric fan; stings face in temperature below 33°F. Smoke rises at 30°. Slack halliards whip while bending continuously to leeward. Taut halliards maintain slightly bent position. Low whistle in rigging. Heavy flag does not extend but flaps along entire length.
6	22 to 27	Wind stings face in temperatures below 35°F. Slight effort to maintain balance against wind. Smoke rises at 15°. Both slack and taut halliards whip slightly in bent position. A low moaning, rather than a whistle, is heard in the rigging. Heavy flag begins to extend and flaps more vigorously.
7	28 to 33	Wind stings face in temperatures below 38°F. Necessary to lean slightly into wind to maintain balance. Loose oilskins begin to inflate and pull against the strength of one's arms. Smoke rises at 5° to 10°. There is still a slight whip in the halliards. Whistling and medium moaning heard in the rigging. Heavy flag extends full length and flaps at fly only. Loose canvas protectors around bridge whip slightly against supports.
8	34 to 40	The head is pushed back by the force of the wind if allowed to relax. Oilskins inflate and pull strongly. Halliards rigidly bent. Loud whistle in rigging. Heavy flag flies straight out and whips from the hoist. Loose canvas 'dodgers' or protectors held tight against supports.

Note.—An article about this table appeared in our April 1951 number.

551.326.7

NOTES ON ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM JANUARY TO MARCH 1962

At end of January 1962

RELEVANT WEATHER FACTORS

January 1962 was unusual in that there was intense cyclonic activity from north-east

Canada to the Russian Arctic, including the Atlantic north of 50°N, but excluding northern Greenland. Surface air masses were colder than normal over eastern Canada and the Russian Arctic and outbreaks of Arctic air moved into the Atlantic from the Canadian Arctic, and from the Russian Arctic across the Barents Sea and Greenland Sea. Snowfall appeared to be below normal in the Arctic generally, except along the north Russian coasts. The very intensive cyclonic activity over the North Atlantic between Labrador and Scandinavia was associated with widespread northward movement of warm Atlantic water, particularly into the Davis Strait and west of Iceland. Sea temperatures were therefore generally high in the Norwegian Sea, the Denmark Strait and the Davis Strait. There was a wide exchange zone (of the order of a degree of longitude) between the cold Arctic water and the warmer Atlantic water off south-east Greenland, and cold water also moved southwards extensively at the surface, east and south of Iceland.

CANADIAN ARCTIC ARCHIPELAGO AND BAFFIN BAY

Very little information is available concerning this area. Long periods of temperatures below freezing and low snowfall are likely to have produced large masses of fast-ice with the area of open water well below normal. Land stations of western Greenland towards 70°N reported from 16 to more than 200 icebergs, suggesting that locally large groups of bergs were held in the ice and were possibly moving round Baffin Bay within the ice.

DAVIS STRAIT

During this month much warm Atlantic water moved north-westwards into Davis Strait. Very little fast-ice or pack-ice was reported off western Greenland although sea temperatures adjacent to the coast were approximately 0°C. Individual land stations reported up to 50 icebergs moving northwards along this coast. Meteorological observations and observations of pack-ice off southern Labrador suggest that the mass of pack-ice moving southwards was probably below normal, and sea surface isotherms suggest that the pack was open and melting on its eastern edge. It was also evident that isolated icebergs were moving southwards, south and east of the pack-ice.

BELLE ISLE STRAIT

The eastern entrance and most of the strait were obstructed by pack-ice. Young ice was forming on the adjacent north coast of the Gulf of St. Lawrence.

GREAT BANK

This area remained ice free.

GULF OF ST. LAWRENCE

A great deal of the Gulf remained open water and it appeared that relatively warm Atlantic water occupied the surface layers over a great part of the eastern half of the Gulf. There were extensive areas of young ice, ice crust and slush in the sea areas around Prince Edward Island in Chaleur Bay and in the estuary of the River St. Lawrence with widespread hummocking. Small amounts of fast-ice had formed in shallow inlets. Ice appeared to be forming rapidly in the north-east arm of the Gulf and it is likely that cold Labrador Current water was flowing through the Strait of Belle Isle into the Gulf.

ST. LAWRENCE RIVER

Much open water remained below Quebec. Above Quebec the river was covered with young and winter ice. There was widespread fast-ice generally in shallow water but the deeper waters of the Great Lakes were almost completely open except Lake Erie which was largely covered by young ice and ice crust.

GREENLAND SEA

The mass of polar pack-ice drifting out of the Arctic Basin and the area of fast and very close pack-ice off the Greenland coast appeared to be about normal. There were no reports of icebergs.

DENMARK STRAIT AND ICELANDIC WATERS

The area of pack-ice off south-east Greenland was normal but the concentration and state of ice at the seaward edge was variable with a large belt of brash. Large groups (up to 50) including very large icebergs existed within the pack-ice.

BARENTS SEA

From meteorological observations it is estimated that considerable amounts of polar pack in excess of normal moved southwards, east of Spitzbergen. However, high sea temperatures over most of the Barents Sea would have prevented any excessive southward penetration. Air and sea temperatures also suggest that the mass of ice in the south-east of the area was probably less than normal but there were more severe conditions further to the east.

BALTIC SEA

During most of the month this area was influenced by Atlantic depressions and maritime air. Masses of pack-ice and fast-ice formed in the north of the Gulf of Bothnia and in the east of the Gulf of Finland as a result of outbreaks of Arctic air and continental air from the north-east and east. However, amounts of ice were below normal.

At the end of February 1962

RELEVANT WEATHER FACTORS

This is the time of year when the Icelandic low is most active, and Arctic and continental air masses are coldest. The intense cyclonic activity of January continued in early February with depressions moving from south of Greenland to the Barents Sea and beyond and into north-west Europe. The Azores high, however, became extremely active and linked up with the high pressure over Russia across north-west Europe. Late in the month pressure built up over northern Canada into an immense area of high pressure which towards the end of the month covered most of North America and Greenland. The distribution of sea temperatures differed little from that of January. However, the more variable atmospheric circulation lessened the tendency for cold water to make deep inroads into warm water, but warm water continued to flow extensively into Davis Strait and northwards round the west of Iceland. Sea temperatures appeared to be falling in the Barents Sea from the north-east.

CANADIAN ARCTIC ARCHIPELAGO AND BAFFIN BAY

Atmospheric temperatures below normal continued to be experienced over most of this area and it is estimated that the mass of fast-ice increased in area and thickness. Large numbers of icebergs (two stations each observed more than 200) were reported by land stations of western Greenland north of 70°N and there was an absence of fast-ice north of the Arctic Circle to 70°N probably associated with the predominating subsiding atmospheric flow from the east, off Greenland over a period of many weeks.

DAVIS STRAIT

It is apparent from observations of ice in the south that, as a result of continuous northerly gradient winds and high sea temperatures, increasing amounts of pack-ice and larger numbers of icebergs were drifting south off Labrador than in January. The extent of pack-ice remained less than normal, again largely because of high sea surface temperatures. South of 65°N there was little or no pack-ice or fast-ice off the south-west Greenland coast, and all land stations reported less than five icebergs. Sea surface temperatures remained approximately 0°C adjacent to this coast.

BELLE ISLE STRAIT

During this month icebergs and pack-ice from the Labrador current moved into Belle Isle Strait. By the end of the month the Strait was completely filled and obstructed by hummocked ice.

GREAT BANK

Pack-ice and icebergs moved southwards over the west side of the Great Bank during February. However, at the end of the month the area and mass of pack-ice remained below normal, although it obstructed ports of eastern Newfoundland. The number of icebergs moving southwards on to the Great Bank, and their southerly and easterly penetration, were well below normal.

GULF OF ST. LAWRENCE

During February air flowed across north-east Canada mainly from the polar regions to the Gulf of St. Lawrence which, after remaining open for an unusually long period, became rapidly covered by all types of ice (including vast floes) by the end of the month, and pack-ice moved out of the Cabot Strait and southwards off the coast of Nova Scotia. The extent of the movement of pack-ice through the Cabot Strait was, however, less than normal.

ST. LAWRENCE RIVER

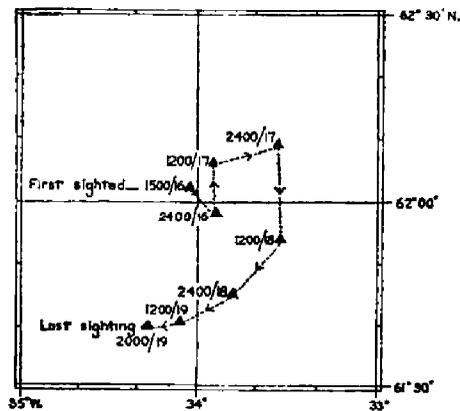
The St. Lawrence River below Quebec had become filled with mainly young and winter ice. There were a number of small areas of open water but also there were vast ice floes. The ice in the river above Quebec had consolidated and there was a great increase in the area of winter, fast- and pack-ice over the Great Lakes (i.e., most of the surface of the Lakes was ice-covered). However, in spite of these adverse conditions the coastal motor tanker *Maple-branch* arrived in Montreal on 15th February to end the port's shortest closed winter season of 55 days.

GREENLAND SEA

The area of polar pack was probably less extensive than normal off eastern Greenland owing to the very high sea surface temperatures to the east. The area of fast-ice and the concentration of polar pack were probably normal. Individual land stations reported 16 to 50 icebergs moving southwards within the polar pack.

DENMARK STRAIT AND ICELANDIC WATERS

The high level of cyclonic activity referred to above caused abnormal sea surface flow to continue off south-east Greenland. Sea temperatures were above normal over most of Denmark Strait and off western Iceland, but cold water from the East Greenland Current continued to make large inroads off southern Greenland into the warm Atlantic water. An iceberg within one of these inroads, 95 ft. high and 347 ft. in length, was observed and followed



Positions of berg tracked by O.W.S. *Weather Monitor*, 16th–19th February 1962.

by the Ocean Weather Ship *Weather Monitor* at Station 'A' (62°N, 33°W). The map above gives the path of the iceberg plotted by the ship's officers and it can be seen that for a time the iceberg moved away from the Greenland coast and then resumed its south-westerly drift. The areas of fast-ice and polar pack off the Greenland coast were below normal; individual land stations reported less than 15 icebergs within the pack-ice. No pack-ice, and less than five icebergs, were observed in the vicinity of Cape Farewell.

BARENTS SEA

There were frequent outbursts of Arctic air from the north and north-east over the Barents Sea during February and it is likely that at the end of the month there was widespread southward drift of the polar pack-ice east of Spitzbergen. Variable and nondescript ice were reported off western Spitzbergen and Bear Island. Meteorological conditions suggest that in the south-east the pack-ice and all types of ice were lighter than normal except where periods of strong onshore winds caused ice to build up in bays and inlets. More severe ice conditions existed to the east.

BALTIC SEA

Meteorological conditions were similar to those in January but outbreaks of cold air from the Arctic and Asia were more frequent. The amount of ice considerably increased during February, producing by the end of the month the seasonal normal area of fast- and pack-ice. The amount of drifting ice in the centre of the Gulf of Bothnia appeared to be above normal.

At the end of March 1962

RELEVANT WEATHER FACTORS

High pressure continued to build up over northern Canada and Greenland. However, depression activity from Canada to the south of Greenland and thence to north-west Europe and the Barents Sea again intensified and the high declined. During most of the month Arctic air again flowed strongly southwards east of Greenland and over the north Barents Sea but for long periods maritime air flowed westwards into north-west Canada.

CANADIAN ARCTIC ARCHIPELAGO AND BAFFIN BAY

Very few reports were available for this area but meteorological conditions suggest that the extent of fast-ice continued in excess of normal over all the Canadian Arctic Archipelago except perhaps in the west, and all types of ice (i.e. pack-ice as well as fast-ice) were likely to have been heavier than in February. Warm Atlantic water appeared to have penetrated almost to the Arctic Circle; this tended to limit the pack-ice off southern Baffin Island and that moving south, off Labrador. Open water was observed off the West Greenland coast as far north as 70°N and a number of land stations continued to report more than 200 icebergs off the coast.

DAVIS STRAIT

Sea surface temperatures over most of the area except immediately off the Greenland and Labrador coasts were several degrees Centigrade above normal. As a result the area of pack-ice was less than normal off the Labrador coast. There continued to be little or no pack-ice off western Greenland. Off western Greenland aircraft reported numerous icebergs (more than 20 at a sighting) and many growlers, drifting northwards, but individual land stations reported less than 15 icebergs off the coast. There were many icebergs and growlers drifting southward off the Labrador coast. More than a thousand growlers were observed by aircraft off this coast, suggesting that icebergs were being released in increasing numbers further to the north.

BELLE ISLE STRAIT

Pack-ice was clearing rapidly from the Strait although icebergs continued to move into and obstruct the eastern entrance. There were large amounts of various types of ice at the western end of the Strait.

Table 1. Icebergs sighted by merchant ships in the North Atlantic

(This does not include growlers or radar targets)

LIMITS OF LATITUDE AND LONGITUDE		DEGREES NORTH AND WEST								
		58	56	54	52	50	48	46	44	42
Number of bergs reported south of limit	JANUARY	•	•	2	0	0	0	0	0	0
	FEBRUARY	•	•	28	28	18	0	0	0	0
	MARCH	•	•	> 205	55	24	23	1	1	0
	Total	•	•	> 235	83	42	23	1	1	0
Number of bergs reported east of limit	JANUARY	•	2	2	0	0	0	0	0	0
	FEBRUARY	•	28	28	3	0	0	0	0	0
	MARCH	> 204	> 184	23	0	0	0	0	0	0
	Total	•	> 214	53	3	0	0	0	0	0
Extreme southern limit	JANUARY	53° 37'N, 52° 50'W on 29.1.62								
	FEBRUARY	49° 30'N, 53° 00'W on 22.2.62								
	MARCH	43° 45'N, 61° 30'W on 19.3.62								
Extreme eastern limit	JANUARY	53° 37'N, 52° 50'W on 29.1.62								
	FEBRUARY	51° 32'N, 50° 31'W on 15.2.62								
	MARCH	46° 41'N, 52° 27'W on 7.3.62								

* Probably larger numbers, but none sighted in excess of those reported in further south positions or in further east positions.

> ("greater than") has been inserted where there is some doubt as to the actual number of icebergs at some of the sightings, but the true value is probably greater than the value given.

GREAT BANK

During March icebergs and pack-ice continued to move southwards over the western side of the Great Bank. The southward drift of icebergs and growlers was confined to one degree of longitude from the Newfoundland coast and icebergs tended to drift round Cape Race and then westwards off the south of Newfoundland towards the Gulf of St. Lawrence. The icebergs appeared to be drifting at about $\frac{1}{4}$ – $\frac{1}{2}$ kt. During the last ten days of March a pre-dominating easterly gradient wind gave way to a westerly, and towards the end of the month the icebergs were observed moving eastwards round the north of the Great Bank at about $\frac{1}{2}$ kt. There was also evidence of an easterly drift of the accumulation of icebergs off the east coast of Newfoundland.

GULF OF ST. LAWRENCE

At the end of March very little pack-ice remained in most of the Gulf of St. Lawrence. There remained extensive areas of pack-ice, consisting of small and medium floes, mainly in the south of the Gulf, some of which was moving out through Cabot Strait. However, the extent of the pack-ice was well below normal.

ST. LAWRENCE RIVER

At this time the break-up of the ice season in the St. Lawrence River and the Great Lakes had begun. Below Quebec there was much open water and navigation was only slightly impeded by ice although dangerous pack-ice existed. Above Quebec the heavy pack-ice and fast-ice of the river had begun to melt and break in many places, and there was a rapid increase in the area of open water over the Great Lakes.

GREENLAND SEA

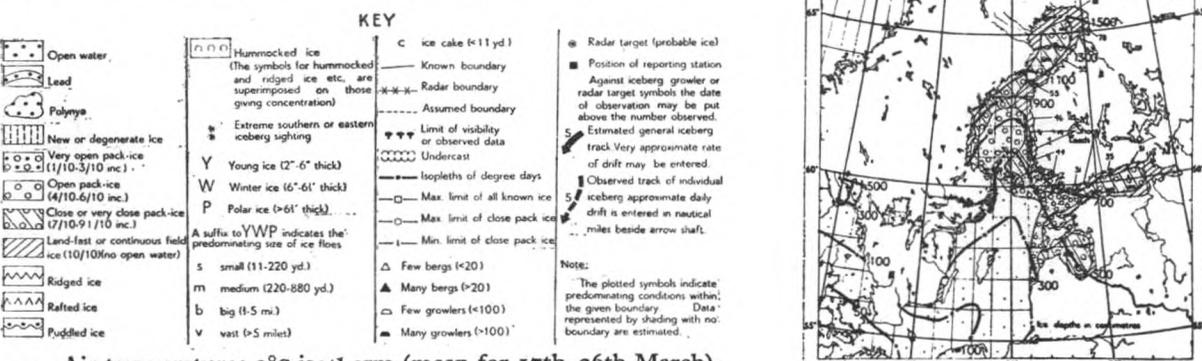
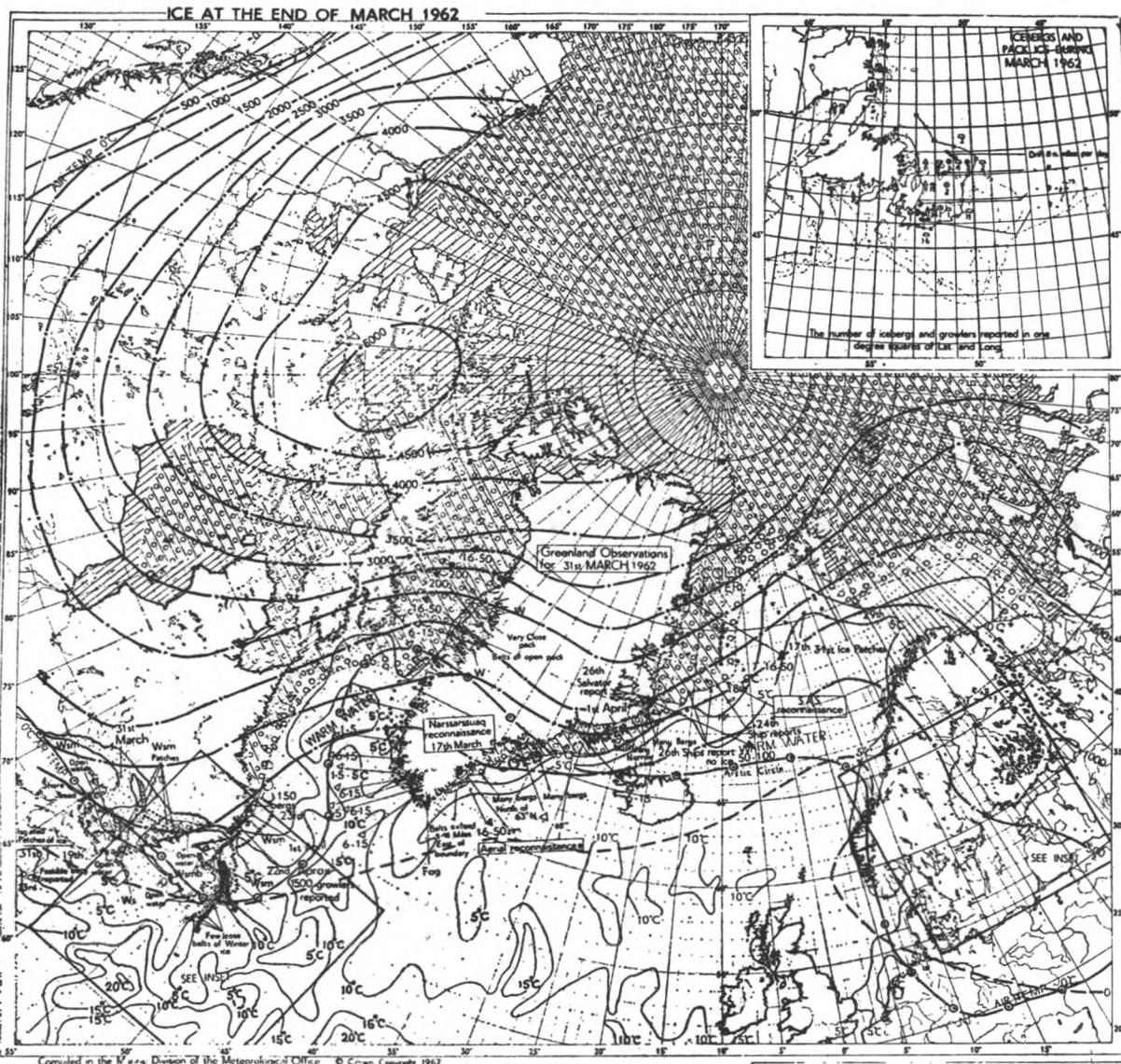
Fast and polar pack-ice were less than normal, while the polar pack was probably very open to seaward on its eastern boundary.

DENMARK STRAIT AND ICELANDIC WATERS

There were no material changes in this area from the end of February. The extent of the cold water along the East Greenland coast again appeared to be less than normal, and most of the Strait was occupied at the surface by warm Atlantic water with exchanges between the adjacent warm and cold water masses. The distribution of pack-ice and the movement of icebergs therefore continued to be complex. The extent of the polar pack was less than normal but up to 50 icebergs were observed moving south-westwards by individual land stations.

BARENTS SEA

Polar pack probably continued moving southwards extensively east of Spitzbergen and the extent of polar pack probably continued in excess of normal. Meteorological conditions suggest that the extent of fast- and pack-ice also probably remained less than normal in the south-east



- o- Air temperature: $^{\circ}\text{C}$ isotherm (mean for 17th-26th March).
- .- Air temperature: degree-days, $^{\circ}\text{C}$ (as defined by col. I and footnote in Table 2).
- Sea temperature, $^{\circ}\text{C}$, for 17th-26th March. These isopleths give an indication of the monthly movement of warm and cold water.
- Sea temperature, as above, but only estimated values.

Note.—The notes in this article are based on information plotted on ice charts each month, similar to the map above, but on a much larger scale (18 in. \times 13 in.). They are available at the price of reproduction on application to the Director-General, Meteorological Office (M.O.1), London Road, Bracknell, Berks. Alternatively, they may be seen at any Port Meteorological Office or Merchant Navy Agency.

of the Barents Sea with pack-ice and fast-ice accumulating in bays and inlets exposed to the wind.

BALTIC SEA

There was much fast-ice and pack-ice in the Gulf of Bothnia, the Gulf of Finland and Gulf of Riga. The extent of fast- and pack-ice was about normal but meteorological conditions suggest that the thickness of ice was probably below normal and all ice was likely to clear rapidly with a seasonal rise in temperature.

G. A. T.

INDIAN EXCELLENT AWARDS

[The following statement has been received from the Deputy Director General of Observatories (Forecasting) of the India Meteorological Department.]

The India Meteorological Department had 44 Selected Ships and 52 Supplementary Ships on the list of their voluntary observing fleet during the year ended 31st March 1961. Seven hundred and ten logs, consisting of 8213 meteorological observations, were received from these ships in this office during the year. Nearly half of the observations were received by w/t at different forecasting centres and were of great value in the day-to-day forecasting activities of the Department in general for issuing warnings to ships in particular. The Department wishes to convey its appreciation to all the officers concerned of the voluntary observing fleet for their valuable co-operation.

It has been customary in previous years to give awards in the form of books to the captains, observing officers and radio officers of ships whose meteorological work was adjudged to be 'excellent' and who were in the ships concerned for six months or more during the award year. The following ships have been selected for Excellent Awards for the year 1960-61, and the officers named will receive books as Excellent Awards.

NAME OF VESSEL	CAPTAIN	OBSERVING OFFICER(S)	RADIO OFFICER(S)	COMPANY
<i>Rajula</i>	G. A. Brignall	D. H. Cain ..	I. Jeffery ..	British India S.N. Co., Ltd.
<i>State of Bombay</i>	S. K. Kaikobad	K. B. Trilokikar	A. R. Steel ..	Shipping Corporation of India, Ltd.
<i>Mozaffari</i> ..	J. W. Mountford	G. S. Rangar ..	C. D. Joshi ..	
<i>Amra</i>	N. C. Bruce ..	B. J. Nazareth	S. M. Valliat ..	Mogul Line, Ltd.
		E. G. Dawes ..	S. D. Warke ..	
		A. M. Barker ..	B. S. Kher ..	
		A. M. Simpson	K. J. Bourke ..	British India S.N. Co., Ltd.
		L. M. T. Goodwin ..	J. G. McKechnie	
<i>Jaladharna</i> ..	C. B. Sutherland	P. K. Seth ..	P. D'Souza ..	Scindia S.N. Co., Ltd.
<i>Mahadevi</i> ..	—	A. D. Divekar	C. L. Bertram ..	Asiatic S.N. Co., Ltd.
		T. C. Kelsey ..		
		D. J. Daniels ..		
<i>Mohammedi</i> ..	H. J. Palmer ..	J. S. Woollam	V. N. Kalle ..	Mogul Line, Ltd.
		S. H. Khajotia	B. Sowani ..	
<i>Kampala</i> ..	D. Hutton ..	K. S. Sultan ..	I. J. Evans ..	British India S.N. Co., Ltd.
		W. Macdonald	H. C. Berry ..	
		D. C. Price ..		
<i>Jag Rani</i> ..	M. R. Hussain	J. C. Briggs ..	R. Sequeira ..	Great Eastern Shipping Co., Ltd.
<i>Bharatvani</i> ..	A. E. Sampson	D. N. Chawala	M. N. Manalar ..	Bharat Line, Ltd.
		K. R. Surendran		
		R. K. Sinha ..		

The useful work put in by the other officers, who served in the ships listed above for lesser periods than six months, is also very much appreciated.

Official Publications

A COURSE IN ELEMENTARY METEOROLOGY

Prepared in the Meteorological Office. 9½ in. × 6 in. pp. 189 + 79 diagrams and 18 cloud photos. H.M.S.O., London, 1962. 17s. 6d. net.

See notice on inside front cover.

M.O. LEAFLET NO. 3

This leaflet, which gives details of weather bulletins and gale warnings for coastwise shipping and fishing vessels, has recently been reprinted. The old (1961) edition is now obsolete.

Copies of the leaflet may be obtained free from Port Meteorological Officers and Merchant Navy Agents of the Meteorological Office, or from the Marine Superintendent, Meteorological Office (M.O.1), London Road, BRACKNELL, Berks.

Book Review

Meteorology (for the M.O.T. examinations), by J. F. Kemp and P. Young, pp. 80.

Illus. Kandy Publications, Brighton, 1961. 6s. 6d.

This booklet is nicely produced, and has a large number of very good diagrams and maps which no doubt will commend themselves to many students as a quick aid to revision. The text is easy to read, but there are a number of inaccuracies in it, and a certain amount of looseness in some of the technical definitions. In explaining what is meant by specific heat, the book takes sand (0.19) as an example and states that "a given quantity of sand will heat five times as much as the same quantity of water, provided the same amount of heat is applied". Here 'quantity' means mass (as distinct from volume), and the word 'heat' as a verb is used very loosely to describe change in temperature. In a list of the signs of an approaching tropical revolving storm, it is stated that a reading appreciably (3 mb.) higher or lower than the corrected reading for that time as shown on the weather chart should be regarded with suspicion. The term 'weather chart' implies a chart of the weather for a particular day—what is meant presumably is a climatological map giving long-period averages for the month and time of day—e.g. as given in tables in the Meteorological Office's Monthly Meteorological Charts of the Oceans. The book makes no mention of paying attention to variations in the diurnal range of pressure. Further, a pressure reading of 3 mb. *higher* than the average (see above) is no indication of this type of storm. One very wise precaution to which this book refers, once the approach of a tropical revolving storm in the vicinity is confirmed, is to press up any slack water in ballast tanks in order to ensure maximum stability. In some respects the book is not up to date—for example, the definitions of mist and haze, and bay ice, are several years out of date.

A statement which we feel goes rather too far is that "a barometer and a hygrometer together with the broadcast weather information will enable one to make an accurate forecast for the next few hours". These instruments can, however, assist the mariner to interpret and make the best use of broadcast weather information.

In its present state the book's many inaccuracies detract considerably from its value but it could, if it were thoroughly scrutinised and revised when next reprinted, make quite a useful booklet for revision purposes.

M. V. R.

THE CARE OF INSTRUMENTS

In recent months, during the course of experiments investigating the possibilities of improving shipborne meteorological instruments, a representative of the Instruments Branch of the Meteorological Office visited a number of Selected Ships and met their observing officers.

He made a short trip in one of the ships using some of the equipment under conditions of comparatively fair weather. The care so obviously taken by the majority of observing officers in looking after the equipment greatly impressed him, and he expressed the wish that they be notified of this appreciation.

Care of instruments, their correct use and treatment, are key factors in the accuracy of observations, which is of paramount importance and which we have come to expect from our voluntary observers.

Personalities

RETIREMENT.—CAPTAIN D. BLAIR retired recently after half a century at sea.

David Blair served his time with the Ellerman City Line, and on completion of his indentures in 1916 joined the Anchor Line as 4th Officer of their *Huntspill*, then engaged on trooping duties. He remained with this company for the rest of his career.

He passed for master in 1926 and was appointed to his first command, the *Samvannah*, in 1944. In this ship he made a two-year voyage of great variety, it being the first British ship to enter Singapore after the Japanese occupation, carrying repatriated Japanese prisoners-of-war, and taking the British party to accept the surrender of the Andaman islands.

Captain Blair's association with the Meteorological Office goes back to 1928 when he was in the *Elysia*. Since then he has in 17 years sent us 60 meteorological logbooks, all his post-war meteorological logbooks coming from the *Caledonia*, which he commanded for 10½ years. He received Excellent Awards in 1929, 1930, 1956, 1960 and 1961.

We were very pleased to have a visit from him shortly after his retirement and to show him round our new home at Bracknell.

We wish him health and happiness in his retirement.

L. B. P.

RETIREMENT.—CAPTAIN K. D. G. FISHER, G.M., retired from the sea earlier this year after 48 years' service.

Kenneth Desmond Gronow Fisher first went to sea as a Cadet in the four-masted barque *Port Jackson* in 1913, subsequently transferring to the *Medway*, these two ships being commanded respectively by Captain Charles Maitland and Captain David Williams, two shipmasters of the old school whom Captain Fisher still remembers with the greatest respect and affection. He left the *Medway* to join the R.N.R. as a temporary midshipman and served in the armed merchant cruiser *Kildonan Castle* in the 10th Cruiser Squadron in the Northern Patrol and later as sub-lieutenant in the cruiser *Kent* on the China Station, but mostly in Vladivostok.

After demobilisation Captain Fisher joined the Harrison Line and passed for master in 1922. He then joined the Aberdeen Line, which was later merged into the Shaw Savill Line.

While serving as Chief Officer in the *Akaroa* in January 1943 he rescued a ship's engineer and a shore carpenter who had been overcome by gas in an air trunk, for which gallant action he was awarded the George Medal.

Later in 1943 he was appointed to his first command, the *Samrich*, which was being managed by the Shaw Savill Lines for the Ministry of War Transport.

After the war he commanded the *New Australia*, *Gothic* and *Dominion Monarch*, all of them being Selected Ships.

Captain Fisher's connection with the Meteorological Office goes back to 1926 when he was in the *Euripides*. Since then he has in 17 years sent us 40 logbooks, 34 of which were classed 'excellent'. He received Excellent Awards in 1928, 1931, 1952, 1953, 1954, 1955, 1958, 1961 and 1962. His long and zealous voluntary service on our behalf was recognised this year by the presentation of an inscribed barograph.

We wish him health and happiness in his retirement.

L. B. P.

RETIREMENT.—CAPTAIN G. M. FLETCHER recently completed his last voyage at sea in command of the *Andes*.

Geoffrey Montague Fletcher, a native of Rossert in Denbighshire, first went to sea as an apprentice in 1916 in the Pacific Steam Navigation Company's *Orita*, of which his father had been a former Master. He left this firm in 1922 to join the Leyland Line with whom he served for two years.

Captain Fletcher transferred to the Royal Mail Lines in 1924 as 4th Officer, and on the outbreak of war in 1939 he had attained the rank of Chief Officer. He spent

most of the war as Chief Officer of the *Almanzora* which made trooping voyages to most parts of the world.

He received his first command in 1947 in the American built ship *Samphill*, renamed *Berbice* by Royal Mail, and went on to command the *Loch Avon*, *Loch Loyal*, and *Highland Brigade*. In 1959 he was appointed Staff Captain of the *Andes*, and after one voyage in the ship he became Master.

Captain Fletcher's record with the Meteorological Office dates back to 1933, and in 16 years he has sent in 47 log books, 29 of which were classed 'excellent'. In 1938 he received an Excellent Award.

We wish him health and happiness in his retirement.

E. R. P.

RETIREMENT.—CAPTAIN J. W. HART retired recently after fifty years at sea.

John Walton Hart comes of seafaring stock. His grandfather was master in sail though deafness brought him ashore to a position with the White Star Line shore staff. He was killed in a windlass accident aboard the *Cedric* in 1903. His uncle also was master in sail and retired as Commodore of the White Star Line Australian service after 19 years in command of the *Corinthic*.

Captain Hart commenced his sea career by making a voyage as an ordinary seaman in his uncle's ship *Corinthic* to see if the life suited him. He then signed indentures in 1912 with the Prince Line. Passing for 2nd mate in 1916 he joined the Booth Line, served them as 3rd and 2nd Officer until 1919, then made one voyage as 2nd and Chief Officer in the Anglo-Saxon tanker *Escalona*, before passing for master in March 1920. Three months later he passed for extra-master.

He joined the Shaw Savill Line as 3rd Officer of the *Tainui* in July 1920, rising to command their s.s. *Mahia* in 1942.

Captain Hart bore a charmed life during both world wars for he was not torpedoed, mined or bombed though he spent most of the Second World War in the North Atlantic.

His active connection with the Meteorological Office goes back to 1924 when he sent us his first meteorological logbook from the *Matakana*. Since then he has in 16 years sent us 36 meteorological logbooks and received Excellent Awards in 1956 and 1958.

The names of the ships in which his grandfather served are not now remembered in the family so we cannot say whether he was ever a voluntary marine observer, but we received several meteorological logbooks from Captain Hart's uncle during his long years in command of the *Corinthic*.

Our connection with this loyal voluntary observing family is happily by no means ended with Captain Hart's retirement for two of his sons, John and David, have been observing for us in the Port Line since 1956 and 1957 respectively, whilst his eldest son Frank was a voluntary observer in Shaw Savill's until 1958 when he joined the Union Steam Ship Co. of New Zealand. The three sons all hold masters' certificates, surely a record for one family.

We wish Captain Hart health and happiness in his retirement.

L. B. P.

RETIREMENT.—CAPTAIN HAROLD THOMPSON retired on 3rd March after 47 years at sea, over 30 of which were spent at Heysham in ships of British Railways on the Irish Sea service.

Captain Thompson's last command was the *Duke of Rothesay*; during the Second World War he had commanded the old *Duke of Rothesay* when engaged as a hospital ship, and later as a troop carrier at the D-Day landings on the Normandy beaches.

During his 30 years' service on the Irish Sea run, Captain Thompson estimates that he covered well over a million miles in nearly 10,000 crossings.

For many years now Captain Thompson has sent in observations to the Meteorological Office, mainly as 'Marid' reports.

We wish him health and happiness in his retirement, at his home in Heysham.

J. R. R.

Fleet Lists

GREAT BRITAIN (Information dated 27.3.62)

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 Captains, 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. The Port Meteorological Officers and Merchant Navy Agents will make personal calls on the Captains 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 financial year. The names of the Captains, Principal Observing Officers and Senior Radio 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 Captain, or other circumstances which may prevent the continuance of voluntary meteorological service at sea, may be made to a Port Meteorological Officer or Merchant Navy Agent, or to the Marine Superintendent of the Meteorological Office at Bracknell.

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

Selected Ships

NAME OF VESSEL	LAST RETURN RECEIVED	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
<i>Accra</i>	26.2.62	W. R. M. Lightbody, M.B.E.	J. Wild, A. Woods, J. Langstaff	J. Stuart	Elder Dempster Lines
<i>Achilles</i>	28.9.61	S. C. Llewellyn	B. A. Cooper, J. Corter, M. E. G. Leale	R. M. Lang	A. Holt & Co.
<i>Adelaide Star</i>	28.12.61	J. McInnes	A. W. Askew, K. A. Mackenzie, P. Nicholls	C. R. Frost	Blue Star Line
<i>Aden</i>	14.7.61	R. A. Nowell	J. E. Peck, A. Bell, R. B. Thomson, B. Pierce	D. J. Moore	P. & O. Line
<i>Africa</i>	15.3.62	R. A. Barns	A. Whiteford, T. Ffowes-Williams, S. Norwell	F. O'Reilly	Shaw Savill Line
<i>Ajana</i>	1.1.62	T. Hastings	J. Alexander, R. Brown, A. V. Pratt	B. Taylor	Trinder Anderson & Co.
<i>Albany</i>	22.2.62	C. Ratcliff	R. D. Hagger, R. Oliphant, I. Park	J. Connelly	Royal Mail Lines
<i>Albistan</i>	23.8.61	T. D. Dumont	R. F. Palmer, L. Lunnley, P. E. Thomson	J. S. Whitehead	Strick Line
<i>Alert</i>	2.2.62	J. P. Ruddock	D. Alford, D. MacDonald, A. Fulton, J. Lowe	R. MacDonald	H.M. Postmaster General
<i>Alsatia</i>	29.12.60	A. E. Austin	B. Edwards, T. A. Bell, R. Hall	J. S. Bishop	Cunard Line
<i>Alva Bay</i>	11.1.62	R. G. Roberts	E. Thiebe, E. Fehr, A. Philippot	J. P. Christie	Alva S.S. Co., Ltd.
<i>Amaric</i>	17.10.61	C. Beck	J. Borrell, W. Thomson, F. R. Mees, J. Haberfield	G. Kerr	Shaw Savill Line
<i>Amazon</i>	17.1.61	G. S. Grant, R.D.	R. Parker, G. Vale, A. M. Iward	F. Goodall	Royal Mail Lines
<i>Amber</i>	9.3.62	T. Barry	J. McKinlay, W. Balmer	R. Kerr	Gem Line
<i>Anadama</i>	11.1.62	A. Bridgwater	G. Ferguson, F. Pollitt, M. McGoldrick	G. Sewell	Cunard Line
<i>Andes</i>	4.12.61	G. M. Fletcher	I. S. Farquharson, A. Hawkins, M. Powell, S. Pryce	D. P. Byrne	Royal Mail Lines
<i>Andria</i>	7.2.62	A. E. Austin	R. J. Davidson, P. Holloway, J. Morton, R. Green	A. Newcombe	Cunard Line
<i>Anselm</i>	9.3.62	J. Whayman, C.B.E., D.S.C., R.D.	J. Iglloe, D. Lewis, J. Brierly	G. I. Gilling	Elder Dempster Lines
<i>Apapa</i>	15.11.61	P. M. Rialston	I. Bower, N. D. Estill	P. McKeeon	Strick Line
<i>Arabia</i>	24.1.62	I. G. Bradley, R.D.	G. Miller, I. Grindrod, G. Buckley	P. J. Gleeson	Royal Mail Lines
<i>Arabistan</i>	26.3.62	W. H. D. Marker	D. Lee, R. J. Palmer, H. G. Reid, B. J. Bartlett	P. J. Gleeson	Royal Mail Lines
<i>Aragon</i>	8.3.62	T. W. Stevens	P. Linacre, A. E. Verett, R. Burnett	D. McRae	Booker Line
<i>Arahaka</i>	1.12.61	S. Armitage	E. Fernandes, J. Blackburn, F. Sanchez	P. M. Howell	Trinder Anderson & Co., Ltd.
<i>Arahuen</i>	23.2.62	N. Walter	B. Parker, G. Colbeck, R. Cooter	G. Martyn	Blue Star Line
<i>Aramaic</i>	16.2.62	A. E. Smith	Newton, Lescomb, Clyde	F. R. Dunk	Royal Mail Lines
<i>Argentina Star</i>	23.2.62	E. R. Pearce, O.B.E.	B. Wood, R. Bilton, D. Wadley	P. Benns	James Fisher & Co., Ltd.
<i>Argyllshire</i>	16.2.62	T. N. Soane	A. A. Rawlins, J. K. Currie, J. A. Cowie		
<i>Arlanza</i>		T. W. F. Bolland	R. Kingsbury, J. Barton, P. Barker, J. Beck		
<i>Arthur Albright</i>		S. J. Bristow	D. Snook, D. Cox, R. V. James		

NAME OF VESSEL	LAST RETURN RECEIVED	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
Asia ..	8.3.62	P. W. Silson ..	G. N. Hastings, F. Pollitt, B. Pennington, I. K. Grindrod ..	A. Gandon ..	Cunard Line
Assyria ..	30.3.61	J. G. Bradley, R.D.	B. L. Mullenger, W. F. Musson, M. H. Tisdale	B. A. Long ..	Cunard Line
Athelfoam ..	16.10.62	A. Green ..	G. Sherwood, D. G. Billing, J. McCourt ..	R. Conway ..	Athel Line, Ltd.
Athelmere ..	..	D. Elliot ..	R. Flood, D. Ottway ..	M. F. Hayes ..	Athel Line, Ltd.
Athelprince ..	..	T. Horst ..	P. C. T. Barnett, D. F. Notman, M. R. Davenport	A. Feenan ..	Athel Line, Ltd.
Athletic ..	29.1.62	G. Heywood ..	P. E. Revill, A. N. Hamilton, B. Hills	H. Knight ..	Shaw Savill Line
Athlone Castle ..	27.2.61	A. G. V. Patey ..	M. Alford, —, Blythe, —, Gadaly ..	—, Brew ..	Union Castle Line
Atlantic Trader ..	..	P. Hold ..	K. E. Johnson, R. Thornton, G. Rippingell	G. Temperley ..	Gulf Stream Trading Co.
Aureol ..	7.12.60	T. E. M. Jenkins ..	G. Newton, J. R. Turner, D. R. Reeve ..	F. W. J. Broomfield	Elder Dempster Lines
Australia Star ..	22.1.62	C. P. Leighton ..	G. Evans, I. C. Wood, M. Clare ..	L. Cooper ..	Blue Star Line
Australind ..	..	J. D. Blake ..	W. J. Jones, —, Shuttleworth, —, Dene	..	Trinder Anderson & Co., Ltd.
Author ..	7.3.62	W. E. Williams ..	G. Cubbin, J. B. Hobson, K. Simpson, J. Dwyer	T. Harris ..	Harrison Line
Ayrshire ..	11.12.61	P. McMillan ..	T. Johns, A. Sillars, P. Lameletie ..	D. Allen ..	Clan Line
Bamburgh Castle ..	22.2.62	F. Surtees ..	B. G. Longley, C. Hilton, I. Gault ..	D. N. Robertson ..	W. A. Souter & Co., Ltd.
Bankura ..	28.12.61	D. C. Murison ..	J. C. Taylor, J. W. Cole, T. E. Roderick ..	J. F. Rigg ..	British India Line
Baron Ardrossan ..	6.9.60	G. Harris ..	D. L. Innes, W. Brown, J. T. Rennie ..	J. Thomas ..	Hogarth Line
Baron Glenconner ..	15.2.61	A. MacKinlay, O.B.E.	I. D. Barbour, F. Martin, R. Knock, H. Jones	T. O'Driscoll ..	Hogarth Line
Barrister ..	14.9.61	W. L. Sawley ..	W. G. Todd, G. S. Hunter, G. Charlton ..	L. Sutton ..	Harrison Line
Baskerville ..	13.11.61	R. J. Lungley ..	W. Lorimer, R. Goodfellow, R. Gibbens ..	R. Thorburn ..	Runciman Line
Bassano ..	7.3.62	B. Waldie ..	C. E. Graham, C. B. Davies, J. Shaw ..	P. J. O'Shea ..	Ellerman's Wilson Line
Beaverbank ..	6.11.61	W. Ellery ..	G. R. Smith, —, Griffin, D. Marucci ..	N. F. McCormack ..	Bank Line
Beavercove ..	19.3.62	F. W. S. Roberts ..	R. McLean, R. T. King, D. J. Wilson, G. E. Gamblin	J. N. Couits ..	Canadian Pacific Line
Beaverdell ..	27.7.61	L. H. Johnston, M.B.E.	..	H. Wilson ..	Canadian Pacific Line
Beaverford ..	13.2.62	R. Walgate ..	F. M. Andrews, H. A. Jones, J. Griffin	R. Stanforth ..	Canadian Pacific Line
Beaverlake ..	18.1.62	F. W. S. Roberts ..	D. J. F. Bruce, H. A. Jones, C. Pinchbeck	J. Johnson ..	Canadian Pacific Line
Benavon ..	4.10.61	K. Montgomery ..	G. W. F. Walker, J. Wilson, A. Syme, G. Noble	J. Smith ..	Canadian Pacific Line
Birmingham City ..	23.10.61	J. R. Campbell ..	D. Simpson, A. N. Couch, A. Johansen ..	B. C. Harrison ..	Canadian Pacific Line
Bishopsgate ..	19.3.62	W. Lewis ..	J. M. D. Gowat, P. Vanner, J. D. Millington ..	W. N. Green ..	Ben Line
Black Prince ..	..	F. G. Boize ..	K. B. Harie, H. B. Chambers, D. W. Walker	S. Marchant ..	Bristol City Line
Bombala ..	..	F. A. Everett ..	C. Wood, R. H. Sutton, R. Williams	E. A. Rogers ..	Silver Line
Booker Venture ..	..	I. A. Carter ..	J. Nisbet, A. P. Rea, A. A. Parker, A. G. R. Suther-	D. Owen ..	British India Line
Braemar Castle ..	25.1.62	D. W. Sowden, R.D.	land ..	..	Booker Line
Brasil Star ..	27.10.61	L. Vernon, M.B.E.	A. Jacobs, J. Noyon, P. Watson ..	—, Peake ..	Union Castle Line
Bravo ..	25.1.62	J. Etches ..	S. A. Gallon, J. Jarrat, E. Gay ..	A. Webb ..	Blue Star Line
Brisbane Star ..	13.3.62	J. C. Reeve ..	A. Carrer, R. Stringer, L. Graham, P. Blackham	H. Jackson ..	Ellerman's Wilson Line
Bristol City ..	15.1.62	J. N. Ramsay ..	M. J. Winter, A. G. Pound, J. H. Whitcher	W. Wade ..	Blue Star Line
British Advocate ..	25.1.62	G. R. Armstrong ..	J. R. Potts, G. M. Gough, G. M. Coulson	T. M. Jenkins, M.B.E.	Bristol City Line
British Consul ..	7.3.62	R. E. Bell ..	R. F. Adams, R. C. Murphy, D. Lewry ..	P. G. Gallagher ..	B.P. Tanker Co., Ltd.
British Endeavour ..	12.2.62	A. C. Browne ..	M. B. Pearson, A. Penman, N. L. Roberts	J. E. Bolt ..	B.P. Tanker Co., Ltd.
British Freedom ..	6.12.61	C. H. Halley ..	D. McGeachy, S. T. Mann, R. E. Shaw, E. K. Williams	R. Jackun ..	B.P. Tanker Co., Ltd.
British General ..	12.1.62	J. A. G. Millar ..	J. Jones, G. P. Severn, A. Porter ..	C. N. McCreesh ..	B.P. Tanker Co., Ltd.
British Resource ..	26.2.62	L. A. S. Howell ..	J. J. Brechin, D. L. Holmes, I. A. Potter ..	P. Jones ..	B.P. Tanker Co., Ltd.
British Sailor ..	6.9.61	J. H. Nelson ..	R. S. Hawkins, V. Garratt, J. H. Blackburn	N. J. Cummins ..	B.P. Tanker Co., Ltd.
British Splendour ..	21.9.61	J. A. P. Farret ..	D. B. Grantham, P. Mammen ..	R. Stewart ..	B.P. Tanker Co., Ltd.
Bulimba ..	9.10.61	W. E. Davies ..	—, Ranson, —, Whitton, —, Farley ..	E. George ..	B.P. Tanker Co., Ltd.
Cairnavaon ..	21.11.61	D. Aitchison ..	J. Liston, J. Main, G. Ross ..	W. R. Organ ..	British India Line
Cairnforth ..	13.11.61	J. Hogg ..	P. Wallace, R. Andrews, R. Sidney ..	J. Kinnaird ..	Cairn Line

Cairngovan	26.3.62	I. G. Foster	A. Anderson, W. Pargeter, J. Campbell	E. Johnston	Cairn Line
Calabar	21.6.61	J. H. Edmondson	P. Young, G. Warren, A. Morris	M. Conroy	Elder Dempster Lines
Caledonia	21.9.61	D. Blair	W. Stockley, J. M. P. Henderson, R. Langmuir, A. Brockie	J. McConnell	Anchor Line
Calgaria	28.12.61	A. Hunter	R. Doonson, C. Sheppard, G. Mackay	J. Moodie	Donaldson Line
Calix Camberra	17.5.60	P. J. Davies	G. E. Hill, B. V. Campbell, J. J. Purchall	K. Tyrrell	Overseas Tankship (U.K.), Ltd.
Calix Edinburgh	16.10.61	R. B. Napier	W. A. Huresey, P. Morgan, A. Leighton	R. C. Taverner	Overseas Tankship (U.K.), Ltd.
Calix London	28.12.61	J. Gillies	E. Maddison, W. P. Bilton, C. L. D'Agular	J. Carruthers	Overseas Tankship (U.K.), Ltd.
Cambridge	28.2.62	P. Ogden	G. Wright, P. Robertson, J. Morris, D. Lovering	A. Page	Federal Line
Camitic	17.1.62	R. W. Lundy, O.B.E., R.D.	M. Wedgery, J. Surtees, R. Westwater	A. Knight	Elders and Fyffes
Canopic	8.9.61	T. H. Davies	G. E. Dickinson, B. Pittar, W. A. Siddall	J. Carr	Shaw Savill Line
Canterbury Star	24.1.62	W. T. Pitcher	M. Cramb, D. Filmer, C. Churcher, M. Pyer	A. McFaul	Blue Star Line
Canton	16.2.62	D. West	C. Campbell, D. Bradley, D. Miller, R. Goddard	P. M. Geraghty	P. & O. Line
Cape Franklin	1.1.62	P. G. Farmborough	P. G. McRae, R. Robertson, G. Wilson	T. L. Johnson	Lyle Shipping Co., Ltd.
Cape Grafton	21.9.60	A. Mackinlay	H. A. Gilman, E. Pittaway, J. Sullivan	C. R. Snelling	Lyle Shipping Co., Ltd.
Cape Sable	21.11.61	A. B. Sutherland	E. Pittaway, T. Hogg, C. Maclean	C. Glass	Lyle Shipping Co., Ltd.
Capetown Castle	22.3.62	A. T. Underdown		J. H. Summers	Union Castle Line
Cardiganshire	2.2.62	A. Lane		M. Edmondson	Glen Line
Carinthia	29.1.62	G. T. Marr, D.S.C., R.D.	J. R. O. Davies, R. Smith, F. J. Maguire	I. MacDonald	Cunard Line
Carmarvon Castle	23.2.62	W. S. Byles	P. T. Bingley, F. H. Sergeant, D. Wilford, C. Burtinshaw	I. Eager	Union Castle Line
Caronia	7.12.60	S. A. Jones, R.D.	A. O. Stewart, R. Gadsby, M. Carr, D. Rees	D. Williams	Cunard Line
Carrigan Head	3.1.62	S. T. Ross	A. J. Hutcheson, D. Atkinson, H. Dorner, T. Whitehead	B. Carr	Head Line
Caston	29.12.60	T. O. Hodgson	R. G. N. Aiken, P. Sherriff, R. C. Crawford	W. D. Brown	Runciman Line
Catalina Star	8.1.62	G. J. R. Bouden	I. May, A. N. Macfarlane, I. G. Rollo	M. Rooney	Blue Star Line
Ceramic	21.3.62	N. S. Milne	J. W. Brew, N. J. Case-Green, J. D. Allen	R. O'Shaughnessy	Shaw Savill Line
Chantala	18.8.61	D. W. Speirs, G.M., R.D.	A. Miles, B. Biddick, B. Woolley	J. W. Field	British India Line
Cheshire	7.11.61	A. N. Williamson	R. E. Hann, A. Frost, S. Dyer	P. A. Jones	Bibby Line
Chesnot	12.3.62	P. Gardiner	P. E. P. Liddell, P. Phillips, D. Owen, W. Cooper	W. MacKenzie	Bamburgh Shipping Co., Ltd.
Chindwara	4.10.61	M. H. Vincent	B. R. Sanderson, P. E. Humphreys, P. Mainwaring	J. S. Taylor	British India Line
Cilicia	11.1.62	D. Barclay	R. Wart, W. Sawyers, N. Cameron, P. Magonigal	D. J. Warth	Anchor Line
Cingalese Prince	16.1.62	H. Pirie	B. Reagan, J. Croucher, J. Rutherford, G. J. Williams		Furness Lines
City of Birmingham	20.10.61	G. Francis	J. F. Hartnack, B. Hughes, D. Jameson, C. J. Pickering		Ellerman Lines
City of Brisbane	5.4.61	W. Kerr	A. J. Evans, B. Butler, D. M. P. Lynch, P. K. Leatham	G. Barlow	Ellerman Lines
City of Carlisle	28.6.61	E. Fawcett	A. H. Gardiner, O. Henderson, P. Wheldon	R. Kiplind	Ellerman Lines
City of Chester	26.1.62	G. E. Greenhow	G. B. Hughes, D. Rattray, J. E. Pritchard	D. Hagarty	Ellerman Lines
City of Coventry	19.10.61	J. Ingoldsbey	B. F. Keith, T. M. Dickson, A. R. Weatherley	J. Swesney	Ellerman Lines
City of Darham	25.9.61	L. King	A. R. Miller, M. Matheson, J. G. Hill, D. Brown	L. Craig	Ellerman Lines
City of Johannesburg	20.2.62	H. E. Roberts	C. V. Paget, J. Owen, A. Forrest	P. McMeeking	Ellerman Lines
City of Kharitoun	4.1.62	F. C. O'Neill	M. Aldridge, P. D. Lester, D. J. Hazelby	T. P. Parker	Ellerman Lines
City of Liverpool	8.2.62	T. S. Dennis	G. N. P. Dougal, R. L. Cooper, R. G. MacMahon	J. Leuchars	Ellerman Lines
City of London	16.1.61	W. S. Doidge	E. R. Finch, L. H. Nel, M. J. Wood	H. Hall	Ellerman Lines
City of Lucknow	29.1.62	B. T. Wortley, R.D.	D. F. Oldfield, J. Hammond, J. Netterberg	R. Stringer	Ellerman Lines
City of Manchester	23.8.61	E. H. D. Routledge	C. Baxter, V. M. Rore, J. I. Watson, H. G. Quigley	H. Gilchrist	Ellerman Lines
City of Melbourne	5.6.61	J. W. Wotherspoon, M.B.E.	J. Addison, H. Swinney, J. E. Frost	J. Beilby	Ellerman Lines
City of New York	8.2.62	B. E. Hooper	M. J. Raison, H. M. Townsend, A. F. Woolloccott	J. Brierley	Ellerman Lines
City of Oxford	24.8.61	W. G. McCulloch	W. G. Wilson, D. Cullen, J. Martin, J. L. Blanch	R. Kerr	Ellerman Lines
City of Pretoria	24.10.61	N. Groundwater	T. Fitchet, J. Kendall, H. Owen, R. Jones, M. Willman	L. G. Brousmiche	Ellerman Lines
City of Swansea	16.11.61	R. K. Walker	R. G. King, M. Lee, R. C. Cairnsfather, C. Jarret	B. W. Rennie	Ellerman Lines
City of Swansea	31.1.61	M. L. Hernan, M.B.E.	I. Campbell, I. R. Hopton, J. J. Watson	J. W. Kenny	Ellerman Lines
City of Wellington	20.1.61	T. F. Symons	W. M. Fieldhouse, H. E. Rogers, D. O. Duffield	T. McAnerney	Ellerman Lines
Clan Brodie	6.3.62	W. H. Dalley	F. L. Kilmartin, P. A. MacNiven, D. Finlayson	J. Lamb	Clan Line
Clan Buchanan	12.12.61	J. L. Jones	B. C. Peat, G. Allison, D. C. Warwick		Clan Line

NAME OF VESSEL	LAST RETURN RECEIVED	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
<i>Clan Chisholm</i>	9-10-61	A. G. Beynon	J. W. Costley, J. J. Grigor, A. Baker	J. MacNeil	Clan Line
<i>Clan Macaulay</i>	21-11-61	W. J. Freestone, M.B.E.	D. I. McMinn, A. R. Macintyre, K. S. Burton	F. Fawcett	Clan Line
<i>Clan Macdonald</i>	8-1-62	H. D. T. Lockyer	C. R. S. Dyer, J. Shaw, D. K. Harris	A. W. J. MacLeod	Clan Line
<i>Clan Macdougall</i>	7-7-61	L. Pogson	R. M. Dougall —, King, D. Grant, H. Robb	G. Randall	Clan Line
<i>Clan Macindoe</i>	22-1-62	S. S. Davidson	I. C. Laing, J. K. Robinson, R. Dobie	W. S. Joice	Clan Line
<i>Clan MacIaren</i>	15-1-62	D. T. Griffiths	W. Ridgell, I. A. W. Williamson, W. B. Walgate	S. Aspinall	Clan Line
<i>Clan Macleay</i>	19-1-62	J. West	J. W. Trickett, J. Nutt, M. D. Cooper	A. G. Horton	Clan Line
<i>Clan Maclean</i>	25-9-61	R. D. Helme	J. A. Milne, D. Richards, J. J. Ferguson	N. P. Sherrin	Clan Line
<i>Clan Macleod</i>	8-1-62	R. Harber	M. B. Fowkes, N. Wallace, C. F. Robinson, E. Bolenz	K. F. Plumridge	Clan Line
<i>Clan Macnab</i>	15-1-62	T. A. Watkinson	A. C. J. Baker, S. Healy, D. Stonehouse	R. W. Moore	Clan Line
<i>Clan Macnabish</i>	9-3-62	C. Rodger	T. A. Enevoldson, C. D. Hedges, G. R. Stokes	W. Elmers	Clan Line
<i>Clan Macrae</i>	29-11-61	A. F. Banks	W. J. Jarmin, T. L. Kirby, D. Bell	W. Gay	Clan Line
<i>Clan Sutherland</i>	2-11-61	D. L. Weston	P. A. Cain, A. Chivers, W. Jones	B. Davies	Blue Star Line
<i>Clan Urquhart</i>	17-7-61	J. T. Lowe	B. P. Young, J. Batchen, T. E. Thomas	L. Cody	Houlder Line
<i>Columbia Star</i>	21-10-60	D. A. Parkin	W. Doodson, J. McCredic, H. H. Grant	W. Cusick	Donaldson Line
<i>Condesa</i>	11-1-62	J. L. McQueen, O.B.E.	R. Noal, I. Condie, W. Downing	J. Lamb	Shaw Savill Line
<i>Corinaldo</i>	21-2-62	A. C. Jones	P. H. King, R. Michael, T. Whyatt, J. Griffith	—, Lillis	Federal Line
<i>Corinthac</i>	8-12-61	I. Y. Batley	D. C. McCugan, R. Murray, A. I. Johnston, L. Marriot	S. Addams	Donaldson Line
<i>Cornwall</i>	4-7-61	J. H. Clinton	A. S. Adams, D. Outhwaite, A. R. Law, R. Davies	A. Gordon	Pacific S.N. Co., Ltd.
<i>Cortona</i>	8-12-61	E. C. Hicks	A. Canstick, H. Dewsnap, T. O'Driscoll	M. Garratt	Shaw Savill Line
<i>Cotopaxi</i>	6-11-61	W. Stanger	R. Gibb, K. Ingles, W. Howatt	E. Cathcart	J. & J. Denholm, Ltd.
<i>Cretic</i>	22-2-62	K. Turner	P. G. T. Potter, T. Wilson, P. McParlin, P. Black-	H. Barclay	
<i>Crinan</i>	15-1-62	R. Sutcliffe	moore		
<i>Crofter</i>	15-1-62	R. Sutcliffe	P. G. T. Potter, T. Wilson, P. McParlin, P. Black-		
<i>Crystal Bell</i>	27-11-61	E. R. Owen	P. G. T. Potter, T. Wilson, P. McParlin, P. Black-	J. A. L. MacDonald	Harrison Line
<i>Cumberland</i>	21-2-62	J. Bury	E. Beckett, N. Niblock, P. Kean	K. D. O'Kelly	Sugar Line
<i>Cusco</i>	1-3-61	R. B. Bryant	M. J. Ratcliffe, E. Gowland, D. Ellis	T. Mason	Federal Line
<i>Cynric</i>	18-8-61	H. C. Smith	J. Neil, M. Clark, T. I. Oliver	V. Dalton	Pacific S.N. Co., Ltd.
<i>Darro</i>	7-9-61	A. J. Barff, R.D.	P. J. Bouchet, W. McCarver, B. Darling	W. Charlton	Shaw Savill Line
<i>Debrett</i>	7-3-62	C. E. Legg	J. J. Barrowcliff, G. Cole, G. Hepple, A. Kenyon	J. Barnes	Royal Mail Lines
<i>Delphic</i>	28-6-61	R. Frisby	A. P. Herbert, —, McEwan, —, Oliver, —, Clarke	A. J. MacNeil	Lampport & Holt Line
<i>Derbyshire</i>	19-3-62	H. B. Peate, D.S.C., R.D.	A. E. R. Burton, J. Code, M. Wood	—, Williamson	Shaw Savill Line
<i>Deseado</i>	18-7-61	T. Frazer, D.S.C.	C. W. Lindall, B. Sugden, R. Peters, R. Brook	C. Beyer	Bibby Line
<i>Devon</i>	27-3-62	R. B. C. Brown	A. I. McNeill, J. Whittington, R. Laycock	M. O'Donoghue	Royal Mail Lines
<i>Devon City</i>	18-7-61	J. D. Lloyd	A. E. French, T. W. D. John, D. H. Williams	A. Hall	Federal Line
<i>Diomed</i>	27-3-62	W. J. Moore, D.S.C., R.D.	J. M. Leese, D. H. Clark, H. J. Moore	A. S. Ferguson	A. Holt & Co.
<i>Discovery II</i>	5-12-61	P. T. Taylor	D. Freeman, E. May, B. Warren, J. E. Higham	E. O. Roberts	Sir Wm. Reardon Smith & Sons
<i>Dominion Monarch</i>	2-1-62	K. D. G. Fisher, G.M.	N. Jackson, G. Cudlipp, R. Barton, T. Freeman	A. Holt & Co.	National Institute of Oceanography
<i>Domino</i>	13-2-62	J. E. Wray	J. L. Barker, G. Gash, E. Tushingham	D. Barry	Shaw Savill Line
<i>Donegal</i>	11-1-62	R. Willcocks	P. Grant, D. Llewellyn, P. Butcher	R. Crompton	Ellerman's Wilson Line
<i>Dorset</i>	11-1-62	J. S. Laidlaw	W. Killackey, L. E. Howell, R. C. Ford	D. Leeson	Trinder Anderson & Co., Ltd.
<i>Drina</i>	5-3-62	F. A. C. Thacker	G. Shaw, J. R. Rawding, G. Kinnersley	W. Burns	Federal Line
<i>Dunedin Star</i>	20-3-62	R. H. Stark	H. Blaik, M. F. Davison, R. Gosnow	A. Hirst	Royal Mail Lines
<i>Dunera</i>	12-12-61	B. A. Rogers, D.S.C., R.D.	D. Phillips	H. P. Conway	Blue Star Line
<i>Durango</i>	7-3-61	R. C. S. Woolley, R.D.	D. Wiles, R. Charile, M. Godfrey	W. C. G. S. Sturges	British India Line
<i>Durban Castle</i>	20-9-60	H. Holland	P. D. H. Richards, R. Wilson, M. Shuter, J. Brickwell	J. Everitt	Royal Mail Lines
<i>Durham</i>	11-12-61	R. G. Hollingdale	J. C. Jardine, D. S. Guinness, A. K. G. MacGregor	W. Kay	Union Castle Line
<i>Eden</i>	20-11-61	A. B. Medlicott	J. J. Moran, P. Bennisson, B. Walmsley, P. Dyer	J. Duignan	New Zealand Line
<i>Edermore</i>	7-12-61	A. Wiles	—, Buddle, —, Parker, —, Innes	J. Dunne	Royal Mail Lines
<i>Edinburgh Castle</i>	30-10-61	A. G. V. Patey		—, Hodgson	Furness Lines

<i>Egida</i>	9-3-62	W. MacVicar, M.B.E.	D. B. Bisset, R. H. Watt, D. C. Tripp, B. Purvis	P. J. Kelly	Anchor Line
<i>Elybank</i>	21-9-61	A. F. King	J. Scrimgeour, G. Fry, P. Streeter	— Drake	Bank Line
<i>Elysia</i>	16-2-62	R. H. Harris	D. W. Wale, J. Suddes, O. H. Cook	A. E. Adams	Anchor Line
<i>Empire Star</i>	28-9-61	G. T. King	A. Crawford, P. L. B. Coulthurst, C. Rawlinson, P. Hansell	J. Mann	Blue Star Line
<i>Empress of Britain</i>	15-11-61	S. W. Keay	D. Lumbard, N. Hebdien, F. M. Andrews	P. B. McNab	Canadian Pacific Line
<i>Empress of Canada</i>	28-12-61	J. P. Dobson, C.B.E., D.S.C., R.D.	J. Spruce, G. St. C. Smith, J. Carmichael	P. B. McNab	Canadian Pacific Line
<i>Empress of England</i>	20-1-62	C. L. de H. Bell, D.S.C., R.D.	D. Wale, A. Jacobs, O. Cook	C. Quinn	Blue Star Line
<i>English Star</i>	13-3-62	E. C. Laidlaw	R. V. L. Thorn, B. Sukden, F. Hopkinson, C. E. Sturcke	— Quinn	Ministry of Agriculture, Fisheries & Food
<i>Ernest Holt</i>	15-2-62	E. A. Binnington	G. H. Webber, C. J. Highfield, D. J. Thomson, A. Allen	L. Sutton	Royal Mail Lines
<i>Essequibo</i>	6-6-61	W. B. Avison	F. W. Dogherty, F. G. Gair, B. Nicholas	M. Zappert	Federal Line
<i>Essex</i>	28-9-61	S. W. Andrews	G. Harrison, T. Harrower, T. Crompton	T. Barrett	Eso Petroleum Co., Ltd.
<i>Eso Cambridge</i>	1-11-61	H. W. Brice	G. E. Daykin, R. Marcham, A. McMahon	A. Lambert	Eso Petroleum Co., Ltd.
<i>Eso Canterbury</i>	8-1-62	J. W. Brown	J. M. Murray, N. Harris, D. Langwell, D. Barclay	J. Berrie	Eso Petroleum Co., Ltd.
<i>Eso Exeter</i>	6-9-61	L. J. Smith	P. S. Burn, J. Craig	J. Steven	Anchor Line
<i>Eucadia</i>	8-1-62	G. Ramage	I. L. C. Thomas, F. W. Bush, P. J. Williamson,	K. Dusher	Department of Agriculture & Fisheries for Scotland
<i>Explorer</i>	28-8-61	E. A. Bruce	D. R. Christie, L. J. A. Gibb	—	Strick Line
<i>Farsistan</i>	8-2-61	R. Connacher	F. Saunders, A. T. Banack, F. A. Skinner	J. Anderson	Chr. Salvesen & Co., Ltd.
<i>Fiadra</i>	10-3-61	J. Clark	M. A. R. Stuart, P. Limerland, D. Steel	— Favre	Bank Line
<i>Firbank</i>	12-5-61	O. L. Moody	G. M. Henderson, R. Goodlet, N. Golding	T. R. Wilson	Pacific S.N. Co., Ltd.
<i>Flamenco</i>	12-5-61	J. H. Allenby	B. F. Walters, P. Guerrier, W. Wright	F. T. Everard & Sons	Sir Wm. Reardon Smith & Sons
<i>Frederick T. Everard</i>	28-2-62	J. Thornhill	P. J. Povall, R. H. Dixon, B. Tang	J. A. Lynch	Trinder Anderson & Co., Ltd.
<i>Fresno City</i>	26-1-62	E. J. Ridout	J. D. R. Ghest, P. S. Carr, R. March	A. Thompson	Glen Line
<i>Galway</i>	24-11-61	D. C. Evans	T. G. Johnston, A. Bridson, E. A. P. Sambrooke	D. Storror	Glen Line
<i>Glenarney</i>	12-1-62	H. K. Martin	J. Johnston, H. McDonald, H. Munro	A. Brown	Glen Line
<i>Glenfinlas</i>	30-11-61	H. S. Clarke	A. J. Champion, D. Jamieson, C. Cowie, H. Crane	S. D. Sutherland	Glen Line
<i>Glenorchy</i>	22-2-61	D. McKelvie	P. M. Gibbard, M. F. Williams, N. Childs, M. Dawson	D. Ritchie	Federal Line
<i>Glenpark</i>	23-1-62	D. E. Moran	G. H. N. Keyzar, D. Howell, L. Tait	M. Brett	Bristol City Line
<i>Gloucester</i>	14-3-62	E. Irish	C. Wynne-Eyton, A. R. Smith, R. V. Primrose,	P. Kelly	Elders & Fyffes, Ltd.
<i>Gloucester City</i>	14-8-61	E. Irish	R. Guille	B. McGovern	Shaw Savill Line
<i>Golfito</i>	6-4-60	G. M. Roberts, M.B.E.	E. W. Reay, — Jarret, S. Briggs	M. Jagger	Craig Shipping Co., Ltd.
<i>Gothic</i>	17-8-61	L. J. Hopkins	P. J. Borougas, D. J. Ferris, R. M. Gidden	N. O. S. McLaren	Sir Wm. Reardon Smith & Sons
<i>Graig</i>	16-11-60	R. Dodds	W. F. R. Whiting, W. Noble, B. Greenwood	I. Barber	New Zealand Line
<i>Great City</i>	9-10-61	A. B. Parkhouse	J. Rutherford, G. Martin, M. Keat	G. Lovie	J. & C. Harrison, Ltd.
<i>Haparangi</i>	11-1-62	W. J. Stevens	A. J. Gibbs, A. Betts, E. C. Pannall,	M. Moore	New Zealand Line
<i>Harbation</i>	28-2-62	S. B. Davis	W. Brown, J. E. Webb, J. B. Hodgson, M. S. Humphrey	A. Torrance	A. Holt & Co.
<i>Hauraki</i>	19-3-62	E. F. H. Allen	J. Wrags, A. Prince, R. J. Williams	B. G. Smith	Hector Whaling, Ltd.
<i>Hector</i>	23-1-62	R. A. Hanney	J. Ablett, D. Wilkinson, M. Reeves	A. Holman	A. Holt & Co.
<i>Hector Heron</i>	24-11-61	E. W. Rousell	S. T. Culshaw, A. W. S. Cripps, M. W. Elsam, W. N. Drumet	C. M. Dunwoody	Shell Tankers, Ltd.
<i>Helenus</i>	20-7-61	N. A. Rae, M.B.E.	J. F. E. Crawford, M. K. Handfield, R. E. Barnard, J. A. North	W. Ferry	Bibby Line
<i>Hemgiypta</i>	12-12-61	A. N. Rylett	R. Bond, N. Drummond, M. Hodgkinson, R. Ford	A. W. Hall	New Zealand Line
<i>Herefordshire</i>	12-2-62	A. E. Young	J. P. McClelland, J. Hutchinson, J. Ogonowski,	P. E. Newman	New Zealand Line
<i>Hertford</i>	12-2-62	H. C. R. Dell	L. Lewis	J. Hewitt	New Zealand Line
<i>Hinakura</i>	20-12-61	N. L. Warren		F. Fitzgerald	Booth Line
<i>Honorata</i>	21-6-61	C. P. Robinson			
<i>Hubert</i>	28-12-61	J. H. Stoker			

NAME OF VESSEL	LAST RETURN RECEIVED	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
<i>Huntingdon</i>	29.1.62	H. R. M. Smith	G. C. Stalker, W. J. Hooley, A. R. Pope	D. L. Byrne	New Zealand Line
<i>Hurumi</i>	12.9.61	F. Pover	C. Greenwood, C. Baugh, J. Sargent, J. Hutson	A. Tittley	New Zealand Line
<i>Imperial Star</i>	26.4.61	G. L. Evans, O.B.E.	J. F. Rowe, M. Foster, R. Brisset	R. R. Whitehead	Blue Star Line
<i>Inshouwen Head</i>	26.5.61	H. N. Clarke	W. Dallas, B. Stewart, E. Crossan, D. Nivison	D. R. J. Shepherd	Head Line
<i>Irimesmoor</i>	12.2.62	R. R. Jordan	W. G. Kingwood, R. Thompson, D. Durbin	R. R. Thomas	Runciman Line
<i>Interpreter</i>	21.6.61	H. Skelly	C. D. Riley, B. Crook, P. G. Rylands, R. Surcliffe	P. A. Howe	Harrison Line
<i>Ionic</i>	18.1.62	R. Grant	G. S. R. Trounson, I. Cameron, A. Pitt, I. Sayward	D. Waterhouse	Shaw Savill Line
<i>Iron Barque</i>	15.1.62	J. G. Wright	L. A. Smith, J. C. Carr, L. Orsted	J. Hanly	Common Bros., Ltd.
<i>Iron Ore</i>	7.12.61	J. V. Beawick	G. E. Shearer, J. Robertson, D. C. Fraser, M. T. Richardson	S. Dingwall	Common Bros., Ltd.
<i>Ioernia</i>	2.3.62	W. F. Warwick, R.D.	H. L. Smith, J. King, C. H. Brown, D. A. Davies	G. Parsons	Cunard Line
<i>Ixon</i>	5.2.62	A. M. Pilcher	I. J. Wilkinson, A. P. Sinclair, J. A. C. McGregor	W. Beebee	A. Holt & Co.
<i>Jamaica Planter</i>	3.1.62	G. E. M. Jenkins	P. V. Clark, M. Lunn, J. Toschack	L. G. Price	Kaye Son & Co., Ltd.
<i>Jamaica Producer</i>	12.2.62	T. A. Kidd	I. B. Thomson, P. Dodge, E. A. Price	G. A. Winters	Kaye Son & Co., Ltd.
<i>Jason</i>	13.3.62	R. T. Harries	J. T. Cole, T. Woodfield, J. Russell	I. Williamson	A. Holt & Co.
<i>John Biscoe</i>	7.6.61	W. Johnston	J. T. Shearer, M. F. Murfin, D. McDowell, J. B. Kendall	A. R. King	Government of Falkland Islands
<i>John Holt</i>	11.12.61	R. A. Simpson	C. W. Kirkby, E. J. Maxwell, R. G. Bell	W. F. String	Guinea Gulf Line
<i>Journalist</i>	6.11.61	R. F. Longster	A. P. Caola, M. C. Wilkie, W. A. Hyde, G. R. Plummer	M. D. Evans	Harrison Line
<i>Kemilworth Castle</i>	18.9.61	C. E. Lorains	N. Birch, G. Gordon, G. Hunter, B. Cook	N. Roberts	Union Castle Line
<i>Kenuta</i>	19.12.61	D. I. Jones, D.S.C.	E. G. Rowley, A. D. Methven, R. Beedle	J. Masterman	Pacific S.N. Co., Ltd.
<i>Kenya</i>	29.1.62	H. B. W. Cray, M.B.E.	M. J. Woodhead, K. Fullarton, D. McMinn	J. Wright	British India Line
<i>King Arthur</i>	14.6.60	J. L. Ritch	W. Mackenzie, R. H. Barr, A. C. McCulloch	J. Kidd	King Line
<i>Kohistan</i>	20.11.61	C. S. Bartlett	E. D. Somes, B. W. Jordan, A. Priestly, D. Angus	R. Locke	Strick Line
<i>Koyan</i>	7.6.61	M. E. M. Fair	R. Martin, J. C. Campbell, W. J. M. Brown	P. J. Behan	Henderson Line
<i>Lasambank</i>	27.7.61	J. Porteous	N. C. Campbell, W. Caldwell, H. MacDiarmid, G. Anderson	D. Murray	Bank Line
<i>Laurentia</i>	1.1.62	T. S. Graham	G. R. Excell, P. Saunders, V. J. Gatis, C. J. Vaughan	E. Unsworth	Donaldson Line
<i>Leicestershire</i>	5.2.62	H. Kerbyson	W. V. Wood, B. M. Gardner, P. W. Wesson	A. J. Morgan	Bibby Line
<i>Limerick</i>	8.9.61	C. Parry	W. D. Cooper, A. Magrath, M. Benley	B. Kennedy	Trinder Anderson & Co., Ltd.
<i>Lindsayfame</i>	1.6.61	J. Macgugan	A. Buchan, W. F. Joyce, R. Brewster, W. Smith	J. Limpitlaw	W. A. Souter & Co., Ltd.
<i>Lismoria</i>	8.1.62	R. McNie	R. Jones, K. Richmond, J. Grantham	L. G. Mercer	Donaldson Line
<i>Livorno</i>	24.10.61	A. Jackson	D. C. R. Abbott, B. L. Cater, T. Cobb	G. R. Clarke	Ellerman's Wilson Line
<i>Loch Avon</i>	23.11.61	J. A. Phillips	B. Melton, I. Worrall, J. Clark	F. Page	Royal Mail Lines
<i>Loch Garth</i>	15.5.61	C. C. Dingle	P. J. Smith, R. N. Miller, W. R. Hughes	J. Greenhalgh	Royal Mail Lines
<i>Loch Gowan</i>	17.1.62	G. S. Grant, R.D.	M. R. Edensmith, A. Smith, I. Berry, W. T. R. Shanks	D. Stevenson	Royal Mail Lines
<i>Loch Loyal</i>	7.7.61	L. T. Peterson	L. J. A. Gibb, R. Flett, T. V. Walgate, A. D. Couper	P. Wood	Chr. Salvesen & Co., Ltd.
<i>Logna</i>	24.8.61	A. F. Baikie	E. G. Kemp, J. Ashworth, R. Bourne, D. G. Scourfield	J. H. S. Watson	London & Overseas Freighters, Ltd.
<i>London Pride</i>	19.12.61	J. Wallace	D. A. Hammond, N. F. Grayson, R. A. Evans	J. H. S. Watson	Brocklebank Line
<i>Macharda</i>	28.12.61	J. Lyle	J. H. Larbalestier, B. Ross, H. Foulkes	H. Connell	Brocklebank Line
<i>Magdapur</i>	7.7.61	J. G. Nuttall	G. M. Kennedy, D. N. Sinclair, D. C. Mathews	P. Y. Wright	Brocklebank Line
<i>Mahanada</i>	7.3.62	C. S. W. Gray	S. P. McGlue, P. Slade, P. Swift, G. Simms	P. Brown	Brocklebank Line
<i>Mahseer</i>	4.12.61	W. Couling	H. R. Owen, P. D. Guthrie, A. Stallard	W. Wilson	Manchester Liners
<i>Makalla</i>	17.1.62	G. T. Kenyon	H. W. Norton, G. Humphrey, J. M. Rimmer	W. MacPherson	Manchester Liners
<i>Manchester City</i>	14.12.60	D. G. Thomas	J. M. M. Brock, M. Butler, D. Smith, M. Barratt	I. Buchanan	Manchester Liners
<i>Manchester Faith</i>	26.6.61	G. R. Thompson	R. M. Booth, J. A. Williamson, A. N. Gow, P. A. Boniface	M. Doran	Manchester Liners
<i>Manchester Fame</i>	9.5.61	L. Taylor	J. A. McKay, M. Barnes, C. Spence		Manchester Liners
<i>Manchester Mariner</i>	16.2.61	M. E. Bewley			Manchester Liners

NAME OF VESSEL	LAST RETURN RECEIVED	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
<i>Papanui</i>	30.6.61	R. E. Baker	P. Hornby, B. S. Smith, P. M. J. Ireland, G. B. Johnson	E. E. Pooley	New Zealand Line
<i>Paparua</i>	29.11.61	P. R. Moulton	H. G. Williams, R. C. Anderson, R. Jones, C. H. J. Brownings	W. Hutton	New Zealand Line
<i>Paraguay</i>	31.8.61	J. Allason-Jones	D. M. M. Shaw, H. G. N. Lloyd, B. J. Hotter	P. A. Lockhart	Royal Mail Lines
<i>Paraguay Star</i>	2.8.61	H. McNeil	B. Wood, J. Gathercole, R. Williams	G. Scott	Blue Star Line
<i>Pardo</i>	7.3.60	C. Robertson	U. F. R. Moorman, J. W. W. Taylor, G. B. Panes	F. Baker	Royal Mail Lines
<i>Parina</i>	16.6.61	G. G. Chatterley	F. Gibbery, J. Madge, P. Butler	D. Turner	Royal Mail Lines
<i>Pendennis Castle</i>	14.6.61	J. P. Smythe, R.D.	S. G. Medhurst, S. Snowdon, W. Young, G. Elwick	P. P. Williams	Union Castle Line
<i>Pennysworth</i>	18.5.61	N. Thompson, M.B.E.	D. C. Smart, L. Barefoot, W. J. Jones	A. Lambert	R. S. Dalgleish, Ltd.
<i>Perim</i>	10.5.61	T. Hopkins	E. G. Williams, D. S. Walker, L. P. Jones, C. L. Oxenham	J. Walters	P. & O. Line
<i>Persaus</i>	12.2.62	W. K. Hole	J. Gillies, M. G. Coghlan, J. D. Howie	W. Peat	A. Holt & Co.
<i>Persic</i>	19.1.62	G. W. Houchen, O.B.E., R.D.	A. Ewing, D. Geddes, F. Jones	P. Treharne	Shaw Savill Line
<i>Pertshire</i>	18.12.61	F. Harris	B. E. Melton, D. Foote, M. P. Whitehead, M. F. G. Nickson		Turnbull, Martin & Co.
<i>Pilcomayo</i>	15.11.61	J. M. F. Anderson	A. Lamont, T. Gibson, J. Ashford	T. O'Flaherty	Royal Mail Lines
<i>Pipiriki</i>	26.7.61	W. Dan	R. G. Dodsworth, R. T. Riley, W. Jenkins	D. Bissell	New Zealand Line
<i>Pizarro</i>	13.2.61	A. Lang	S. N. Hurst, J. Lister, J. Mackness	J. Newman	Pacific S.N. Co., Ltd.
<i>Port Adelaide</i>	24.10.61	E. W. Dingle, M.B.E.	G. J. Botterill, R. G. Asplet, C. G. Bennetts	C. Hill	Port Line
<i>Port Auckland</i>	30.1.62	C. R. Townshend	A. Rattray, G. D. B. Thomas, J. H. Pring	H. Horrocks	Port Line
<i>Port Brisbane</i>	10.2.62	E. E. Roswell	J. Lloyd Jones, D. C. Campbell, R. King	P. J. McGuire	Port Line
<i>Port Dunedin</i>	7.7.61	W. M. Clough	J. W. Fisher, N. R. Sinclair, G. G. Blackler	R. Day	Port Line
<i>Port Fairy</i>	16.6.61	J. A. Newberry	D. Shearmonth, J. Cullen, R. Williams	M. J. P. Hannon	Port Line
<i>Port Hobart</i>	13.2.62	E. W. R. Young	J. M. Bennett, R. Jenkins, T. Rayment	T. A. Cameron	Port Line
<i>Port Invercargill</i>	20.10.61	A. S. McClouman	R. P. Center, R. D. Henderson, G. Hay	T. Twistleton	Port Line
<i>Port Jackson</i>	14.12.61	V. G. Wright	M. E. Hughes, N. Hogg, T. Steddy	F. Flinders	Port Line
<i>Port Launceston</i>	20.5.61	R. A. Holmes	M. Thwaite, G. Rostie, E. J. Churchouse	B. V. Harford	Port Line
<i>Port Lincoln</i>	8.2.62	V. M. Read	R. H. Mitchell, I. Rankin, P. A. Bates	T. H. Shuster	Port Line
<i>Port Macquarie</i>	20.3.62	F. J. Lavers	H. T. Channon, F. Hope, W. J. Starkey	T. Hargraves	Port Line
<i>Port Napier</i>	28.2.62	W. J. Williams	S. I. Clough, I. Burt, P. Bush	W. Trainor	Port Line
<i>Port Phillip</i>	27.10.61	L. J. Skalles	G. N. Squire, T. R. Howe, D. R. Macfarlane	R. Robertson	Port Line
<i>Port Pyre</i>	24.10.61	I. S. Moate	J. Betts, J. D. Cartmell, A. G. Williamson	E. Loft	Port Line
<i>Port Townsville</i>	1.1.62	W. Eastoe	E. L. G. Nightingale, G. H. M. Thompson, D. Hart, J. W. Gunn	E. G. Hutchison	Port Line
<i>Port Victor</i>	22.1.62	A. Brown	I. G. Watson, M. J. Sebbage, R. Hyde	C. G. Kavanagh	Port Line
<i>Port Vindex</i>	21.11.61	C. A. Hodson	G. Hunter, C. Earl, I. Berry	M. Hesketh	Port Line
<i>Port Wellington</i>	20.11.61	A. Hodson	M. Quirk, P. Whitaker, D. Outhwaite	R. Slater	Port Line
<i>Port Wyndham</i>	12.3.62	K. G. Morris	K. Coussons, A. Adams, L. Cuttriss	R. Passmore	Royal Mail Lines
<i>Potaro</i>	10.3.61	C. Wightman	D. Bedford, R. Fells, G. Gendall	C. McCarthy	Pacific S.N. Co., Ltd.
<i>Potosi</i>	24.10.60	R. D. S. Eckford	P. Fetherbridge, C. Turner, J. F. Hill	E. H. Pitt, D.S.C.	Union Castle Line
<i>Pretoria Castle</i>	7.7.60	J. D. B. Fisher	C. Thomas, B. Goldthorpe, O. Rowlands, D. Miller	H. Stennett	Furness Line
<i>Queen of Bermuda</i>	20.10.61	M. E. Musson	J. Reid, Daniels, Rowen	O. Smith	Blue Star Line
<i>Queenland Star</i>	8.1.62	R. White, D.S.C.	D. A. Chinn, N. Walsh, H. O'Byrne, P. Pinkerton	R. Brinkshaw	New Zealand Line
<i>Rakata</i>	30.6.61	F. G. Bevis	E. M. Smith, I. M. Green, R. K. Young	J. M. Lyons	I. Cory & Sons, Ltd.
<i>Ramilies</i>	14.4.61	W. J. Thomas	R. MacD. Mair, P. Snow, J. E. Crawford, D. C. Sheppard	J. M. Lyons	Larrinaga S.S. Co.
<i>Ramon de Larrinaga</i>	14.9.61	Wilson		M. McGurk	Head Line
<i>Ramore Head</i>	14.9.61	E. G. Davey		E. Whittington	New Zealand Line
<i>Rangitane</i>	20.11.61	R. G. Rees		P. Dickson	New Zealand Line
<i>Rangitata</i>	28.12.61	A. Hocken			

NAME OF VESSEL	LAST RETURN RECEIVED	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
<i>Sir William Hardy</i>	31-7-61	I. R. Munro, M.B.E.	M. Slater	S. Ribee	Torry Research Station
<i>Socotra</i>	16-2-62	E. G. Joss	R. D. Postlethwaite, J. C. W. Beer, C. F. N. M. Swain	R. Bennet	P. & O. Line
<i>South Africa Star</i>	5-3-62	F. MacGuckin	D. Tipping, C. A. Veno	D. Buckley	Blue Star Line
<i>Southbank</i>	4-7-61	B. L. Carnie	J. J. Farrington, A. A. Rawlinson, E. P. Miller, W. H. Martin		
<i>Southern Cross</i>	28-2-62	L. J. Hopkins	C. Wynne-Eyton, J. Sayers, A. Cairns	D. Kennedy	Bank Line
<i>Southern Harvester</i>	18-5-61	H. Myhre	J. B. Kerr, J. Lough	H. Matthews	Shaw Savill Line
<i>Southern Opal</i>	8-5-61	A. F. Baikie	H. S. Ansen, S. Jacobson, A. Hanson	D. W. Miller	Chr. Salvesen & Co., Ltd.
<i>Southern Venture</i>	30-5-61	P. Virik		J. McQuirre	Chr. Salvesen & Co., Ltd.
<i>Stirling Castle</i>	21-2-61	W. S. Byles, R.D.	T. Murton, L. O. Roskell, M. Fazakerley, N. Beavis	I. Summers	Union Castle Line
<i>Stirlingshire</i>	8-1-62	W. J. Jones	R. A. Wilson, D. M. Geddes, M. J. Meyer	W. Latus	Turnbull Martin & Co.
<i>Stratheden</i>	5-3-62	P. G. Lawrence	B. Peartree, B. Hollevoak, P. Curtis	P. Maloney	P. & O. Line
<i>Strathmore</i>	25-4-61	L. H. Howard, R.D.	W. M. Lucas, J. Legros, H. E. J. Wrigley	G. Dawson	P. & O. Line
<i>Suevic</i>	16-2-62	C. L. Carroll, D.S.C., R.D.	A. W. Rees, B. E. F. Pittar, R. G. Woodhead	J. Carr	Shaw Savill Line
<i>Suffolk</i>	1-8-61	H. J. D. Sladen	G. Wright, M. Perfect, P. Keane, P. Henderson	D. Lake	New Zealand Line
<i>Sunda</i>	8-1-62	J. F. McArthur			P. & O. Line
<i>Surrey</i>	20-11-61	J. D. Hellings	I. Luxton, M. Field, C. James, D. Watson	A. McInnes	New Zealand Line
<i>Sussex</i>	2-10-61	J. R. M. Ramsay	P. G. Davis, A. L. Jackson, M. Weston	T. McDowell	Federal Line
<i>Swiftpool</i>	2-10-61	E. A. Snaith	J. Landells, P. Robinson, B. W. Hayward	P. Watkins	Sir R. Ropner & Son, Ltd.
<i>Sydney Star</i>	31-1-62	L. W. Evans	C. D. Church, K. L. Morris, D. A. Hope	T. Regan	Blue Star Line
<i>Sylvania</i>	8-12-61	J. Crosbie-Dawson, D.S.C., R.D.	C. R. Lucas, R. G. Turner, M. V. P. Doyle, I. B. McLundie		
<i>Tabaristan</i>	26-1-62	R. B. Arthur	R. Price, K. Gregory, D. Foster	A. F. Crosby	Cunard Line
<i>Tamale</i>	10-7-61	J. A. Cleator	P. J. Finan, J. W. Bristol, J. A. Chapman, J. Moffat	N. F. McCormack	Strick Line
<i>Tantallon Castle</i>	6-12-61	C. W. Armstrong, R.D.	R. Stearn, D. Turrell, T. Nigby	T. Ainsworth	Elder Dempster Lines
<i>Tarkua</i>	28-9-61	E. Kingan	M. R. Walker, E. S. Mathews, B. Johnson, S. Thomson	P. Heald	Union Castle Line
<i>Tasmania Star</i>	21-2-62	F. N. Johnson, M.B.E.	M. Pyer, D. Tranter, C. D. Churcher, J. O. White	R. Seaward	Elder Dempster Lines
<i>Thelma</i>	26-2-62	R. S. MacLachlan	J. Fyfe, J. McLeod, J. Boyce	F. Hugget	Blue Star Line
<i>Tidecrest</i>	22-2-62	A. Miller	D. Wilkins, L. Richards, P. W. Finnie		Glen & Co., Ltd.
<i>Tinto</i>	9-8-61	C. Everingham	T. Lowery, J. Holmes, B. Blampey, P. Rotheram	A. D. Evans	Ivanovic & Co., Ltd.
<i>Toronto City</i>	17-1-62	W. Stoodley	K. Miller, W. Coombes, E. Mace	E. A. Morgans	Ellerman's Wilson Line
<i>Torr Head</i>	*	S. T. Ross	S. J. McCormick, T. Sellers, P. C. Dobbs	T. R. Barrow	Bristol City Line
<i>Transvaal Castle</i>	*	A. G. V. Patey	J. F. Veysey, D. R. Cox, R. Allen	J. Hannon	Head Line
<i>Trecarne</i>	19-2-62	S. O. Watkins	J. Carmichael, P. V. Underwood, W. H. Dodson	K. R. Thompson	Union Castle Line
<i>Trecarrell</i>	2-3-62	I. M. Price	W. G. Bothwell, J. Spall, R. Whisker	S. Stephenson	Hain S.S. Co., Ltd.
<i>Trelawry</i>	26-2-62	W. R. Bulmer	C. K. Newton, A. Barley, J. S. Cotton	J. Farrer	Hain S.S. Co., Ltd.
<i>Treleuan</i>	5-12-61	G. A. McKay	M. Cowton, G. Streeter, C. Cornish	R. O'Rourke	Hain S.S. Co., Ltd.
<i>Treissick</i>	9-3-62	H. Gravel	R. C. Lister, C. J. Ducker, A. D. Garner	A. A. Randle	Hain S.S. Co., Ltd.
<i>Trelyon</i>	27-11-61	F. G. Bolton	G. R. Mills, J. O. Spence, D. Lea	A. W. Bradbury	Hain S.S. Co., Ltd.
<i>Tremcadow</i>	*	W. Phillips	T. Hallatt, R. Perry, I. Williams	A. R. Watt	Hain S.S. Co., Ltd.
<i>Tremorvah</i>	11-9-61	C. E. Pratt	J. Carmichael, W. Dodson, W. Railton	W. Dobbie	Hain S.S. Co., Ltd.
<i>Trevalgan</i>	27-10-61	J. Cornish, M.B.E.	J. E. Johnson, L. J. Antoszewicz, R. Francis	J. Anderson	Hain S.S. Co., Ltd.
<i>Treyaylor</i>	3-7-61	W. F. Denyer, O.B.E.	G. R. Crease, D. C. Penberthy, A. Bollingham	P. C. A. Enrico	Hain S.S. Co., Ltd.
<i>Trevelan</i>	26-2-62	R. J. Richards	M. J. Ball, F. Adams, I. Smith	H. L. Hall	Hain S.S. Co., Ltd.
<i>Trevelyan</i>	1-1-62	E. F. Boyd	C. J. Double, F. M. Marchant, R. H. Wingate	V. N. Kearney	Hain S.S. Co., Ltd.
<i>Trevoose</i>	29-1-62	C. D. Abbott	L. E. Quigley, J. B. Sparkes, A. J. Hayes	N. Brewer	Hain S.S. Co., Ltd.
<i>Trevellard</i>	13-11-61	D. L. Lacey	J. M. F. Barnett, W. E. Wilson, D. Green	A. Lambart	Hain S.S. Co., Ltd.
<i>Trinculo</i>	11-12-61	F. H. Simpson	R. L. Smyth, J. G. Darlington, R. A. Reay, W. R. Pilling		
<i>Turakina</i>	7-6-61	H. A. Owen	R. Bayliss, D. Watson, P. O. Kean, K. Mills	D. Broadbridge	C. T. Bowring & Co., Ltd.
				W. H. Hall	New Zealand Line

<i>Tyrone</i>	18.12.61	H. J. Jones	I. W. Williams, D. McMurray, T. E. Graham	F. Cooper	Trinder Anderson & Co., Ltd.
<i>Valletta</i>	7.12.61	I. Jeffrey	R. E. Robinson, A. Andrews, N. Sloan, M. D. Grant	D. Turner	Shell Tankers, Ltd.
<i>Venassa</i>	1.1.62	K. J. Morris	J. S. Hines, C. C. Paterson, M. G. Jennings, G. C. Sanderson	R. McKellar	Shell Tankers, Ltd.
<i>Wairangi</i>	21.6.61	J. Stanger	C. H. Swindells, W. A. Murison, B. J. Wardle	A. Hudson	Shaw Savill Line
<i>Wainera</i>	4.12.61	J. O. Williams, R.D.	B. Lloyd, A. Nelson, C. Truman, D. Ritchie	J. Downie	Shaw Savill Line
<i>Wainstead</i>	19.1.62	M. G. King	A. D. Lightfoot, D. L. G. Jones, I. B. Roberts	B. Godfrey	Watts, Watts & Co., Ltd.
<i>Welsh City</i>	12.12.61	S. Leebetter	P. J. Stenart, J. Harry, D. C. Barker, A. Cameron	S. G. Whitmore	Sir Wm. Reardon Smith & Sons
<i>Wendover</i>	20.10.61	J. Cormack	W. B. Rial, W. Burdon, G. Bowman	H. O'Donnell	Watts, Watts & Co., Ltd.
<i>Westmeath</i>	6.11.61	H. R. Coates	D. N. Richardson, D. Affleck, N. McLean	W. R. Jones	Trinder Anderson & Co., Ltd.
<i>Willowpool</i>	8.3.62	F. D. Lloyd	K. Jones, T. Poole, Woodall	S. Duffy	Sir R. Ronner & Son, Ltd.
<i>Windsor</i>	27.11.61	J. A. Tully	R. A. Hawkes, T. L. Cook, D. J. Vincent	D. K. Parkinson	Watts, Watts & Co., Ltd.
<i>Windsor Castle</i>	30.11.60	J. C. Lewis	D. Donnet, M. J. Court, B. W. Musgrove	R. Pitt, D.S.C.	Union Castle Line
<i>Wokingham</i>	1.3.62	E. Paice	C. Sinclair, Shwe Tin, A. H. S. Gray	I. M. Rae	Watts, Watts & Co., Ltd.
<i>Woodford</i>	29.1.62	D. Campbell	P. J. Dermott, R. Weir, N. J. Rice	J. Cooper	Watts, Watts & Co., Ltd.
<i>Yoma</i>	5.2.62	T. Cooper, D.S.C.	R. A. Livingstone, A. W. Livingstone, J. Hamilton	J. P. Monaghan	Henderson Line
<i>Yorkshire</i>	19.3.62	L. W. Loose		C. Wilkin	Bibby Line
<i>Zena</i>					Glen & Co., Ltd.

Supplementary Ships

NAME OF VESSEL	LAST RETURN RECEIVED	CAPTAIN	OBSERVING OFFICERS	RADIO OFFICER	OWNER/MANAGER
<i>Aaro</i>	15.2.62	W. C. Gill	B. Nicolle, R. Neesham, J. V. Hatfield	F. H. Nicoll	Ellerman's Wilson Line
<i>Anno</i>	26.4.61	J. C. Cowie	J. C. Cowie, R. Watt, D. Cowie		Mitchell & Rae, Ltd.
<i>Apollo</i>	19.1.62	G. V. Barnes	G. J. Murphy, B. Burcher, R. Cox		Bristol S.N. Co., Ltd.
<i>Borodino</i>	23.11.61	A. T. Jardine	C. Mitchell, T. Marshall, W. Smith	F. E. Smith	Ellerman's Wilson Line
<i>Brittish Reliance</i>	6.3.62	W. L. Pugh	R. Haworth, P. J. Burtleigh, C. E. Jones	J. O'Connell	B.P. Tanker Co., Ltd.
<i>Byland Abbey</i>	14.3.62	T. W. Westerdale	F. Cooper, B. Wooler, J. Marr	B. Wooler	Associated Humber Lines, Ltd
<i>Camellia</i>	12.12.61	G. W. Mortimer	S. Hyland, A. Collins, E. Hutchinson, W. Keough	R. T. Hewitt	I. Robinson & Co., Ltd.
<i>Carlo</i>	21.9.60	F. A. Firth	S. A. Gallon, A. Backhouse, J. Jabyers	G. H. Shilson	Ellerman's Wilson Line
<i>Casford</i>		F. Clarke, M.B.E.	L. Thompson, G. W. Beattie	A. Corkhill	South East Gas Board
<i>Cato</i>	29.11.61	W. Kays	A. S. Phillips	R. Newton	Bristol S.N. Co., Ltd.
<i>Cicero</i>	31.7.61	E. Tyler	D. Gibson, P. Willingham, H. Street	W. Long	Ellerman's Wilson Line
<i>Circassia</i>	21.2.62	J. L. Gibson	L. K. MacArthur, A. McNeil, W. Southworth		Anchor Line
<i>Dartmoor</i>	15.11.61	T. R. Rowe	D. Robinson, B. Tong, R. M. Bertenshaw, E. Howlett		Runciman Line
<i>Dartwood</i>	28.12.61	W. Manson	B. Taylor, J. Potter, S. Jajo, L. Hocking	W. Paterson	Wm. France, Fenwick & Co., Ltd.
<i>Denbighshire</i>	26.3.62	T. R. Walker	P. K. B. Elder, H. A. S. Palmer, R. L. Flinders	M. Lebbon	A. Holt & Co.
<i>Eastern City</i>	28.12.61	D. J. Young	P. G. Radford, J. S. Murray, B. Jones	E. H. Power	Sir Wm. Reardon Smith & Sons, Ltd.
<i>Echo</i>	28.12.61	J. L. Jenkins	C. W. Wallis-Newport, J. F. Tremlett	N. Beech	Bristol S.N. Co., Ltd.
<i>Edward Wishaw</i>	20.3.61	R. W. Porter Reynolds	P. F. Silwood, D. O. Ferry, M. Gywer, M. Humphrey	B. J. M. Holt	Cable & Wireless, Ltd.
<i>Ethel Everard</i>	14.3.62	W. G. Hunt	H. T. Wells, R. I. Wood	J. Griffin	F. T. Everard, Ltd.
<i>Gardania</i>	5.12.61	J. H. Gray	I. W. Spence, G. Pearson, F. Bowden, S. Hyland	W. Britton	J. Robinson & Son
<i>Glenearn</i>		A. Millard	P. A. Read, J. S. Shunter, J. Barlow	D. P. Stoker	Glen Line
<i>Glenyle</i>	5.3.62	R. Johnston	B. L. Lloyd, M. J. Steele, A. J. Child		Glen Line

Supplementary Ships (contd.)

NAME OF VESSEL	LAST RETURN RECEIVED	CAPTAIN	OBSERVING OFFICERS	RADIO OFFICER	OWNER/MANAGER
Glenroy	26.3.62	D. Stewart	T. A. H. Dick, T. W. Willows, S. E. Minshall	J. B. Carr	Glen Line
Glitra	3.10.60	M. Scott	D. Corbett, R. D. McGlashan	A. Hogg	Chr. Salvesen & Co., Ltd.
Greathope	30.12.60	R. Cook, M.B.E.	W. Craig	D. B. Sommerville	E. R. Newbigin, Ltd.
Hudson Deep	16.6.61	J. Gibbons, D.S.C.	P. J. Walters, H. Horsley, A. Ozolins		Hudson S.S. Co., Ltd.
Hudson Firth	7.7.61	A. Crosby	M. R. Uminski, A. A. Brown, A. E. Ford, P. Thomas	M. Goodwin	Hudson S.S. Co., Ltd.
Kirkham Abbey	8.12.61	H. W. Crabtree	G. T. Hall, R. Dukes, B. C. Boot	J. Otlely	Associated Humber Lines, Ltd.
Lady Denison Pender	11.4.60	G. T. Robinson	P. Clough, P. Watts, E. G. L. Small		Cable & Wireless, Ltd.
Laksa	21.6.61	L. B. Anderson	J. Carnie	N. J. Varnes	Chr. Salvesen & Co., Ltd.
Lord Codrington	15.2.61	C. O. Caldcleugh	N. Munce, A. Kamdron, J. Beaumont		Ship's Finance & Management Co., Ltd.
Malmö	12.12.61	J. F. Tognola	J. H. Randell, P. M. Ogran, N. Phillips, K. Blake	S. Parker	Ellerman's Wilson Line
Manipur		J. P. Brand	D. I. Peters, D. F. Barratt, G. A. Jenkins	A. Dunn	Brocklebank Line
Maskelyia		A. F. Evans	K. J. G. Bell, W. G. M. Coles, J. A. Fraser	B. Beecham	Brocklebank Line
Mangla	21.11.61	J. B. Newman	P. F. Blackburn, P. A. Gunson, A. A. Pittendrigh	W. H. H. Ritch	Brocklebank Line
Milo	7.9.61	J. N. Thatcher	S. Church, J. Campbell		Bristol S.N. Co., Ltd.
Mirror	3.2.61	G. Garrett	R. M. D. Wright, P. J. Duff, G. J. Ayrton	J. Kinison	Cable & Wireless, Ltd.
Prome		E. W. Campbell	A. B. Crawford, J. G. Stewart, W. Fitzgerald	A. Gilbert	Henderson Line
Shuna	1.3.62	T. Henry	R. A. Livingstone, A. Lamont, D. MacLean		Glen & Co., Ltd.
Soutra	23.5.61	G. Barrie	C. F. Irving, R. S. Oakes		Chr. Salvesen & Co., Ltd.
Tana	26.1.62	I. Clark	J. V. Walgate, W. Ross		Chr. Salvesen & Co., Ltd.
Tolsta	24.2.61	M. Polson	J. C. Perkin, R. Morris, D. Loud		Chr. Salvesen & Co., Ltd.
Tremayne	17.10.61	G. Joslin	J. Phumister, W. N. H. Anderson, C. J. Nicolson		Chr. Salvesen & Co., Ltd.
Truro	24.4.61	R. Massam	J. Myers, C. B. Batty, G. Setterfield, C. Main		Hain S.S. Co., Ltd.
Tudor Prince		A. Kent	C. Robins, A. Cole, B. Ditchburn, P. Miller	K. Brooks	Ellerman's Wilson Line
Tynemouth	5.2.62	E. H. Thomas	P. Spink, G. Masie, E. Taylor	G. Shilson	Prince Line
Uganda	28.12.61	D. M. Gill	R. E. Dolby, J. N. King, W. H. Orgill	M. Whitworth	Burnett S.S. Co., Ltd.
Yalo	6.9.60	L. R. Stilwell	J. Ball, E. Anderson, G. Setterfield	R. Haskell	British India Line
Waroonga	22.3.62	D. J. Bardsley	S. E. Maitland, J. B. Wells	J. W. Soulsby	Ellerman's Wilson Line
Warwick Castle	11.1.62	F. J. Pye	C. K. Jones, R. Elliott, D. Joyce, K. R. Bennett	W. McCarthy	British India Line
Winga	9.8.61	R. J. McNinch	W. J. S. Burr, J. MacLean, R. Livingstone, D. H. Fairweather	D. G. Bristow	Union Castle Line
Zinnia	19.2.62	W. R. Hunter	J. Spencer, G. Richardson, R. Mackey	A. Corless	Glen & Co., Ltd.
				J. J. Higgins	Stag Line, Ltd.

‘Marid’ Ships

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

NAME OF VESSEL	CAPTAIN	OWNER/MANAGER
* <i>Actuality</i>	D. O’Leary	F. T. Everard & Sons, Ltd.
<i>Adriatic Coast</i>	R. E. Holt	Coast Lines, Ltd.
* <i>Alderney Coast</i>	G. S. Palmer	Coast Lines, Ltd.
* <i>Amsterdam</i>	A. Greenham	British Transport Commission
* <i>Ariosto</i>	F. Barnard	Ellerman’s Wilson Line, Ltd.
* <i>Arnhem</i>	A. P. Sutton	British Transport Commission
<i>Atlantic Coast</i>	H. J. Cowan	Coast Lines, Ltd.
<i>Ballylagan</i>	A. Barron	John Kelly, Ltd.
<i>Belvedere</i>	T. Foulkes	Onesimus Dorey & Sons, Ltd.
<i>Bardic Ferry</i>	K. Hockings	Atlantic S.N. Co., Ltd.
<i>Blisworth</i>	W. R. Day	Grand Union (Shipping), Ltd.
* <i>Bolton Abbey</i>	H. Aaron	Associated Humber Lines, Ltd.
* <i>Brenda</i>	J. Mackinnon	Dept. of Agric. & Fisheries for Scotland
<i>British Coast</i>	P. A. Johnson	Coast Lines, Ltd.
<i>B.P. Marketer</i>	G. Sayer	Shell-Mex & B.P., Ltd.
<i>Caesarea</i>	V. Newton	British Transport Commission
<i>Caledonian Coast</i>	F. Mara	Coast Lines, Ltd.
<i>Caledonian Princess</i>	J. F. D. Hey	British Transport Commission
<i>Cambria</i>	W. R. Roberts	British Transport Commission
<i>Cheshire Coast</i>	E. C. Maddell	Coast Lines, Ltd.
<i>Claymore</i>	J. C. McKinno	David MacBrayne & Co.
* <i>Clupea</i>	J. Jappy	Dept. of Agric. & Fisheries for Scotland
* <i>Corfen</i>	G. Jeffrey	Wm. Cory & Son, Ltd.
* <i>Cormead</i>	A. Metcalfe	Wm. Cory & Son, Ltd.
* <i>Cormoat</i>	E. A. Pusey	Wm. Cory & Son, Ltd.
<i>Corncrake</i>	C. Lennard	General S.N. Co., Ltd.
<i>Crane</i>	J. Cullen	General S.N. Co., Ltd.
* <i>Darlington</i>	W. Brown	Associated Humber Lines, Ltd.
<i>Deal</i>	J. Allan	British Transport Commission
<i>Devon Coast</i>	W. Grogan	Coast Lines, Ltd.
<i>Drake</i>	R. Fookes	General S.N. Co., Ltd.
* <i>Dryburgh</i>	G. Simpson	G. Gibson & Co., Ltd.
<i>Duke of Argyll</i>	W. N. Greenwood	British Transport Commission
<i>Duke of Lancaster</i>	J. Irwin, R.D.	British Transport Commission
<i>Duke of Rothesay</i>	H. Thomson	British Transport Commission
* <i>Duke of York</i>	R. Good	British Transport Commission
<i>Empire Nordic</i>	W. H. Laws	Atlantic S.N. Co., Ltd.
<i>Esso Poole</i>	J. S. Clark	Esso Petroleum Co., Ltd.
<i>Falaise</i>	C. E. Hatchley	British Transport Commission
<i>Fauvic</i>	H. S. Shugar	Channel Shipping, Ltd.
<i>Ferryhill</i>	J. Innes	Aberdeen Coal Shipping Co., Ltd.
* <i>Frisian Coast</i>	D. K. Wright	Tyne Tees Shipping Co., Ltd.
<i>Fruin</i>	L. Lamont	Wm. Sloan & Co., Ltd.
* <i>Fulham X</i>	D. Battie	Central Electricity Authority
<i>Golden Dawn</i>	A. Adamson, M.B.E.	A. Adamson, M.B.E.
<i>Goldfinch</i>	J. A. Furrett	General S.N. Co., Ltd.
<i>Guernsey Coast</i>	P. Meras	Coast Lines, Ltd.
* <i>Helmsdale</i>	A. Ross	Northern Trading Co., Ltd.
* <i>Heron</i>	E. C. Painter, D.S.C.	General S.N. Co., Ltd.
<i>Hesperus</i>	C. Campbell	Northern Lighthouse Board
<i>Hibernia</i>	E. A. Horspool	British Transport Commission
* <i>Hibernian Coast</i>	G. Mearns	Coast Lines, Ltd.
* <i>Hydracrete</i>	J. Johnston	Wm. Cory & Son, Ltd.
* <i>Iberian Coast</i>	G. J. Croxford	Tyne Tees Shipping Co., Ltd.
<i>Innisfallen</i>	T. McVeigh	City of Cork Steam Packet Co.
<i>Ionic Ferry</i>	W. Close	Atlantic S.N. Co., Ltd.
* <i>Irish Coast</i>	— Barry	Coast Lines, Ltd.
<i>Yade</i>	D. Miller	Wm. Robertson, Ltd.
<i>Jersey Coast</i>	H. G. Keilit	Coast Lines, Ltd.
<i>Karri</i>	D. Hill	W. N. Lindsay, Ltd.
<i>Kingsgate</i>	F. G. Norton	Hull Gates Shipping Co., Ltd.
<i>Lairdscrest</i>	W. J. Scott	Burns & Laird Lines, Ltd.
<i>Lairds Glen</i>	D. Campbell	Burns & Laird Lines, Ltd.
<i>Lairds Loch</i>	D. McCormack	Burns & Laird Lines, Ltd.
* <i>Lancashire Coast</i>	R. E. Holt	Coast Lines, Ltd.
<i>Lapwing</i>	W. Maybee	General S.N. Co., Ltd.
* <i>Leinster</i>	W. Boylan	British & Irish Steam Packet Co.
<i>Loch Ard</i>	J. MacLean	David MacBrayne & Co.
<i>Lochbroom</i>	D. Gunn	David MacBrayne & Co.
<i>Loch Carron</i>		David MacBrayne & Co.
<i>Lochee</i>	J. Morrison	Dundee Perth & London Shipping Co.
<i>Loch Limhe</i>	G. Coffey	J. Rainey, Ltd.
<i>Lochmoor</i>	D. Sinclair	David MacBrayne & Co.
* <i>Loch Seaforth</i>	J. Smith	David MacBrayne & Co.
<i>May</i>	R. Williamson	Northern Lighthouse Board
* <i>Melrose Abbey</i>	J. Blackburn	Associated Humber Lines, Ltd.
<i>Mitcham</i>	H. G. N. D’Evelin	South Eastern Gas Board
* <i>Munster</i>	J. Williams	British & Irish Steam Packet Co.
* <i>Mytongate</i>	S. H. Langford	Hull Gates Shipping Co., Ltd.
* <i>Netherlands Coast</i>	E. Fisher	Tyne Tees Shipping Co., Ltd.

* These ships report wind and weather.

'Marid' Ships (contd.)

NAME OF VESSEL	CAPTAIN	OWNER/MANAGER
<i>Ocean Coast</i>	G. R. Jones	Coast Lines, Ltd.
<i>Olivian Coast</i>	T. S. Stewart	Tyne Tees Shipping Co., Ltd.
<i>Orelia</i>	W. Backhouse	Houlder Bros., Ltd.
* <i>Pearl</i>	W. Campbell	Wm. Robertson, Ltd.
* <i>Peniland</i>	J. McClure	Currie Line, Ltd.
<i>Pharos</i>	C. Campbell	Northern Lighthouse Board
<i>Pluto</i>	E. Jones	Bristol S.N. Co., Ltd.
<i>Pole Star</i>	A. W. Walker	Northern Lighthouse Board
<i>Prince Louis</i>	H. G. de Chair, D.S.C.	Outward Bound Moray Sea Sch.
<i>Princess Maud</i>	R. Roberts	British Transport Commission
<i>Ringdove</i>	J. W. Klemp	General S.N. Co., Ltd.
* <i>Rollo</i>	D. H. Stokes	Ellerman's Wilson Line, Ltd.
<i>St. Andrew|St. David</i>	H. Coney	British Transport Commission
<i>St. Clair</i>	T. Gifford	North of Scotland Shipping Co., Ltd.
<i>St. Magnus</i>	J. Harvey	North of Scotland Shipping Co., Ltd.
<i>Sappho</i>	C. Knight	Bristol S.N. Co., Ltd.
<i>Sarnia</i>	C. Cartwright	British Transport Commission
* <i>Scotia</i>	A. M. Finlayson	Dept. of Agric. & Fisheries for Scotland
* <i>Scottish Coast</i>	J. S. Nicholson	Coast Lines, Ltd.
<i>Seamew</i>	W. Lockhart	General S.N. Co., Ltd.
* <i>Silvio</i>	J. Marrow	Ellerman's Wilson Line, Ltd.
<i>Slieve Bawn</i>	G. R. Gill	British Transport Commission
<i>Slieve Bearnagh</i>	D. A. Pontin	British Transport Commission
<i>Slieve Bloom</i>	A. R. Evans	British Transport Commission
<i>Slieve League</i>	G. Butterworth	British Transport Commission
<i>Slieve More</i>	J. R. Rowlands	British Transport Commission
* <i>Spray</i>	E. Andrews	Ellis & McHardy, Ltd.
<i>Stamsted</i>	E. Read	Stevenson Clarke, Ltd.
<i>Suffolk Coast</i>	H. Haxell	Tyne Tees Shipping Co., Ltd.
<i>Superiority</i>	J. Gardner	F. T. Everard & Sons, Ltd.
<i>Tay</i>	N. MacIver	Wm. Sloan & Co., Ltd.
* <i>Teano</i>	L. R. Stillwell	Ellerman's Wilson Line, Ltd.
<i>The President</i>	— Hay	J. Hay & Sons, Ltd.
<i>Thrift</i>	H. J. Tait	Northern Co-operative Society
* <i>Torquay</i>	G. Youngson	J. & A. Davidson, Ltd.
* <i>Whitby Abbey</i>	T. Boylan	Associated Humber Lines, Ltd.
* <i>Woodwren</i>	A. L. Ward	General S.N. Co., Ltd.

* These ships report wind and weather.

Training Establishments

The following is a list of Training Establishments in which the Cadets under training record observations in the Selected Ships' Meteorological Logbook.

ESTABLISHMENT	CAPTAIN/SUPERINTENDENT
<i>Conway</i> , H.M.S.	E. Hewitt, R.D., Capt. R.N.R.
Pangbourne Nautical College	A. F. P. Lewis, C.B.E., Capt. R.N. (Retd.)
Reardon Smith Nautical College	J. N. Rose, R.D., Lt. Cdr. R.N.R. (Retd.)
Warsash School of Navigation	G. W. Wakeford, M.B.E.
<i>Worcester</i> , H.M.S.	L. W. L. Argles, O.B.E., D.S.C., R.N. (Retd.)

Trawlers

The following is a list of trawler skippers and radio operators, who voluntarily observe and report those elements of the weather which do not entail the use of any meteorological instruments (irrespective of the vessels in which they sail).

SKIPPER	RADIO OPERATOR	TRAWLER OWNER/MANAGER
P. Craven	D. L. Verity	St. Andrew's Steam Fishing Co., Ltd.
J. E. Dobson	K. H. Massey	Thomas Hamling & Co., Ltd.
G. Eddom	J. H. Senior	St. Andrew's Steam Fishing Co., Ltd.
C. T. Hogg	K. Harrison	Kingston Steam Trawling Co., Ltd.
J. Hunt	J. Lester	Northern Trawlers, Ltd.
A. Jackson	G. A. Holiday	Kingston Steam Trawling Co., Ltd.
J. A. Kersey	R. R. N. Laing	Charleson-Smith Trawlers, Ltd.
J. Miller	A. Jagger	Thomas Hamling & Co., Ltd.
J. T. Nunn	G. Bovill	Northern Trawlers, Ltd.
D. Pougher	A. Jagger	Thomas Hamling & Co., Ltd.
M. Smith	J. Lester	Northern Trawlers, Ltd.
T. H. Spall	C. J. J. Youngs	Northern Trawlers, Ltd.
S. Sparks	K. H. Massey	Thomas Hamling & Co., Ltd.
B. Stepetic	L. Hought	St. Andrew's Steam Fishing Co., Ltd.
R. Waller	R. R. N. Laing	Charleson-Smith Trawlers, Ltd.
B. C. Wharam	L. Hought	St. Andrew's Steam Fishing Co., Ltd.
G. Whur	A. Ramsay	Charleson-Smith Trawlers, Ltd.

Light-vessels

NAME OF VESSELS	MASTERS
<i>Bar</i>	N. S. Burns, G. B. Calcutt
<i>Dowsing</i>	T. W. Dodd, W. R. Nobbs
<i>East Goodwin</i>	W. E. Harvey, G. Alp
<i>Galloper</i>	E. J. Winterflood, W. G. Burroughs
<i>Humber</i>	D. W. Bird, D. A. Bacon
<i>Longstone</i>	W. Mortimer
<i>Newarp</i>	G. A. Harris, W. E. Finn
<i>Royal Sovereign</i>	B. J. Key, L. V. Dawson
<i>St. Gowan</i>	H. C. L. Hall, R. C. Jones
<i>Seven Stones</i>	D. J. Harries, J. Davies
<i>Shambles</i>	A. C. Edwards
<i>Shipwash</i>	B. G. Simpson, J. Goldsmith
<i>Skulmartin</i>	J. O'Neill, J. K. Carley
<i>Smith's Knoll</i>	R. E. Say, B. E. Cunham

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 when in 'sparse areas'), which voluntarily co-operate with meteorological services of the British Commonwealth.

Information for these lists is required by 20th April each year. Information for the January corrective lists is required by 20th October each year.

AUSTRALIA (Information dated 3.10.61)

NAME OF VESSEL	OWNER
Selected Ships:	
<i>Aganemmon</i>	A. Holt & Co.
<i>Arafura</i>	E. & A. S.S. Co.
<i>Aros</i>	Wilhelmsen Agency Pty., Ltd.
<i>Bamora</i>	B.I.S.N. Co.
<i>Bermuda Trader</i>	Br. Phosphate Commns.
<i>Bulolo</i>	Burns Philp & Co.
<i>Canara</i>	B.I.S.N. Co.
<i>Carpentaria</i>	B.I.S.N. Co.
<i>Chakrata</i>	B.I.S.N. Co.
<i>Charon</i>	Dalgety & Co.
<i>Chupra</i>	B.I.S.N. Co.
<i>Citos</i>	Wilhelmsen Agency Pty., Ltd.
<i>Delos</i>	Wilhelmsen Agency Pty., Ltd.
<i>Gorgon</i>	Dalgety & Co.
<i>Koojarra</i>	W. A. State Shipping Ser.
<i>Koomilya</i>	McIl. McEach.
<i>Malaita</i>	Burns Philp & Co.
<i>Malay</i>	Blue Star Line
<i>Malekula</i>	Burns Philp & Co.
<i>Mandama</i>	Blue Star Line
<i>Milos</i>	Wilhelmsen Agency Pty., Ltd.
<i>Montoro</i>	Burns Philp & Co.
<i>Nankin</i>	P. & O.—Orient Line
<i>Nellore</i>	E. & A. S.S. Co.
<i>Orestes</i>	Dalgety & Co.
<i>Port Melbourne</i>	Gibbs, Bright & Co.
<i>Port New Plymouth</i>	Port Line, Ltd.
<i>Sarpedon</i>	Dalgety & Co.
<i>Shansi</i>	China Navigation Co., Ltd.
<i>Triadic</i>	Br. Phosphate Commns.
<i>Trienza</i>	Br. Phosphate Commns.
<i>Tulagi</i>	Burns Philp & Co.
<i>Wanganella</i>	Huddart Parker & Co.
<i>Wangara</i>	James Patrick & Co.
<i>Windarra</i>	James Patrick & Co.
Supplementary Ships:	
<i>Delamere</i>	W. A. State Shipping Ser.
<i>Dorrigo</i>	W. A. State Shipping Ser.
<i>Dulverton</i>	W. A. State Shipping Ser.
<i>Kabbarli</i>	W. A. State Shipping Ser.
<i>Koolama</i>	W. A. State Shipping Ser.

CANADA (Information dated 22.2.62)

NAME OF VESSEL	OWNER
Selected Ships:	
<i>A. T. Cameron</i>	Govt. of Canada
<i>Baffin</i>	Govt. of Canada
<i>Beaver Fir</i>	Canadian Pacific Steamships
<i>Bluenose</i>	Govt. of Canada
<i>Camsell</i>	Govt. of Canada
<i>Canberra</i>	Union S.S. Co. of New Zealand
<i>C. D. Howe</i>	Govt. of Canada
<i>Cyrus Field</i>	Western Union Telegraph Co.
<i>D'Iberville</i>	Govt. of Canada
<i>Edward Cornwallis</i>	Govt. of Canada
<i>Imperial St. Lawrence</i>	Imperial Oil, Ltd.
<i>Irving Brook</i>	Kent Lines, Ltd., Saint John, N.B.
<i>Irving Glen</i>	Kent Lines, Ltd., Saint John, N.B.
<i>John A. Macdonald</i>	Govt. of Canada
<i>Kapuskasing</i>	Govt. of Canada
<i>Labrador</i>	Govt. of Canada
<i>Lakemba</i>	Pacific Shipowners, Ltd., Suva, Fiji
<i>Letitia</i>	Donaldson Line, Glasgow
<i>Lord Kelvin</i>	Western Union Telegraph Co.
<i>Montcalm</i>	Govt. of Canada
<i>N. B. MacLean</i>	Govt. of Canada
<i>Northern Shell</i>	Shell Canadian Tankers, Ltd.
<i>Oriana</i>	Union S.S. Co., of New Zealand
<i>Port Dauphine</i>	Govt. of Canada
<i>Sir Humphrey Gilbert</i>	Govt. of Canada
<i>Sir William Alexander</i>	Govt. of Canada
<i>Sunbeam</i>	Saguenay Shipping, Ltd.
<i>Suva</i>	Pacific Shipowners, Ltd., Suva, Fiji.
<i>Thor I</i>	A. S. Thor Dahl, Sandefjord, Norway
<i>Thorshope</i>	A. S. Thor Dahl, Sandefjord, Norway
<i>Waihemo</i>	Union S.S. Co. of New Zealand
<i>Waitomo</i>	Union S.S. Co., of New Zealand
<i>Wolfe</i>	Govt. of Canada
Supplementary Ships:	
<i>Anna Bakke</i>	Knutsen Line, Norway
<i>Arcadia</i>	Union S.S. Co., of New Zealand
<i>Arthur Cross</i>	Dominion Steamship Co., Sydney, N.S.
<i>Banksland</i>	Hudson's Bay Co.
<i>Bougainville</i>	A. F. Klaveness & Co., Oslo
<i>Bonneville</i>	A. F. Klaveness & Co., Oslo
<i>Bronxville</i>	A. F. Klaveness & Co., Oslo
<i>Emerillon</i>	Shell Canadian Tankers
<i>Indiana</i>	Saguenay Shipping, Ltd.
<i>Princess Helene</i>	Canadian Pacific Railways
<i>Sunadele</i>	Saguenay Shipping, Ltd.
<i>Sunnyville</i>	A. F. Klaveness & Co., Oslo
<i>Sunprincess</i>	Saguenay Shipping, Ltd.
<i>Thorsriver</i>	A. S. Thor Dahl, Sandefjord, Norway
<i>Thorstream</i>	A. S. Thor Dahl, Sandefjord, Norway
<i>Varda</i>	A. S. Thor Dahl, Sandefjord, Norway
<i>Ventura</i>	H. Ditlev-Simonsen, Oslo
<i>Vigan</i>	H. Ditlev-Simonsen, Oslo
<i>Whitethroat</i>	Govt. of Canada
<i>William Carson</i>	Canadian National Railways

Auxiliary Ships:

Canada has 16 ocean-going Auxiliary Ships, and 21 Auxiliary Ships operating on the Great Lakes.

INDIA (Information dated 19.4.62)

NAME OF VESSEL	OWNER
Selected Ships:	
<i>Amra</i>	British India S.N. Co., Ltd.
<i>Andemans</i>	Shipping Corporation of India, Ltd.
<i>Bahadur</i>	Asiatic S.N. Co., Ltd.
<i>Bharatmitra</i>	Bharat Line, Ltd.
<i>Bharatratna</i>	Bharat Line, Ltd.
<i>Daresa</i>	British India S.N. Co., Ltd.
<i>Dumra</i>	British India S.N. Co., Ltd.
<i>Dwarka</i>	British India S.N. Co., Ltd.
<i>Indian Exporter</i>	India S.S. Co., Ltd.
<i>Indian Merchant</i>	India S.S. Co., Ltd.
<i>Indian Pioneer</i>	India S.S. Co., Ltd.
<i>Indian Reliance</i>	India S.S. Co., Ltd.
<i>Indian Shipper</i>	India S.S. Co., Ltd.
<i>Indian Trader</i>	India S.S. Co., Ltd.
<i>Islami</i>	Mogul Line, Ltd.
<i>Jalazad</i>	Scindia S.N. Co., Ltd.
<i>Jaladharna</i>	Scindia S.N. Co., Ltd.

INDIA (contd.)

NAME OF VESSEL	OWNER
<i>Jaladhruv</i>	Scindia S.N. Co., Ltd.
<i>Jalaketu</i>	Scindia S.N. Co., Ltd.
<i>Jalamanjiri</i>	Scindia S.N. Co., Ltd.
<i>Jalapadma</i>	Scindia S.N. Co., Ltd.
<i>Jalapakash</i>	Scindia S.N. Co., Ltd.
<i>Jalaputra</i>	Scindia S.N. Co., Ltd.
<i>Jalausha</i>	Scindia S.N. Co., Ltd.
<i>Jalavihar</i>	Scindia S.N. Co., Ltd.
<i>Jalawahar</i>	Scindia S.N. Co., Ltd.
<i>Kampala</i> [U.K.]	British India S.N. Co., Ltd.
<i>Karanja</i> [U.K.]	British India S.N. Co., Ltd.
<i>Mahadevi</i> [U.K.]	Asiatic S.N. Co., Ltd.
<i>Mohammedi</i> [U.K.]	Mogul Line, Ltd.
<i>Mozaffari</i> [U.K.]	Mogul Line, Ltd.
<i>Nicobar</i>	Shipping Corporation of India, Ltd.
<i>Pradeep</i>	Dept. of Lighthouses and Lightships; Govt. of India
<i>Rajula</i> [U.K.]	British India S.N. Co., Ltd.
<i>Samthia</i> [U.K.]	British India S.N. Co., Ltd.
<i>Saudi</i>	Mogul Line, Ltd.
<i>Sirdhana</i> [U.K.]	British India S.N. Co., Ltd.
<i>State of Bombay</i>	Shipping Corporation of India, Ltd.
<i>State of Kutch</i>	Shipping Corporation of India, Ltd.
<i>State of Madras</i>	Shipping Corporation of India, Ltd.
<i>State of Orissa</i>	Shipping Corporation of India, Ltd.
<i>State of Travancore</i>	Shipping Corporation of India, Ltd.
<i>Subadar</i> [U.K.]	Asiatic S.N. Co., Ltd.
<i>Umaria</i> [U.K.]	British India S.N. Co., Ltd.
Supplementary Ships:	
<i>Bharatbhushan</i>	Bharat Line, Ltd.
<i>Bharatdeepak</i>	Bharat Line, Ltd.
<i>Bharatram</i>	Bharat Line, Ltd.
<i>Bharatveera</i>	Bharat Line, Ltd.
<i>Bharatvijaya</i>	Bharat Line, Ltd.
<i>Indian Commerce</i>	India S.S. Co., Ltd.
<i>Indian Endeavour</i>	India S.S. Co., Ltd.
<i>Indian Industry</i>	India S.S. Co., Ltd.
<i>Indian Renown</i>	India S.S. Co., Ltd.
<i>Indian Resolve</i>	India S.S. Co., Ltd.
<i>Indian Resource</i>	India S.S. Co., Ltd.
<i>Indian Security</i>	India S.S. Co., Ltd.
<i>Indian Splendour</i>	India S.S. Co., Ltd.
<i>Indian Strength</i>	India S.S. Co., Ltd.
<i>Indian Success</i>	India S.S. Co., Ltd.
<i>Indian Tradition</i>	India S.S. Co., Ltd.
<i>Indian Triumph</i>	India S.S. Co., Ltd.
<i>Indian Trust</i>	India S.S. Co., Ltd.
<i>Yag Ganga</i>	Great Eastern Shipping Co., Ltd.
<i>Yag Jivan</i>	Great Eastern Shipping Co., Ltd.
<i>Yag Laxmi</i>	Great Eastern Shipping Co., Ltd.
<i>Yag Mitra</i>	Great Eastern Shipping Co., Ltd.
<i>Yag Ram</i>	Great Eastern Shipping Co., Ltd.
<i>Yag Tara</i>	Great Eastern Shipping Co., Ltd.
<i>Yaladhana</i>	Scindia S.N. Co., Ltd.
<i>Yaladharti</i>	Scindia S.N. Co., Ltd.
<i>Yaladhanya</i>	Scindia S.N. Co., Ltd.
<i>Yaladhir</i>	Scindia S.N. Co., Ltd.
<i>Yaladuhita</i>	Scindia S.N. Co., Ltd.
<i>Yaladurga</i>	Scindia S.N. Co., Ltd.
<i>Yalagovind</i>	Scindia S.N. Co., Ltd.
<i>Yalakanta</i>	Scindia S.N. Co., Ltd.
<i>Yalakrishna</i>	Scindia S.N. Co., Ltd.
<i>Yalamani</i>	Scindia S.N. Co., Ltd.
<i>Yalamayur</i>	Scindia S.N. Co., Ltd.
<i>Yalamudra</i>	Scindia S.N. Co., Ltd.
<i>Yalaprabha</i>	Scindia S.N. Co., Ltd.
<i>Yalaprataap</i>	Scindia S.N. Co., Ltd.
<i>Yalapushpa</i>	Scindia S.N. Co., Ltd.
<i>Yalarajendra</i>	Scindia S.N. Co., Ltd.
<i>Yalvallah</i>	Scindia S.N. Co., Ltd.
<i>Yalaveer</i>	Scindia S.N. Co., Ltd.
<i>Yalavijaya</i>	Scindia S.N. Co., Ltd.
<i>Yalavishnu</i>	Scindia S.N. Co., Ltd.
<i>Yalavikram</i>	Scindia S.N. Co., Ltd.
<i>Vishwajyoti</i>	Shipping Corporation of India, Ltd.
<i>Malika</i> [U.K.]	Asiatic S.N. Co., Ltd.
<i>Rajah</i> [U.K.]	Asiatic S.N. Co., Ltd.
<i>Ranee</i> [U.K.]	Asiatic S.N. Co., Ltd.
<i>State of Andhra</i>	Shipping Corporation of India, Ltd.
<i>State of Assam</i>	Shipping Corporation of India, Ltd.
<i>State of Bihar</i>	Shipping Corporation of India, Ltd.
<i>State of Uttar Pradesh</i>	Shipping Corporation of India, Ltd.
<i>State of Gujrat</i>	Shipping Corporation of India, Ltd.
<i>Vishvakirti</i>	Shipping Corporation of India, Ltd.
<i>Vishva Prabha</i>	Shipping Corporation of India, Ltd.
<i>Vishva Usha</i>	Shipping Corporation of India, Ltd.

HONG KONG (Information dated 30.3.62)

NAME OF VESSEL	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
Anking	V. R. Woolfe	J. Lough, J. H. Gomersall, H. A. Feather	Lum A. Gwan Ying	China Navigation Co., Ltd.
Asahan	A. J. Keddie	B. A. Owen, R. J. Smith, J. H. Gunn	Chan Yeung Choi	China Navigation Co., Ltd.
Changsha	W. E. Hargrave	P. S. Fleming, D. J. V. Packman, H. J. Stagg	Kwan Hok Chung	China Navigation Co., Ltd.
Chefoo	M. D. Burbidge	K. H. Nettleship, D. H. Hulme, D. W. Boys	Lau Yan Kee	China Navigation Co., Ltd.
Chekiang	J. R. Kidd	J. K. Davies, B. C. Maloney, M. de G. Waymouth	Chin Fook On	China Navigation Co., Ltd.
Chengtu	J. A. McDonald	A. T. Tugwell, A. W. McLauchlan, N. Bohill	Wai Pun Un	China Navigation Co., Ltd.
Chungking	A. V. Harrison	D. R. Owens, D. S. Thomson, B. Stook	Tsang Pui Leung	China Navigation Co., Ltd.
Clara Yebson	R. Nielsen	E. Aabenhus, N. E. Moeller, J. E. Thomas	Ong Sze Chin	Jebsen & Co.
Dana	L. Hetland	I. J. Apeland, A. Grimstedt, H. Bjordal	Wong Chi Hung	T. H. Nordboe
Eastern Argosy	J. F. G. Fotheringham	R. C. Hoggard, R. G. Sanderson, R. L. McKenzie	A. P. Burns	Indo-China S.N. Co., Ltd.
Eastern Glory	T. C. W. Marr	E. E. Ewbank, S. J. Sanson, M. L. Olesen	T. A. O'Donnell	Indo-China S.N. Co., Ltd.
Eastern Maid	W. G. White	R. N. Maund, R. J. W. Raudon, I. H. F. Lowe	K. D. Cullen	Indo-China S.N. Co., Ltd.
Eastern Muse	W. E. Reeve	P. R. Williamson, M. G. Bishop, A. T. Webb	M. Stephenson	Indo-China S.N. Co., Ltd.
Eastern Queen	F. H. Main	D. Wilson, G. A. Roddam, W. J. M. Attrill	J. F. Fitzgerald	Indo-China S.N. Co., Ltd.
Eastern Rover	D. G. R. Kinnear	G. C. Taylor, G. Mitchell, T. N. Hubble	R. O. Smith	Indo-China S.N. Co., Ltd.
Eastern Saga	W. J. Bartlett	I. D. R. Witachi, D. Smith, T. N. Hubble	E. A. Dunford	Indo-China S.N. Co., Ltd.
Eastern Star	M. I. Groundwater	B. O. Jensen, D. R. Cole, M. G. Lever	H. E. Brookfield	Indo-China S.N. Co., Ltd.
Eastern Trader	M. J. K. Crichton	I. P. Skipp, J. A. C. Hunter, B. T. Scarbrough	R. B. Field	Indo-China S.N. Co., Ltd.
Elsbeth	A. C. Tai	B. S. Fitzgibbon, Woo Ting Po	Wong Kam Bui	Shun Cheong S.N. Co., Ltd.
Fengning	D. W. R. Gash	D. T. Hollands, D. A. Isaacs, D. Lee	Li San Kau	China Navigation Co., Ltd.
Fengtien	M. W. Lewis	C. I. N. Darch, M. C. Sherman, C. T. Lu	Tam Tin Yiu	China Navigation Co., Ltd.
Foochow	M. R. M. Seale	R. Porter, P. Matthews, W. K. Li	Yue Shiu Ming	China Navigation Co., Ltd.
Fukien	M. M. K. Kelly	R. J. Shipp, T. J. Wilson, R. D. Keene	Choi Pong Cheung	China Navigation Co., Ltd.
Funing	L. L. Watson	T. R. Gilchrist, W. B. Jones, M. Bufton	Chan Wai Keung	China Navigation Co., Ltd.
Hai Hing	O. Andersén	A. Øverland, O. J. Strømness, H. Isaksen	Chung Yeuk	Norwegian Asia Line
Hai Lee	N. O. Wilhelmssen	R. L. Andersen, K. Melbø, Fredrik Filsk	Chan Wue Lu	Norwegian Asia Line
Hai Meng	N. O. Wilhelmssen	T. Eikeland, Ivar Henrik Buer, Kai G. Pedersen	Chan Kam Tsun	Norwegian Asia Line
Hallador	E. Nordendal	Jan Roald Pedersen, B. M. Nybakk, J. Riverud	T. Nötland	Norwegian Asia Line
Hang Sang	L. C. Cox	N. J. M. Wilson, J. B. Skerrett, S. J. Goodchild	P. Erkeseth	Norwegian Asia Line
Hanyang	J. Keates	J. R. Rayner, F. R. Neal, S. M. Ho	A. P. MacIsaac	Indo-China S.N. Co., Ltd.
Heinrich Jessen	G. J. Andersen	L. H. Nielsen, A. Jensen, W. Schmidt	Lai Mou Wah	China Navigation Co., Ltd.
Helios	Ake Sjøberg	O. Skaugstad, G. Knutzen, Niels Kaaber	Leung Tjeuk Shing	Jebsen & Co.
Henrik	O. Holm Andersen	Arne Johnsen, Kåre M. Knutzen, Sverre Eikeland	Ip Yuk Fai	Norwegian Asia Line
Hermod	O. J. Apold	J. Kråkmo, J. Bentzen, Torleif Egeland	Chui Tze Kong	Norwegian Asia Line
Hervar	O. Saltvold	Arne Solbæk, Odd N. Roli, A. Jensen	Poon Chee Pooi	Norwegian Asia Line
Hew Sang	T. H. Nichols	R. W. Gibson, J. S. Heathcote, R. Cha-Wan Yu	Lai Kwong Yin	Norwegian Asia Line
Hin Sang	P. J. Sullivan	P. A. Donohoe, R. E. Jones, Hau Chien Szu	A. N. Butcher	Indo-China S.N. Co., Ltd.
Ho Sang	R. Tasker	I. F. Kite, D. N. Greenhalgh, T. Y. Yuan	J. S. Mathers	Indo-China S.N. Co., Ltd.
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Jacob Yebson	H. P. Fallesen	H. J. Laigaard, J. E. Soerensen	M. Amundsen	Indo-China S.N. Co., Ltd.
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Kota Bahru	J. E. Williams	H. S. Paul	N. S. Sane	Jebsen & Co.
Kuala Lumpur	G. Baxter	J. R. D. Sandison, W. F. Jeffrey, A. L. Carter	Siu Ping Wah	Great Southern Steamship Co., Ltd.
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Kwangtung	J. M. Parker	R. Kennett, W. R. Smith, I. D. Goddard	Shiu Ping Fan	China Navigation Co., Ltd.
Kwai-chow	F. Cunningham	D. G. Langdon, C. C. L. Sims, W. J. Wade	Lo Kin Chek	China Navigation Co., Ltd.
Kwelin	A. Watson	I. F. Reilly, C. A. Flavell, R. Harrop	Omar Ismail	China Navigation Co., Ltd.
Leo	P. A. Perswallid	H. B. Lundin, K. A. Ejlertsen, N. A. Blonde	Wong Woon Man	China Navigation Co., Ltd.
			S. K. G. Stormmen	Everett S.S. Corporation S/A

NEW ZEALAND (Information dated 2.4.62)

NAME OF VESSEL	OWNER
Selected Ships:	
<i>Kaimanawa</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Kaimiro</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Kaitoa</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Kaitoke</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Kaituna</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Karamu</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Karitane</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Katea</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Kauri</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Kawaroa</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Kawatiri</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Kawerau</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Komata</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Koraki</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Koranui</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Koromiko</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Kowhai</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Kurow</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Kurutai</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Matua</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Moana Roa</i>	New Zealand Govt.
<i>Port Montreal</i>	Port Line, Ltd.
<i>Saracen</i>	Crusader Shipping Co., Ltd.
<i>Tarawera</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Tofua</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Waikare</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Waimate</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Waimea</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Waipori</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Wairata</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Wairimu</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Waitemata</i>	Union S.S. Co. of New Zealand, Ltd.
Supplementary Ships:	
<i>City of Auckland</i>	Ellerman & Bucknall S.S. Co., Ltd.
<i>Holmburn</i>	Holm & Co.

Auxiliary Ships:
New Zealand has 11 Auxiliary Ships.

PAKISTAN (Information dated 1.1.62)

NAME OF VESSEL	CALL SIGN
Selected/Supplementary Ships:	
<i>Al-Hasan</i>	AQAN
<i>Al-Husaini</i>	AQAH
<i>Al-Sayyada</i>	AQAS
<i>Anwarbaksh</i>	AQAM
<i>Dacca City</i>	AQED
<i>Fatehabad</i>	AQEM
<i>Jahangirabad</i>	AQEN
<i>Maulabaksh</i>	AQBP
<i>Mustali</i>	AQLY
<i>Ocean Endurance</i>	AQBW
<i>Pakistan Prosperity</i>	AQAZ
<i>Safina-e-Nusrat</i>	AQLM
<i>Safina-e-Hujjaj</i>	AQLW
<i>Shams</i>	

Auxiliary Ships:
Pakistan has 20 Auxiliary Ships.

WEST INDIES (Information dated 4.4.61)

NAME OF VESSEL	OWNER
<i>Lady Denison Pender</i>	Cable & Wireless, Ltd.

Meteorological Office (Marine Division) Atlases

The following are published by the Marine Division of the Meteorological Office and may be purchased from the bookshops of Her Majesty's Stationery Office at any of the addresses on the title page. Copies are available for reference by shipmasters and shipowners in the offices of Port Meteorological Officers.

Meteorological Atlases

Monthly Meteorological Charts of the Atlantic Ocean. M.O.483, 1948, reprinted 1959. (60°S–70°N, 80°W–40°E) 180s. (post 3s. 3d.)

Monthly Meteorological Charts of the Western Pacific. M.O.484, 1945, reprinted 1956. (60°S–60°N, 100°E–155°W) (16½" × 23½") 105s. (post 2s. 9d.)

Monthly Meteorological Charts of the Eastern Pacific. M.O.518, 1950, reprinted 1956. (60°S–60°N, 160°W–60°W) (17½" × 24½") 147s. (post 3s. 3d.)

Monthly Meteorological Charts of the Indian Ocean. M.O.519, 1949, reprinted 1959. (50°S–30°N, 20°E–120°E) (16½" × 22½") 126s. (post 2s. 9d.)

The above four atlases contain monthly charts of wind, barometric pressure, air and sea temperature, and other meteorological elements including some typical tracks of tropical revolving storms.

Monthly Sea Surface Temperatures and Surface Current Circulation of the Japan Sea and Adjacent Waters. M.O.M.447, 1950. (20°N–47°N, 110°E–150°E) (20" × 17") 7s. 6d. (post 9d.)

Monthly Sea Surface Temperatures of Australian and New Zealand Waters. M.O.516, 1949. (50°S–10°S, 100°E–180°) (19½" × 12½") 10s. (post 7d.)

Monthly Sea Surface Temperature of the North Atlantic. M.O.527, 1949, reprinted 1950. (30°N–68°N, 80°W–15°E) (19½" × 12½") 10s. (post 7d.)

Monthly Meteorological Charts and Sea Surface Current Chart of the Greenland and Barents Seas. M.O.575, 1959. (60°N–80°N, 30°W–120°E) 126s. (post 2s.)

This atlas contains a generalised surface current chart for the area and monthly charts of wind, barometric pressure, air and sea temperature, and other meteorological elements.

Current Atlases

Currents of the Indian Ocean. M.O.392, 1939, reprinted 1956. (50°S–30°N, 20°E–140°E) (30" × 20") 10s. (post 7d.)

South Pacific Ocean Currents. M.O.435, 1938, reprinted 1959. (60°S–0°, 140°E–70°W) (22" × 34") 12s. 6d. (post 1s.)

The above two atlases contain quarterly "current arrow" and "current rose" charts.

Quarterly Surface Current Charts of the Atlantic Ocean. M.O.466, 1945, reprinted 1957. (60°S–70°N, 80°W–20°E) (22½" × 18") 32s. 6d. (post 1s. 6d.)

Quarterly Surface Current Charts of the Western North Pacific Ocean with monthly chartlets of the China Seas. M.O.485, 1949. (0°–60°N, 98°E–160°W) (21" × 16") 35s. (post 11d.)

Quarterly Surface Current Charts of the Eastern North Pacific. M.O.655, 1959. (0°–60°N, 160°W–65°W) (23" × 17") 15s. (post 10d.)

The above three atlases contain current rose charts, predominant current charts, and vector mean current charts.

Ice Atlases

(Monthly Ice Charts of the Arctic Seas. M.O.M.390a, 1944. (60°N–80°N, 80°W–110°E) (12" × 7") 3s. 6d. (post 5d.)

Polar ice, mean limits of sea ice, extreme limits of sea ice, extreme limits of bergs.

Monthly Ice Charts of Western North Atlantic. M.O.478, 1944. (37°N–53°N, 72°W–35°W) (12" × 7½") 4s. (post 7d.)

Mean limits of pack, extreme limits of pack, mean limits of bergs, extreme limits of bergs.

Climatological Charts

Climatological and Sea-Surface Current Charts of the North Atlantic Ocean. M.O.615, 1958. (5°S–60°N, 100°W–40°E) (40" × 25", folded to 13" × 8") 36s. the set (37s. with folder) (post 1s. 2d.)

One chart for each month, based on information in M.O. 483, M.O. 466 and M.O. 478 (above).

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