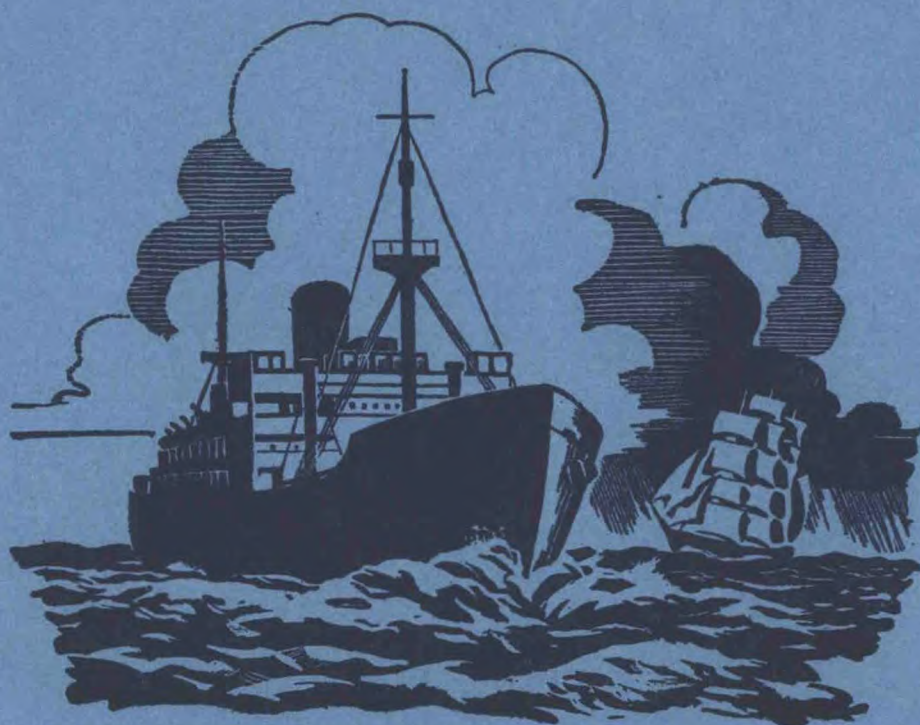


M.O. 736

The Marine Observer

*A quarterly journal of Maritime
Meteorology*



Volume XXXIII No. 201

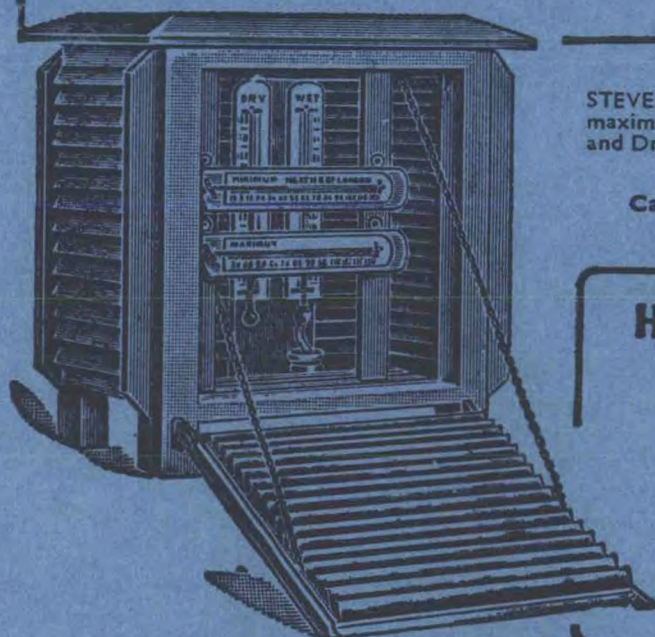
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THE MARINE OBSERVER

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

VOL. XXXIII

No. 201

JULY 1963

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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*

Published for the Meteorological Office by
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Editorial

That Was The Winter That Was! And there can't be very many people in the United Kingdom and neighbouring European countries who are sorry it is over, unless they are very devoted skating or ski-ing enthusiasts. And it wasn't only the cold which caused the British climate to further tarnish its rather bad reputation; fog also played a notable part in mid-December.

This was the winter when the climatologist and his meteorological statistics came to the fore. During much of the time, the situation seemed so static that the forecasters' story was largely one of rather depressing repetition. The British love of talking about the weather concentrated on conjectures and recollections from personal experience or making official enquiries about past records of such items as what was the coldest winter or the longest period of cold weather ever recorded.

The four-day period of fog ended on 4th December and the shipping papers inferred that this fog caused the biggest hold-up in the Thames ever recorded. When it cleared there were about 100 ships in the river waiting to go to sea and a similar number in the estuary waiting to get up the river. This long delay must have had quite a serious economic effect, in view of the high cost of operating ships nowadays. The reports indicate that the VHF link for consultation between ships and the Thames Navigation Service proved extremely useful. On one occasion the fog was so thick that it was said that crane drivers couldn't see well enough to unload a ship safely—and this caused a labour dispute!

On 22nd December, a rapid fall of temperature, which during the previous two weeks had been about average for the time of year, marked the beginning of the long period of cold wintry weather with many days' temperatures over most of the country near or below freezing. This cold spell continued with little interruption until the first week of March. During this period, the weather tended to be dominated by anticyclones over Scandinavia and near Iceland, which maintained winds over the British Isles from an easterly or northerly point, the recurring blizzards being associated with small but active depressions. The snowfall was heavy at times and winds frequently became fresh or strong, causing much drifting of the snow; this caused considerable hardship and transport dislocation in many districts (particularly in Devonshire). Towards the end of the cold spell, rivers became frozen over and ice formed at the approaches to many British harbours and in docks, with the result that in some cases ice-breakers had to be used. On March 6th, a welcome depression from the Atlantic arrived to bring generally warmer weather.

A meteorological station which is fairly representative of Britain and at which records have been maintained for many years is Kew. In January 1963, the mean temperature there was 30°F (33.1° by day and 27.1° by night); this made it the coldest January at Kew since 1828. And the mean air temperature for December, January and February was 33.3°F, making these three months the coldest since 1829-30 when the mean was 32.1°F. February 1947 and December 1891 were equally cold and February 1855 somewhat colder. All these statistics confirm what most of us felt—that it was an exceptionally cold and unpleasant winter! Sartorial evidence of this was provided by the popularity of fur hats for men—an unusual headwear for Englishmen. And one can hope that the authorities responsible for transport arrangements, heating (and building) will have learned useful lessons from this rather savage meteorological display, to the benefit of all concerned.

If the weather was severe in Britain it was worse on the Continent and as far as shipping was concerned, the most severe result was probably the effect on navigation. Ice in the Baltic was thicker and more extensive than usual and the important waterways like the Elbe, Kiel Canal and the approaches to Rotterdam were obstructed for long periods with heavy ice. There was quite a lot of heavy ice in the vicinity of the Elbe Light-Vessel for example.

There wasn't much trouble with ice on the Thames, but we are reminded that in 1683, 1739-40, 1789 and 1814 the Thames was frozen over solid in the vicinity of London Bridge and there are paintings in the Meteorological Office showing the frost fair on the Thames in those years. These were reproduced in the July and October numbers of *The Marine Observer* in 1949. It seems that the reason the Thames doesn't freeze over now is that the large number of spans of old London Bridge no longer restrict the flow of the river, and also that the river temperature has risen owing to industrial and other discharges into the river. Moreover, the width of the river has been decreased artificially causing a swifter flow.

The economic effects of such severe cold as occurred last winter upon the transport of goods and upon the shipping industry in particular is considerable and may include:—

- (a) delays in inland transport due to snow and ice on road and rail or (not a very important item in Britain) frozen canals and rivers and consequent delay in delivery of cargo to the ships or to the importers respectively, and
- (b) navigational delays and possible damage to the ship due to ice in estuaries, rivers and docks.

There is also the risk of damage to goods susceptible to extreme cold when awaiting shipment or when awaiting inland transport from the docks after discharge from the ship. A further effect may be the slowing up of cargo work due to physical hardship to the stevedores.

All these economic considerations affect not only shippers and importers and ship owners but marine insurance interests also and they were rightly given quite a lot of attention in the shipping press during and after the cold spell. It was study of the shipping press that inspired this editorial.

Winter conditions as described above, being so unusual in Britain, caused more dislocation to traffic and difficulties generally than would be the case in a country where such conditions are more frequent. But wherever they occur, economic consequences are bound to be considerable, involving such matters as the provision of ice-breakers, heating in warehouses, road and rail clearance, etc. A winter such as this makes one realise how fortunate Britain is climatologically, thanks to the North Atlantic drift.

The article on page 145 shows how valuable a single observation from a ship can be, at times, to the forecaster, in a suddenly changing meteorological situation. But regular and accurate ships' observations are always valuable—even in more or less static situations, such as occurred during this last winter. Nobody knows when such a situation is going to change, but the first ray of hope that the forecaster has to indicate a change may be the wind or pressure reading from a ship out in the Atlantic.

Continued efforts are being made by the meteorologists of many countries to evolve a consistently reliable long range forecast system—for (say) a month ahead—but so far these efforts haven't proved very successful, although there have been spectacular exceptions. The economic advantage of being able to anticipate the cold spell of 1963 a month ahead would be obvious. Much research is being done into long range forecasting and climatology plays an important part in this. Regular and accurate observations from the oceans, such as are provided by our Selected Ships make a big contribution to these studies. For example, to find good climatological analogues, the meteorologist needs to go back a century or more—and ships' observations have proved very useful in making such comparisons.

C. E. N. F.

Report of Work for the Year ended 31st December 1962

(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:

- (a) 475 Selected Ships which are supplied on loan with a full set of meteorological instruments and which make observations in code form F.M.21A every six hours and transmit them by radio to the appropriate coastal radio stations wherever their voyages take them.
- (b) 50 Supplementary Ships which make less detailed 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) 126 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 the coasting 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 two only record their observations for climatological purposes. The *Dowsing*, *Galloper* and *Royal Sovereign* light-vessels now make barometric pressure observations using the new precision aneroid, and their reports are included in the B.B.C. five-minute weather bulletins for shipping.
- (e) 17 trawlers which make visual observations only (no instruments being needed) and transmit them by w/T or R/T in code form F.M.23B to radio stations in the U.K., Canada, Iceland, Norway or U.S.S.R. depending on the area in which they are fishing.
- (f) 69 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.

This total of 750 ships represent 19% of the world's total of about 4,000 voluntary observing ships. There has been a gratifying increase in the number of auxiliary ships recruited during the year, mainly ships which voyage in the Indian Ocean whose observations will make a useful contribution to the work of the International Indian Ocean Expedition which continues until the end of 1964.

The recruiting of the ships, instructing the officers in their voluntary observing duties and supplying 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, where possible, they have between them visited each British voluntary observing ship every three months. During these visits newly joined officers are instructed as necessary in the voluntary observing duties and when possible the radio officers are also visited.

By arrangement with the Hydrographer of the Navy and the Director of the Naval Weather Service, H.M. Survey Ships are now keeping the same type of meteorological logbook and regularly sending weather observations by radio as British Selected Ships. These vessels which use their own tested instruments do not form part of the voluntary observing fleet but their observations are of great value as many of them are made in areas of the world where observations are sparse.

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

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

Australia	107	S. America	38
Far East	65	Pacific Coast of N. America ..	10
Persian Gulf	29	Europe	41
S. Africa	33	Falkland Islands and Antarctic	6
N. Atlantic	93	World-wide 'tramping'	74
W. Indies	24		

The map on page 106 shows the position of British Selected Ships in various parts of the world on 10th May 1962 (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 Bracknell during the year from merchant ships.

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	85
'Marid' ships (coasting vessels)	12
Foreign ships	23
Trawlers	6
Total	126
(b) North Sea (51° 30'N to 61°N and 4°W to 7° 30'E)	
U.K. Selected and Supplementary Ships	8
'Marid' ships (coasting vessels)	4
Trawlers	2
Total	14
(c) Light-vessels	34

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

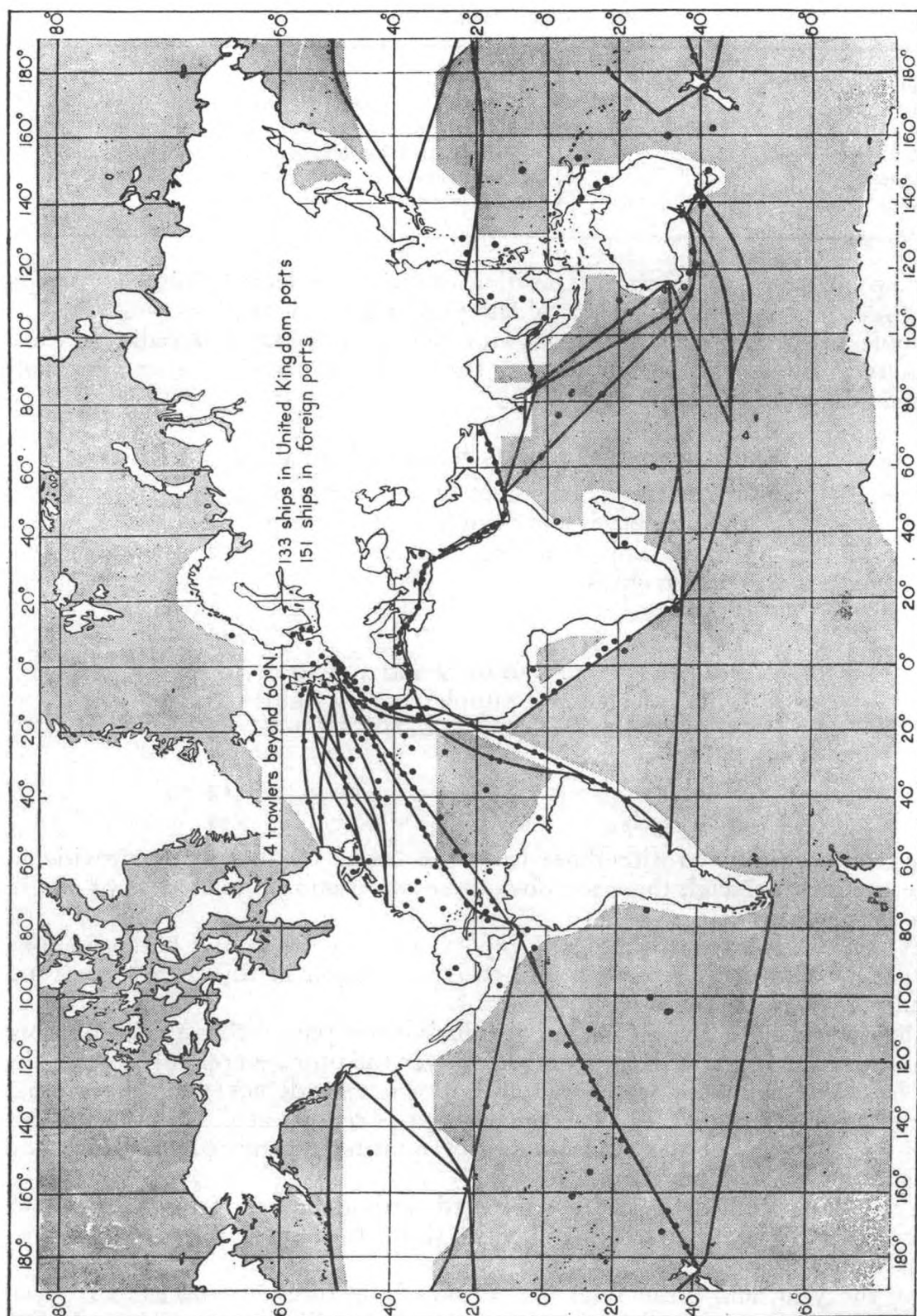
The North Sea is an area where ship reports are very useful, but because ships' officers are usually busily occupied with their navigation in this area reports are not as numerous as we would wish.

British trawlers have given good service during the year, although the number of reports received in the U.K. is somewhat fewer than for several years. With the difficult nature of their work, which we fully appreciate, we do not expect the number of reports to be spectacular. The average number of reports at U.K. radio stations was 248 per month, but the total number of reports transmitted to British and foreign stations was 608 per month.

1,007 meteorological logbooks were received during the year from ships of the voluntary observing fleet, the scrutiny of which shows the high standard of observing has been maintained.

During the year, and throughout the period of the International Indian Ocean Expedition (1962 to 1964), Selected and Supplementary Ships, when in the Indian Ocean, were requested to make a point of recording all precipitation in the meteorological logbook, using the Beaufort notation and giving the time precipitation begins and ends, thus providing useful data for a more detailed investigation into the cause of monsoon winds and rains than is at present possible.

Although there has been a small decrease in the number of selected ships and



The positions of U.K. Selected and Supplementary Ships on 10th May 1962 (a day picked at random). The shaded areas are those in which shipping is sparse, and in which Auxiliary Ships make reports.

trawlers during the year for reasons beyond our control, the number of 'Marid' and auxiliary vessels recruited has shown an encouraging increase. Selected and Supplementary Ships fitted with pitometer logs have made special ocean current observations to assist us to improve the accuracy of our method of determining surface currents; the ocean weather ships have also made a useful contribution to this work. Many interesting auroral and other special phenomena observations have been observed from the voluntary observing fleet during the year.

A study has been made during the year of the economies claimed by the U.S.A. and Netherlands authorities as a result of weather routeing some of their merchant ships. The master of a weather routed ship is given a suggested route to follow by a shore-based marine meteorologist specially trained in this work. The master is then kept advised throughout the voyage by radio as to what alterations of course, if any, are considered best to gain the maximum advantage from the weather forecast for the next two or three days ahead of his ship's position. For weather routeing to be effective it seems desirable that the ship be fitted with facsimile receiving equipment to enable the master to have readily available to him the latest weather maps, so that he can judge for himself the wisdom of following the track advised and can inform the routeing officer by radio of any apparent error in the forecast or if he departs from the suggested track. The Marine Division in consultation with the Climatological Services Branch has studied the subject in some detail and has done some experimental weather routeing on paper with imaginary ships and the aid of synoptic weather maps and medium range forecasts prepared by the Synoptic Services Branch and synoptic wave maps kindly supplied by the Netherlands Meteorological Service. These experiments have so far produced rather inconclusive results but the branches concerned are continuing their study of this problem in consultation with their Netherlands colleagues.

2. Ocean Weather Ships

British ocean weather ships completed 15 years' service in the North Atlantic during the year. The 'Castle' class vessels have proved generally successful vessels for the purpose. The four ships have continued to operate at ocean stations 'A', 'I', 'J' and 'K', in rotation, as required with the French, Netherlands and Norwegian ships—each ship spending 24 days on station each voyage. During the year the average number of aircraft to which navigational aid and other information was given by British ships at the various stations during a 24-day period was:

Station A—434	Station J—1907
Station I—488	Station K—551

O.W.S. *Weather Adviser* assumed the duties of control vessel in the search and rescue operation for survivors of the American Super Constellation Aircraft, forced by engine trouble to ditch in the Atlantic on the 23rd December, in a position approximately 165 miles from *Weather Adviser's* position on station 'J'. She was not the nearest ship to the position of the ditched aircraft and when she arrived in the area the 48 survivors of the 76 persons on board had been picked up by a merchant ship. The weather ship was, however, able to recover 11 bodies. The records kept by her radio staff and all signal traffic concerned with the search and rescue operation proved very useful at a subsequent enquiry held by the Ministry of Aviation.

The new Ocean Weather Ship Base at Greenock, made necessary because of the inclusion of the site of the old base in the construction work of the new dry dock at Greenock, was completed and occupied in July.

Weather ships carry out an extensive oceanographic programme on behalf of organisations in the United Kingdom; this work has steadily increased. The ships provide a unique facility for oceanographers in that they occupy continuously the same group of stations. They are able to collect data from a single location at frequent regular intervals, thus providing useful information about the character of the seasonal and long and short term fluctuations of ocean characteristics.

There is a comprehensive programme of sea temperature measurements. Sea surface temperatures from bucket and intake are recorded regularly on passage and on station. Bathythermograph and deep serial temperature soundings to 3,000 metres are carried out on station and on passage. Associated salinities are also observed particularly on the deep soundings.

One ship, the *Weather Reporter*, carries the National Institute of Oceanography wave recorder. All the ships are taking special navigational observations on passage in order to measure their drifts accurately. Characteristics of the ships' hydrodynamic and engine performance are recorded in order to observe their movements due to the sea and wind.

The ships have also a marine biological programme. They observe the concentrations of plankton on passage and on station and take part in fishing experiments.

All this work is carried out at the request of, and in co-operation with the Hydrographer of the Navy, the Ministry of Agriculture, Fisheries and Food, the Scottish Marine Biological Association or the National Institute of Oceanography, all of whom have given equipment and technical help.

The deck officers aboard the weather ships have been making special independent visual observations of wind force by the Beaufort scale, for comparison with anemometer readings. Aboard one ship rainfall experiments have been carried out.

Since February the twice daily bathythermograph observations of the British and Dutch weather ships have been broadcast to Dunstable the following morning. This information is used for the preparation of graphs showing the monthly average temperature at fixed depths.

3. Ice

Every month the Marine Division continues to publish its ice map of the Arctic Basin and areas adjacent to the North Atlantic. International co-operation from interested research institutes is steadily growing and we can now produce a comprehensive map about one week after the end of the month and a final version in four colours about two months later. On the reverse side of the map an analysis of weather ship sub-surface temperatures continues to be published. Variabilities of sub-surface temperatures are providing new information concerning sea water exchanges.

A careful watch is being kept on the developments in the ice situation in areas of interest to mariners. We have given advice frequently to those associated with ships in difficulties in the approaches to the Baltic Sea during the recent severe winter and with ships about to sail to Newfoundland and the Gulf of St. Lawrence. Explorers planning journeys to the Far North have also been helped. From time to time when it has become clearly evident that dangerous ice conditions are developing in any area we have warned ships through the shipping press.

By the kind co-operation of harbour authorities we have collected sufficient data and photographs to give a full account of the ice conditions which were in British ports during the recent severe 1962-63 winter. We hope to publish this towards the end of 1963.

4. Surface Ocean Currents

The Southern Pacific Ocean current atlas is complete and should be sent to the printer by July 1963. It should be available during 1964.

200,000 current observations have now been put on to punched cards and much fundamental work on their analysis by means of the electronic computer has been completed. We have brought into use two special logbooks for recording ocean currents, one for weather ships and the other for H.M. Survey Ships and for merchant ships which have agreed to use particularly careful navigation methods to give very accurate drifts. Data produced from these will require an electronic computer for their analysis.

5. Marine Climatology and Enquiries

Work continued with the analysis and tabulation of records of total solar radiation and net flux of radiation made by British ocean weather ships during the year. The investigation into the relation between hourly values of total solar radiation and the type and amount of cloud was continued and was nearing completion by the end of the year.

An investigation was made into the relation between maximum wave height and the mean wind speed over the preceding twelve hours. An article on this subject was published in *The Marine Observer* in January 1963.

A substantial increase compared with previous years was shown in the number of requests for information about sea and swell waves in various parts of the world. Enquirers included hover-craft manufacturers; engineers undertaking harbour works; engineers examining the problems of the construction of the Channel tunnel and the laying of a pipeline in the southern North Sea.

Information was supplied as in previous years to the Ministry of Transport in connection with enquiries into shipping casualties.

A firm of gas turbine manufacturers was provided with details of relative humidity and air temperature over many areas from the Arctic to the Tropics.

An inquirer called to extract detailed information about the incidence of winds of force 6 and over in the North and South Atlantic; an International Load-Line committee was provided with information about the occurrence of tropical storms and of winds of force 7 and more in the Ceylon area. Requests for particulars about hurricanes were dealt with and information supplied regarding winds during periods of bird migration.

An enquiry was dealt with concerning the probability of abnormal atmospheric refraction having occurred during the night when the *Titanic* was lost in 1912.

A considerable number of requests for information were received from yachtsmen planning cruises, and from various holidaymakers.

As is customary the bulk of the enquiries handled by this section were requests for details of recent weather in various sea areas from solicitors, brokers, etc., re shipping casualties and injuries to seamen.

Meteorological, ocean current and sea ice data were supplied to the Hydrographer of the Navy for inclusion in the Admiralty routeing charts of the North Atlantic, some of which were published during the year, and for the South Atlantic routeing charts which have not yet been published. Also six 'Pilots' were revised.

6. Publications

- (a) *The Marine Observer* was published quarterly.
- (b) A Mean Sea Level correction card for aneroid barometers was published.
- (c) A new edition of *The Marine Observer's Handbook* was prepared and will be issued during 1963.

7. Awards

Resulting from a detailed examination of meteorological logbooks received during the year from voluntary observing ships, Excellent Awards have been made to the Master, Principal Observing Officer and Radio Officer of all those ships whose records received during the year came in the first 100 in order of merit. (See *Mar. Obs.*, Vol. XXXII, p. 101. *) The books selected as Excellent Awards were *Science as History*, by Heinz Gartmann, and *The University Atlas*. Similar awards also were made to two trawlers and two coasting 'Marid' vessels, the basis of their awards being the number of observations received from the ships by radio. Four barographs were awarded to the masters of merchant ships for long and consistently good observing work.

* Awards for the year ended 31st March 1963 are on pp. 111-113.

EXCELLENT AWARDS, 1962-1963

Once again, as in every July *Marine Observer* since it was first published in 1924, we have the pleasant duty of congratulating the Masters and Officers of the one hundred voluntary observing ships which have sent us the most praiseworthy meteorological logbooks during the year ended on 31st March and who have thus qualified to receive an Excellent Award. The year's list appears on pages 111 to 113 and again we must add to our congratulations a rider of commiseration to the Masters and Officers of those ships who so carefully compiled a further 219 meteorological logbooks which, whilst attaining an 'Excellent' classification, did not get a high enough marking to put them amongst the, if we may borrow and enlarge a popular phrase, 'top ten times ten' to whom alone we are able to give awards.

Below is our ninth successive short list of those ships who sent us the best meteorological logbooks during the year. They are:

1. *Laksa* (Chr. Salvesen & Co., Ltd.), Captain L. B. Anderson.
Corinaldo (Donaldson Line), Captain J. Clinton.
John Biscoe (British Antarctic Survey), Captain W. Johnston.
2. *Cornwall* (Federal Line), Captain J. North.
Port Pirie (Port Line), Captain L. J. Skailes.
Silverbrook (Silver Line), Captain P. L. Hopkins.
Aldersgate (Bishopsgate Shipping Co., Ltd.), Captain M. H. F. Smith.
Pacific Fortune (Furness Lines), Captain B. R. Simons, M.B.E.
3. *Glenorchy* (Glen Line), Captain H. S. Clarke.
Bulimba (British India S.N. Co., Ltd.), Captain A. B. Stephens.
Eucadia (Anchor Line), Captain G. Ramage.

We congratulate *John Biscoe*, *Laksa* and *Pacific Fortune* on their second appearance in an annual short list, the last named being in successive years. The customary photographs of the three top ships appear opposite page 124 and once again we are struck by the dissimilarity of their work: a small North Sea Trader, a Western Ocean trader and an Antarctic Research Ship, a fit measure of the uniform keenness and enthusiasm of ships' officers wherever they may be.

We have happily been able this year to increase the number of awards to short-sea traders taking sea temperatures only ('Marid' ships) to four ships and the number of awards to trawler skippers and wireless operators has also been doubled. These are also given on page 113.

Perhaps the most encouraging sign of the awareness of shipmasters, deck and radio officers to our need of collecting observations from the sparse areas of the oceans is shown by the fact that during the year under review we received no fewer than 193 of the special forms that we prepared for the use of auxiliary ships which might be passing through some of these unfrequented areas (the SHRED form). It is interesting to note also that rather more awards this year have gone to regular traders across the Indian Ocean, no doubt a pointer to the interest which observing ships are taking in the International Indian Ocean Expedition.

The recipients of the awards will, as in past years, 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 here before the official letter reaches him, we would be glad if he would write to us, claiming the award and giving us his receiving address.

We are now organised so that we can almost certainly give an atlas, which seems to be the favourite award, to an officer whose name appears in the list for the first time. But if any such officer does not want an atlas for any reason, we would be glad if he would let us know.

L. B. P.

EXCELLENT AWARDS (Year ended 31st March 1963)

SHIP	CAPTAIN	PRINCIPAL OBSERVING OFFICER	SENIOR RADIO OFFICER	OWNERS
<i>Aaro</i> ..	W. C. Gill	D. M. Corner	F. H. Nicoll	Ellerman's Wilson Line
<i>Achilles</i> ..	S. C. Llewellyn	A. N. Stimson	R. M. Lang	A. Holt & Co.
<i>Afric</i> ..	R. T. Welch	J. D. Allen	B. Cochlin	Shaw Savill Line
<i>Aldersgate</i> ..	M. H. F. Smith	N. J. Evans	J. D. Rush	Bishopsgate Shipping Co., Ltd.
<i>Alsatia</i> ..	A. E. Austin	M. H. Tisdale	J. S. Bishop	Cunard Line
<i>Amazon</i> ..	G. S. Grant, R.D.	B. Hotter	F. Goodall	Royal Mail Lines
<i>Angularity</i> ..	R. H. Golding	E. J. Parker	F. Craske*	F. T. Everard, Ltd.
<i>Apollo</i> ..	G. V. Barnes	S. Church	R. Cox*	Bristol S.N. Co., Ltd.
<i>Australind</i> ..	J. D. Blake	L. Chatfield	D. W. Cross	Trinder Anderson & Co., Ltd.
<i>Author</i> ..	W. E. Williams	H. E. Roberts	T. Harris	Harrison Line
<i>Baron Ardrossan</i> ..	T. B. McLeod	D. M. Cowell	D. D. Rocca	Hogarth Line
<i>Beaverlake</i> ..	E. F. Aikman	D. J. F. Bruce	J. Johnson	Canadian Pacific Steamships
<i>Black Prince</i> ..	E. A. Kemp	J. M. D. Smethurst	S. M. Marchant	Prince Line
<i>Bristol City</i> ..	F. R. Neil	W. Coombes	T. M. Jenkins, M.B.E.	Bristol City Line
<i>British Splendour</i> ..	L. McRitchie	J. W. Farish	M. D. Cooper-Mitchell	B.P. Tanker Co., Ltd.
<i>Bulimba</i> ..	A. B. Stephens	W. K. Fullagar	W. R. Organ	British India S.N. Co., Ltd.
<i>Canton</i> ..	H. V. Williamson	E. Plews	P. M. Geraghty	P. and O.-Orient Line
<i>Catford</i> ..	E. Clarke	A. Thompson	A. Corkhill	South Eastern Gas Board
<i>Chindwara</i> ..	F. A. J. Downer, D.S.C., R.D.	B. R. Sanderson	H. C. Berry	British India S.N. Co., Ltd.
<i>City of Pretoria</i> ..	N. Groundwater	T. Fitchett	P. Foster	Ellerman Lines, Ltd.
<i>Clan MacLeod</i> ..	R. Harber	R. A. Milne	M. S. Bowden	Clan Line
<i>Clan MacNab</i> ..	T. A. Watkinson	M. B. Fowkes	R. W. Moore	Clan Line
<i>Corinaldo</i> ..	J. Clinton	D. Campbell	J. Lamb	Donaldson Line
<i>Cornwall</i> ..	J. North	P. H. King	S. Adams	Federal Line
<i>Crinan</i> ..	R. J. Buckley	T. K. Whyte	D. M. Quiltey	J. & J. Denholm, Ltd.
<i>Crofter</i> ..	W. E. Hinde	H. Traynor	J. A. L. McDonald	Harrison Line
<i>Cumberland</i> ..	J. E. Bury	P. G. Davis	D. R. Lake	Federal Line
<i>Darro</i> ..	G. A. Gibbons	E. Clements	D. Finlayson	Royal Mail Lines
<i>Dartwood</i> ..	W. Wolfe	B. L. Bagg	W. Lebbon	Wm. France Fenwick & Co., Ltd.
<i>Debrett</i> ..	D. S. Leicester	J. J. Barrowcliff	W. Thomson	Lampport & Holt Line
<i>Denbighshire</i> ..	T. R. Walker	S. Barnes	A. G. Thomson	Glen Line
<i>Diomed</i> ..	W. J. Moore, D.S.C., R.D.	J. R. O. Davies	E. O. Roberts	A. Holt & Co.
<i>Dorset</i> ..	J. S. Laidlaw	A. P. I. McGuigan	A. Hirst	Federal Line
<i>Echo</i> ..	J. L. Jenkins	J. Campbell	C. Wallis-Newport*	Bristol S.N. Co., Ltd.
<i>English Star</i> ..	F. P. McGuckin	W. Burroughs	R. Davies	Blue Star Line
<i>Essex</i> ..	S. G. Robinson	D. Prune	J. Bilton	Federal Line
<i>Esso Pembrokehire</i> ..	H. Brice	J. Wedge	A. W. Hutchinson	Esso Petroleum Co., Ltd.

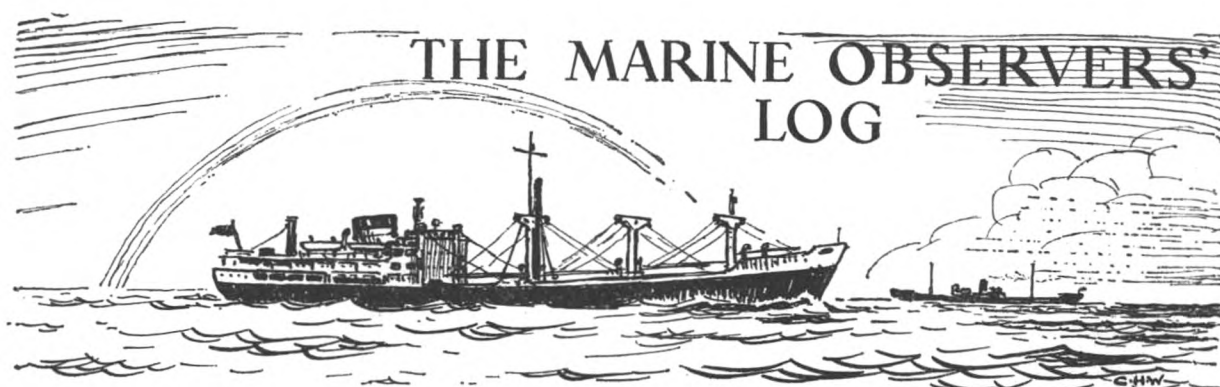
SHIP	CAPTAIN	PRINCIPAL OBSERVING OFFICER	SENIOR RADIO OFFICER	OWNERS
<i>Ethel Everard</i> ..	W. G. Hunt	H. T. Wells ..	H. H. Francis*	F. T. Everard, Ltd.
<i>Eucadia</i> ..	G. Ramage	W. K. West ..	A. MacPhail ..	Anchor Line
<i>Explorer</i> ..	E. A. Bruce	P. S. Burn ..	J. Steven ..	Dept. of Agric. & Fish., Scotland
<i>Gardenia</i> ..	J. H. Gray	J. W. Spence ..	T. J. Quinn ..	J. Robinson & Son
<i>Glenearn</i> ..	A. Millard	A. E. J. Coates	A. Greville ..	Glen Line
<i>Glenfinlas</i> ..	H. K. Martin	M. G. Collins	B. A. Beasley ..	Glen Line
<i>Glengarry</i> ..	N. Wallis	C. J. Halling ..	N. Clark ..	Glen Line
<i>Glengyle</i> ..	R. Johnston	N. G. Simpson	W. H. Redmayne	Glen Line
<i>Glenorchy</i> ..	H. S. Clarke	I. G. Johnston	B. V. Jones ..	Glen Line
<i>Gloucester</i> ..	D. E. Moran	A. J. Champion	D. Ritchie ..	Federal Line
<i>Hertford</i> ..	D. H. Chadwick	S. T. Culshaw	P. A. Lloyd ..	Federal Line
<i>Hororata</i> ..	C. P. Robinson	C. Greenwood	D. H. Farrell**	New Zealand Line
<i>Hurunui</i> ..	S. C. Andrews	W. Killackey ..	W. Hutton ..	New Zealand Line
<i>Illyric</i> ..	R. G. James, R.D.	M. Sargeant ..	H. Preen ..	Shaw Savill Line
<i>Jason</i> ..	R. T. Harries	I. B. Thomson	G. A. Winters	A. Holt & Co.
<i>John Biscoe</i> ..	W. Johnston	R. N. Cumbers	D. A. Davies ..	British Antarctic Survey
<i>Laksa</i> ..	L. B. Anderson	S. Littlejohn ..	T. W. Lawrence	Chr. Salvesen & Co., Ltd.
<i>Laurentia</i> ..	T. S. Graham	W. S. Doodson	D. M. Murray	Donaldson Line
<i>Lismoria</i> ..	R. McNie	A. Buchan ..	J. Limpitlaw ..	Donaldson Line
<i>Macharda</i> ..	J. Lyle ..	D. A. Hammond	F. A. Dunn ..	Brocklebank Line
<i>Mahanada</i> ..	C. S. W. Gray	J. R. Taylor ..	C. M. Pellowe	Brocklebank Line
<i>Manchester City</i> ..	J. E. Jones	K. D. Hunter	P. A. Byrne ..	Manchester Liners
<i>Manchester Regiment</i> ..	A. Starmer	D. Martin ..	T. Berry ..	Manchester Liners
<i>Matheran</i> ..	G. J. Kenyon	B. Lowe ..	R. McMurtrie	Brocklebank Line
<i>Melbourne Star</i> ..	C. H. Watson	D. H. Cooper	P. R. Crawshaw	Blue Star Line
<i>Merchant Duke</i> ..	S. E. Hooper	W. C. Johnston	A. H. G. Wall	Drake Shipping Co., Ltd.
<i>Milo</i> ..	W. Kays	S. Church ..	R. Mudway*	Bristol S.N. Co., Ltd.
<i>Orsova</i> ..	R. J. Craddock, O.B.E.	N. F. Corrigan	P. Parish ..	P. and O.—Orient Line
<i>Otaio</i> ..	K. Barnett, R.D.	M. Weston ..	L. Sutton ..	New Zealand Line
<i>Pacific Fortune</i> ..	B. R. Simons, M.B.E.	C. E. Nicholls	B. Fletcher ..	Furness Lines
<i>Papanui</i> ..	R. E. Baker	D. Carmichael	I. Cross ..	New Zealand Line
<i>Paparoa</i> ..	P. R. Moulton	H. G. Williams	G. S. Scott**	New Zealand Line
<i>Perthshire</i> ..	W. Graham	A. A. Rawlins	P. M. Treharne	Houston Line
<i>Port Adelaide</i> ..	E. W. Dingle, M.B.E.	R. A. King ..	C. Hill ..	Port Line
<i>Port Auckland</i> ..	C. R. Townshend	G. J. Botterill	H. Horrocks ..	Port Line
<i>Port Dunedin</i> ..	A. M. Downes	V. Bowe ..	P. J. Dwyer ..	Port Line
<i>Port Invercargill</i> ..	R. H. Finch	R. H. Mitchell	A. Halcrow ..	Port Line
<i>Port Macquarie</i> ..	J. M. Read	T. J. Steddy ..	J. W. Barry ..	Port Line
<i>Port Pirie</i> ..	L. J. Skailes	M. P. Luce ..	R. Robertson ..	Port Line
<i>Radnorshire</i> ..	G. Carney	M. J. Boddington	J. Williamson	Glen Line
<i>Rangitane</i> ..	R. G. Rees	M. C. Cox ..	L. Wittington	New Zealand Line

<i>Rangitata</i>	..	A. Hocken	..	P. B. Snow	..	F. Fowler	..	New Zealand Line
<i>Rangitoto</i>	..	L. W. Fulcher	..	C. J. Roberts	..	W. F. Shepherd	..	New Zealand Line
<i>Romanby</i>	..	E. A. Snaith	..	T. F. Jones	..	P. McHugh	..	Sir R. Ropner & Son, Ltd.
<i>Shropshire</i>	..	L. H. Sheldrake	..	J. G. Tully	..	P. Jones	..	Bibby Line
<i>Sidonia</i>	..	A. J. F. Colquhoun, M.B.E.	..	J. Swan	..	J. Gourlay	..	Anchor Line
<i>Silverbrook</i>	..	P. L. Hopkins	..	D. V. Wood	..	C. J. Malone	..	Silver Line
<i>Southern Cross</i>	..	L. J. Hopkins	..	J. Fowler	..	H. Matthews	..	Shaw Savill Line
<i>Suffolk</i>	..	H. J. Sladen	..	M. J. West	..	F. E. Watts	..	Federal Line
<i>Sylvania</i>	..	J. C. Dawson, D.S.C., R.D.	..	R. G. Turner	..	A. F. Crosby	..	Cunard Line
<i>Toronto City</i>	..	W. Stoodley	..	A. Johansen	..	W. Read	..	Bristol City Line
<i>Trecarrell</i>	..	G. Joslin	..	J. C. Perkin	..	G. H. Sutherland	..	Hain S.S. Co., Ltd.
<i>Tremeadow</i>	..	W. Philips	..	D. J. Hunkin	..	A. Watt	..	Hain S.S. Co., Ltd.
<i>Tremorvah</i>	..	E. D. Stewart	..	J. Washbourne	..	F. A. Ryan	..	Hain S.S. Co., Ltd.
<i>Trevelyan</i>	..	L. J. Lennox	..	J. M. F. Barnett	..	C. M. Dunwoody	..	Hain S.S. Co., Ltd.
<i>Truro</i>	..	J. R. Atkinson	..	B. Halford	..	T. E. Stronge	..	Hain S.S. Co., Ltd.
<i>Velletia</i>	..	A. R. Spearman	..	M. J. Hollywell	..	D. R. Uglow	..	Ellerman's Wilson Line
<i>Volvatella</i>	..	R. R. Potter	..	R. M. Abbott	..	S. J. Taylor	..	Shell Tankers, Ltd.
<i>Waivera</i>	..	E. E. Snaith	..	R. G. Griffin	..	J. Downie	..	Shell Tankers, Ltd.
<i>Waroonga</i>	..	D. Bardsley	..	G. R. Davidson	..	E. M. J. Priddle	..	Shaw Savill Line
<i>York</i>	..	J. W. J. Laverack	..	B. Boot	..	E. Anderson*	..	British India S.N. Co., Ltd.
<i>Yorkshire</i>	..	R. L. Hagley	..	P. J. McDermott	..	R. A. Waller	..	Associated Humber Lines, Ltd.
<i>Zinnia</i>	..	W. R. Hunter	..	S. D. Hyland	..	P. McMeeking	..	Bibby Line
								J. Robinson & Son
MARD SHIPS†								
<i>Lairds Loch</i>	..	F. M. Flint	..	T. MacArthur	..	W. Caldwell	..	Burns & Laird Lines, Ltd.
<i>Mitcham</i>	..	H. G. N. D'Evelin	..	J. Hamilton	..	L. K. Livie	..	South Eastern Gas Board
<i>Scottish Coast</i>	..	A. S. Nicholson	..	K. J. Dudgeon	..	W. P. Collins	..	Coast Lines, Ltd.
<i>Slieve Bawn</i>	..	G. R. Gill	..	A. C. Leggett	..	V. W. Bosomworth*	..	British Transport Commission

† Vessels in the short sea trades recruited for the purpose of observing and transmitting sea surface temperature.
* Deck Officer. ** 2nd Radio Officer.

TRAWLERS

SKIPPER	RADIO OFFICER	TRAWLER	OWNER
J. E. Dobson	K. H. Massey	<i>St. Loman</i>	Thos. Hamling & Co., Ltd.
R. Waller	R. R. N. Laing	<i>Stella Leonis</i>	Charlson-Smith Trawlers, Ltd.
P. Craven	—	<i>St. Mattheo</i>	St. Andrew's Steam Fishing Co., Ltd.
J. A. Kersey	—	<i>Stella Aquila</i>	Charlson-Smith Trawlers, Ltd.
—	A. Ramsay	<i>Stella Orion</i>	Charlson-Smith Trawlers, Ltd.
—	J. H. Senior	<i>St. Mattheo</i>	St. Andrew's Steam Fishing Co., Ltd.



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.

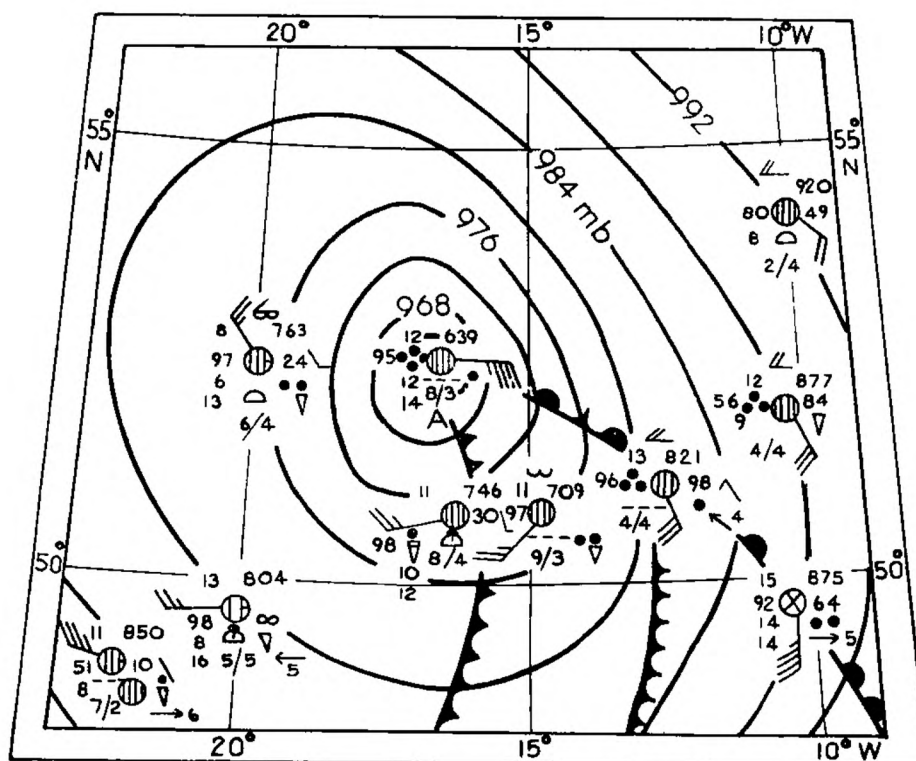
It sometimes happens that we are unable to offer an explanation for phenomena reported. In such cases we shall be very glad to hear from any reader who can put forward an authoritative or a possible explanation, which could be published in this journal. We should also be glad to hear from any reader who has witnessed a similar phenomenon in the past, but which has not previously been communicated to us.

PASSAGE THROUGH CENTRE OF DEPRESSION

North Atlantic Ocean

m.v. *Aldersgate*. Captain M. H. F. Smith. Seven Islands to Newport (Mon.)
Observers, the Master and Mr. N. J. Evans, 3rd Officer.

29th September 1962. At 0500 GMT, the light drizzle which had been falling since the previous night became moderate continuous rain, while the wind backed to SE, force 6, and was increasing. By 0930 it was E's, force 8; the rain was heavy with



Section of the synoptic chart for 1200 GMT on 29th September, 1962.
The ship marked 'A' is *Aldersgate*.



Position of ships whose observations are recorded in "The Marine Observers' Log".

visibility at times down to 1 mile. At 1140 the wind was E's, force 9-10, and the rain was even heavier than before. The observer completed his weather report at 1155 and was on the point of handing the message into the radio room when the wind suddenly fell away to calm. The sea which had been white with breaking seas went fairly still, with only confused swell some 8 ft. in height, moving from W'N. At this time, the sky to the south of the vessel was black as night and deteriorating conditions could be seen rapidly approaching. At 1201 the wind, blowing from W's, force 12, struck the vessel. The sea went flat and turned white with the force of the wind blowing over it. A plain language message was added to the 1200 report "Vessel thought at centre of depression 1201, wind veered W's, force 12". At 1200 the barometer, which had fallen 17.2 mb. in three hours, immediately began to rise. By 1225 the wind moderated to force 10, but high waves were now developing. During the afternoon the wind was WSW, force 9, but it gradually decreased to force 8 in the evening and the visibility improved to about 5-10 miles.

Position of ship at 1200: $52^{\circ} 24' N$, $16^{\circ} 48' W$.

Note. The supposition by the *Aldersgate's* observers that this vessel was at the centre of a depression was entirely correct. We reproduce a portion of the synoptic chart for 1200 GMT on 29th September which shows *Aldersgate's* weather report pin-pointing the centre. This is an excellent example of how extremely valuable a ship's observations can be to the forecasters, and this observation was used to place the depression accurately.

INCIPIENT WATERSPOUT

North Atlantic Ocean

m.v. *Aldersgate*. Captain M. H. F. Smith. Seven Islands to Newport (Mon.). Observer, Mr. W. H. Whitelaw, Chief Officer.

28th September 1962. At 1815 GMT a wave breaking and giving off spray about 20 ft. from the vessel was observed to become agitated. The spray (which the observer thought at first was caused by a whale blowing) rose from the sea and began to revolve in a counter-clockwise direction, the time of rotation being 3-4 sec. At first the diameter of the disturbed patch of water was about 8 ft. but it increased to about 15 ft. which was also the height of the spray thrown up. The area of agitated

water moved quickly away in a NE'ly direction and disappeared at 1825 when it was about 3 miles away from the ship. Although the observer watched the disturbance carefully with binoculars there was never any sign of a column developing between the sea and the cloud base. Air temp. 49°F , wet bulb 43.2° , sea 54.5 . Wind W, force 6. Rough sea and heavy swell. Cb. cloud without anvil overhead at 1000–2000 ft.

Position of ship: $52^{\circ} 58' \text{N}$, $21^{\circ} 56' \text{W}$.

UNUSUAL LIGHTNING FLASHES

Mediterranean Sea

m.v. *Empire Star*. Captain G. T. King. Port Said to Malta. Observer, Mr. M. R. Sutcliffe, 2nd Officer.

25th September 1962. Between 0400 and 0800 SMT much lightning was seen to westward in heavy Cb. cloud. There was no rain or thunder at the time, but slight rain and thunder occurred later. The flashes appeared to rise from the horizon and



occasionally tapered off into a shower of sparks as shown in the diagram. Although lightning had been seen earlier, the 'sparks' effect was absent. Air temp. 74.5°F , wet bulb 71.5° , sea 75° . Wind NNE, force 4.

Position of ship: $33^{\circ} 26' \text{N}$, $24^{\circ} 44' \text{E}$.

Note. m.v. *Glenfinlas* reported lightning of this type on 10th May 1961. An account is given on p. 114 of *The Marine Observer* for July 1962, with Sir Basil Schonland's comments.

FOG PATCH

Indian Ocean

m.v. *Wanstead*. Captain F. W. Grist. Durban to Lourenço Marques. Observers, the Master and Mr. M. W. England, Chief Officer.

2nd July 1962. At 0530 GMT a patch of fog resembling 'sea smoke' was seen ahead about $1\frac{3}{4}$ miles off the coast the air temp. was then 66°F , the wet bulb 62° and the sea 70° . The vessel passed close alongside the fog patch at 0540 and the air temp. fell to 64° while the sea temp. rose to 71° . After passing, both the temperatures reverted to their original values. This was the only patch seen on the water, but there was mist on the hill sides. Wind NNE, force 3. Sea slight. Depth 40 fm.

Position of ship: $27^{\circ} 12' \text{S}$, $32^{\circ} 50' \text{E}$.

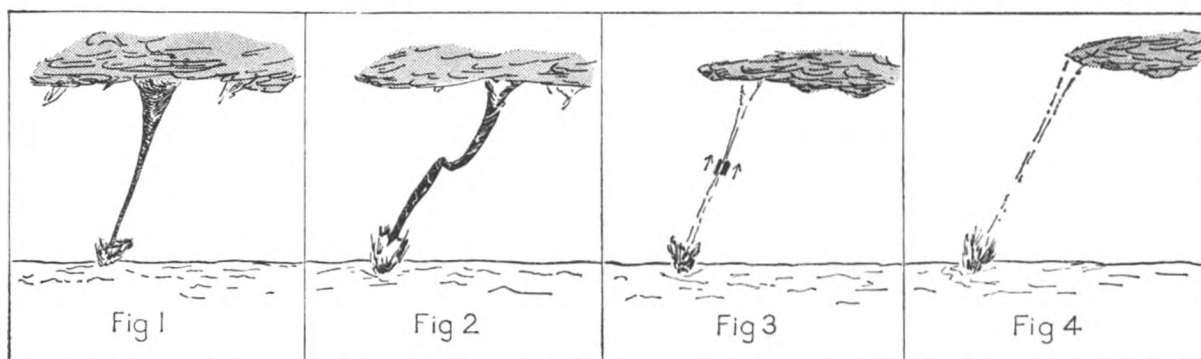
Note. This was probably a patch of cold air of land origin over an area of warm sea.

WATERSPOUT

Strait of Malacca

m.v. *Glenfinlas*. Captain H. K. Martin. London to Singapore. Observers, Mr. D. L. Cockin, 2nd Officer, Mr. M. G. Collins, 3rd Officer and Mr. R. H. Plant, 4th Officer.

23rd July 1962, 0500 GMT. A belt of rain falling from a very dark Cb. cloud was seen at a distance of about $1\frac{1}{2}$ miles from the ship. From the cloud base several "funnels" were seen to be hanging, two of which developed into waterspouts. The



smaller one soon disappeared, but the other was plainly seen for some time. Its height by vertical sextant angle was 1264 ft., while its diameter was about 21 ft. It appeared to be rotating in a clockwise direction, the spray flung up looking very white against the dark column, which at one time had a very pronounced bend about half way between the sea and cloudbase as in Fig. 2. During the phase shown in Fig. 3, the column became very light and thin, but a small section of the outside which was black and heavy moved rapidly upwards, disappearing into the cloud. When the spout had disintegrated, the sea surface remained agitated for some time afterwards. At 0000 GMT: Air temp. 82.5°F; wet bulb 76.7°; sea 85.7°. Wind SE, force 2.

Position of ship at 0000: 2° 12'N, 102° 06'E.

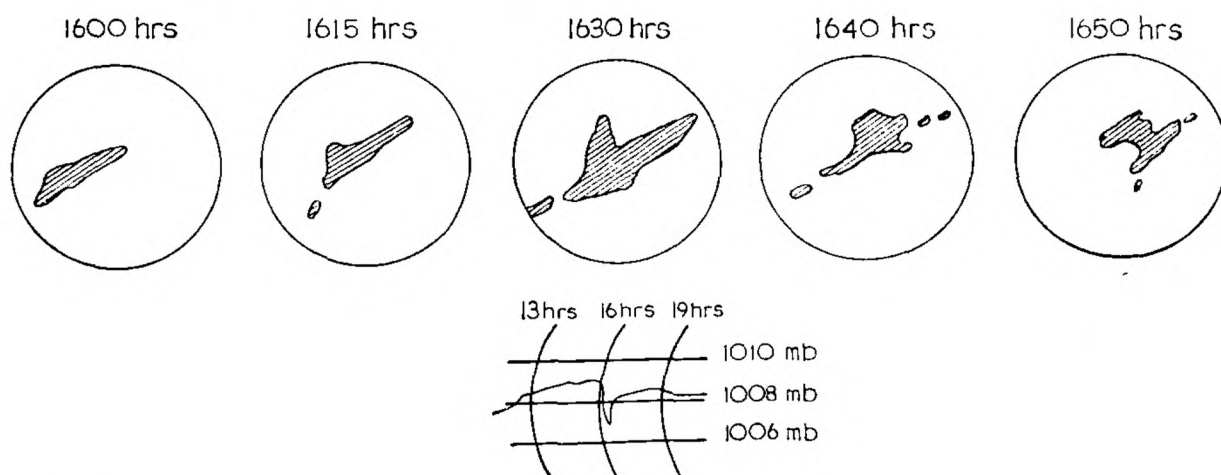
Note. It appears that in the phase shown in Fig. 3 a single vortex ring was transported up the column.

SEVERE SQUALL

South China Sea

c.s. *Recorder*. Captain P. B. Henderson. Hong Kong to Jesseltown. Observer, Mr. E. G. L. Small, 3rd Officer.

6th July 1962.



GMT

- 1600 Wind increased from sw, force 3, to sw, force 8. No precipitation yet but rain belt visible on the PPI using the 25-mile range.
- 1615 Heavy rain with poor visibility. Wind increased to force 10. Barograph dropped 1 mb. (see sketch). Corrected pressure 1007.5 mb. The squall increased in intensity until 1630. Air temp. now 75°F, wet bulb 73°.
- 1630 The wind steadied to the upper limit of force 10, with heavy rain and zero visibility. Barometer now at 1007.2 mb., the lowest reading observed.
- 1640 Weather gradually improving and wind decreasing to force 7. The PPI indicated that the main squall line had passed. Barograph trace rose almost vertically. Rain still moderate.

1650 Overcast with light drizzle. Wind s'w, force 3-4. Barometer 1007.8 mb.
Air temp. 76°F, wet bulb 73°.

Estimated position at 1600 GMT: 8° 47'N, 116° 45'E.

Note. The *Recorder* is a Malayan Selected Ship and the following comment on her observation has been made by the Meteorological Service of Malaya: "The Intertropical Convergence Zone was positioned approximately along 12°N, 110°E; 10°N, 115°E; 9°N, 120°E. Surface reports from other ships confirmed that activity over the zone within about 50 miles of the vessel was moderate or severe in places."

SEISMIC TREMORS

Mediterranean Sea

m.v. *Black Prince*. Captain E. A. Kemp. Famagusta to London.

28th August 1962. At 1005 GMT, while the vessel was in water of charted depth of approx. 1900 fm. several distinct 'bumps' were felt, the series lasting for about 4 sec. The sea was calm at the time and the swell negligible, so the disturbance was attributed to shock waves from earth tremors. Later reports spoke of these affecting a wide area of the north part of the Central Mediterranean.

Position of ship: 35° 25'N, 21° 48'E.

Note 1. Mr. J. Piegza, seismologist at Kew Observatory, comments:

"On 28th August 1962 a very strong earthquake (magnitude 6½) occurred in Greece in 38° 00'N, 23° 06'E, at 10h. 59m. 59s. GMT, causing casualties and moderate property damage. The earthquake was felt over Malta, Sicily, Southern Italy, Yugoslavia, Greece and over the Central and Eastern Mediterranean.

There is no doubt that the severe bumps felt by the *Black Prince* were due to seismic waves caused by this earthquake, as no other Mediterranean earthquake was reported at that time."

Note 2. We are unable to account for the apparent discrepancy between the time of the disturbance as reported by the ship and the time of the actual earthquake.

DISTURBED WATER

Red Sea

m.v. *Empire Star*. Captain G. T. King. Aden towards Suez. Observers, Mr. J. M. Thomson, 3rd Officer and Mr. A. Macdonald, seaman.

2nd March 1963. At 1120 GMT a distinct difference in the coloration of the water was noted. On approaching closer it was seen to be a form of tide rip and as the vessel went through it she was thrown about 10° off course to port. The other odd thing being that on the southern side of the line the wind was 140°, force 4-5, whereas on the northern side it dropped away to force 2 remaining constant in direction. The sea temperature remained the same on both sides at 77°F and the air temperature rose 1° to 80°.

Position of ship: 16° 33'N, 40° 58'E.

China Sea

m.v. *Trevalgan*. Captain C. E. Pratt. Rotterdam towards Dairen (North China). Observer, Mr. J. O. Spence, Chief Officer.

19th September 1962. Between 2330 and 2350, 2355 and 2358, 0009 and 0020 GMT, vessel passed through areas of disturbed water with moderate to heavy confused swell and the sea giving the appearance of being affected by a force 5-6 wind. In between these times the sea was normal for a force 2 wind.

The following soundings were taken: 480 fm. at 2330, 255 fm. with two very sharp peaks at 2340, 450 fm. at 2348, 250 fm. at 2355, then falling rapidly to 600 fm. at 0009, 540 fm. at 0010, 570 fm. at 0012, 465 fm. at 0015 and 540 fm. at 0020.

Various smaller patches of disturbed water were passed during the morning but the wind increased to force 3-4 and they were not so noticeable.

Although the vessel must have passed very close to the patch marked on chart 2661B as "discoloured water 1941 PA", 25 miles SE of Pratas Reef, no discoloration was observed although a sharp lookout was kept.

Position of ship at 2146: $19^{\circ} 59.7'N$, $116^{\circ} 52.8'E$.

Position of ship at 0400: $20^{\circ} 58'N$, $117^{\circ} 49'E$.

Pacific Ocean

s.s. *Remuera*. Captain H. N. Lawson, R.D. Panama towards Auckland. Observers, Mr. D. Butcher, 2nd Officer and Mr. J. Macaulay, Quartermaster.

15th October 1962. At 0910 GMT a current rip was observed alongside the vessel in an SW-NE direction. The sea temperature before crossing through the rip was $72^{\circ}F$, afterwards it was 66° . Waves were heaping up causing little eddies and the vessel went off course about 10° . The wind had dropped from s, force 4, to light airs.

Position of ship: $00^{\circ} 12'S$, $93^{\circ} 12'W$.

Note 1. By the system of chronology adopted for the Marine Observers' Log, only the observation from *Trevalgan* would appear in this number. The above three observations have however certain common features and that from the *Empire Star* is so topical in this year of the International Indian Ocean Expedition, that a departure from our usual rules was thought appropriate.

Note 2. Dr. L. H. N. Cooper, of the Marine Biological Association of the U.K., Plymouth, comments as follows:

"These three interesting observations may all have one thing in common, an irregular sea bed.

That from *Remuera* lies over a ridge which runs west from the Galapagos Islands. The Cromwell current (*Marine Observer*, 1963, vol. 33, p. 13) may also be concerned.

That from *Trevalgan* may be the edge of a continental borderland, such as lies off California. Taking account of the western intensification known to occur on the western side of oceans, upwelling was likely. Upwelling improves the yield of fisheries.

The position of *Empire Star* overlies the edge of the bottom of a pit which exists in the southern Red Sea. The pit may encourage an eddy in the overlying water or the eddy may excavate the pit.

In all cases such as this an echo-sounding record is of much value for interpretation. Navigators, no doubt, appreciate that the comments of research workers on their observations are speculative. The great value of reporting events such as these three is to inform oceanographers where interesting things happen so that they can visit such places when they have the opportunity to take the study further."

Note 3. The last sentence of Dr. Cooper's comment is borne out by the fact that he has sent the observation of the *Empire Star* to Dr. Herdman of the National Institute of Oceanography, and it is hoped that *Discovery* will, on her passage to the Indian Ocean this summer, have an opportunity of going over this position and investigating it further.

DISCOLOURED WATER

Red Sea

s.s. *Waroonga*. Captain D. Bardsley. Aden to Suez. Observers, Mr. S. E. Maitland, 3rd Officer and Mr. J. B. Wells, Extra 3rd Officer.

2nd August 1962, at 0900 GMT. Over a distance of 30 miles run, sand coloured patches and streaks were seen on the sea which had an oily appearance and a slight fishy odour. When a sample of the water was obtained the discoloration was found to be caused by small, stick-like objects perhaps one millimetre in length, with tapered ends, resembling seeds. Air temp. $94^{\circ}F$, sea 89° by E. R. intake. Light airs. Rippled sea, no swell.

Position of ship: $21^{\circ} 43'N$, $37^{\circ} 49'E$.

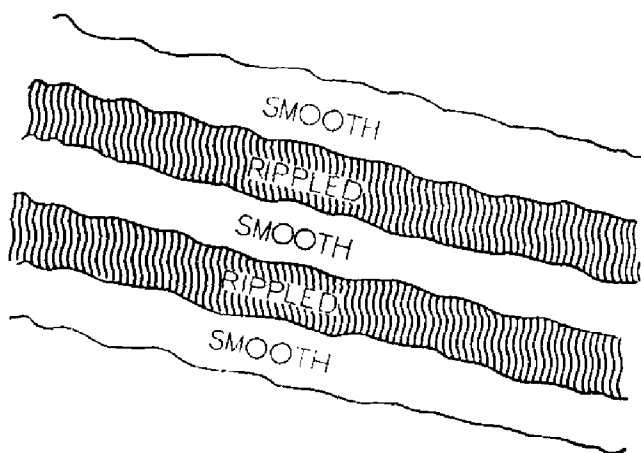
Note. Dr. T. J. Hart, of the National Institute of Oceanography, comments:

"These were almost certainly blooms of the microscopic plankton algae *Trichodesmium erythraeum*, the classic 'cause' of discoloration in that area."

Gulf of Guinea

s.s. *Calabar*. Captain F. St. H. Webber. Lagos to Takoradi. Observers, Mr. M. R. Evans, 2nd Officer and Mr. D. W. Ellis, 3rd Officer.

11th August 1962. At 1030 SMT the vessel traversed a band of brownish coloured water which stretched towards the coast for about 5 to 6 miles in a NW-SE direction.



The band which was about 200 ft. wide was composed of about 10 lanes of alternately smooth and rippled sea, as shown in the sketch. Sea temp 74°F. Wind wsw, force 2.

Position of ship: 4° 57'N, 1° 32'W.

Note. Dr. T. J. Hart, of the National Institute of Oceanography, comments:

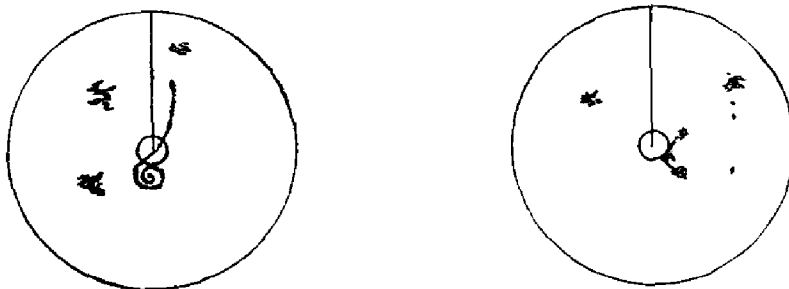
"The very low sea temperature (having regard to time and place) strongly suggests upwelling on a scale that would encourage maximum growth of microplankton organisms, such as are the most usual cause of these phenomena. However, the wind at the time of observation was too light to have caused this—perhaps there had previously been a fairly strong off-shore breeze."

RAIN OBSERVED ON PPI

North Atlantic Ocean

m.v. *Wanstead*. Captain F. W. Grist. Cape Town to Teneriffe. Observers, the Master and Mr. M. W. England, Chief Officer.

12th August 1962. At 0340 GMT while observing targets on the PPI (Marconi Radiolocator, Mk. IV) as we were approaching Cap Vert, a patch of heavy rain showed clearly on the screen as it passed over the vessel, moving in a southerly direction. When the rain was about 5 miles astern it began to form a spiral which lasted for 20 min. and then broke up. Later, other heavy rain patches were observed



but none took the form shown in the sketches. Air temp. 77°F , wet bulb 74.5° , sea 78° . Wind NW, force 4. Frequent heavy rain showers.

Position of ship: $13^{\circ} 34'\text{N}$, $17^{\circ} 29'\text{W}$.

Note. m.v. *Wanstead* observed on its PPI a storm sufficiently large to have a well developed circulation.

PHOSPHORESCENCE

Thames Estuary

s.s. *Dorset*. Captain J. S. Laidlaw. Observers, the Master, Mr. W. Killackey, 3rd Officer and Pilot Straughan, Trinity House.

13th July 1962. At 0000 GMT phosphorescence was observed in the Barrow Deep. It increased as the vessel moved westwards and reached its maximum brilliance in Sea Reach, fading out thereafter. A coastal vessel passing close by at No. 3 Sea Reach Buoy had a green bow wave as though illuminated by a subdued, concealed light. Observers considered that it was comparable with phosphorescence seen in the Persian Gulf. Sea temp. 57°F . Wind, calm.

South Atlantic Ocean

m.v. *Trevose*. Captain L. J. Lennox. Cape Town to Las Palmas. Observers, Mr. L. E. Quigley, 2nd Officer and Mr. R. T. Lindsey, 3rd Officer.

26th August 1962. At 0030 GMT the hand signalling lamp was used to determine the direction of the sea waves, the night being dark with no moon. It was noticed that when the beam of light touched the sea surface bright sparks of phosphorescence appeared. They were very numerous and not unlike the red sparks from the ship's funnel, although occasional blues and greens were also seen.

The specks of phosphorescence darted about in the manner of small fish and quite often appeared to jump clear of the water. Certain other more usual types of phosphorescence were also seen, but they were mainly confined to the foam from the ship's wash. A watch was kept on the following two nights but the phosphorescence gradually disappeared as the vessel passed from the Equatorial Current to the Guinea Current. Sea temp. 74° . Wind SE, force 3. Sea slight. Moderate sw'ly swell.

Position of ship at 0030: $4^{\circ} 40'\text{S}$, $6^{\circ} 28'\text{W}$.

SCHOOL OF PORPOISES

Indian Ocean

s.s. *Jason*. Captain R. T. Harries. Aden to Fremantle. Observer, Mr. J. W. Cottier, 2nd Officer.

25th August 1962. A large school of porpoises, estimated at about 150 in number was seen ahead at 1500 LMT, moving in a SE'ly direction. They were jumping 'en masse' at intervals of approximately 5 sec., but a few were jumping on their own. Although the vessel passed very close they did not deviate in any way. The porpoises were 4-7 ft. long, with a flat tail, a long snout and the blow hole was visible. Wind SE's, force 5. Sea moderate to rough. Long SSE'ly swell.

Position of ship: $6^{\circ} 39'\text{S}$, $77^{\circ} 11'\text{E}$.

WHALES

North Atlantic Ocean

c.s. *Cyrus Field*. Captain F. Kicks. Observers, the Master and all Deck Officers.

11th September 1962. At 1800 GMT whilst stopped undertaking cable repairs the ship was surrounded by a school of about 20 whales. They appeared to be

30 to 40 ft. in length and 8 ft. maximum width. Their colour was blue-black on top, but the undersides of fins and tail were white with black flecks. The air blow-hole was about 2 ft. in diameter and there were 6 or 8 well pronounced nodules on top of the head. No eyes could be seen. The characteristic top fin was most noticeable.

The whales surfaced at intervals of about 1 or 2 min., passing within 15 or 20 ft. of the ship.

At a distance of about a mile from the ship two of these whales were seen to leap 10 or 15 ft. clear of the water, hitting it again with great force.

Position of ship: $48^{\circ} 02'N$, $48^{\circ} 50'W$.

Note. This observation was sent to us by the Director of the Canadian Meteorological Service, *Cyrus Field* being a Canadian Selected Ship. It had been seen by Mr. D. E. Sergeant of the Fisheries Research Board of Canada who commented as follows:

"From the very full description and sketches (not reproduced here) there is no doubt that the whales observed were hump backs. From a number of reports there is evidently a group or groups of this species totalling one or two hundred which spend the warmer months on the Grand Bank, and the animals are characteristically tame. The observations appreciably extend our knowledge of where these animals go, and we are most grateful for the reports of such sightings."

PREDATORY BIRD

North Atlantic Ocean

O.W.S. *Weather Surveyor*. Captain T. J. Morgan. On Weather Station 'J'. Observer, Mr. R. J. Reid, Scientific Assistant.

12th September 1962. Just before breakfast at 0730 hrs. GMT, a merlin (female) was first observed perched on the mainmast. During the previous few days a variety of migrants had taken refuge aboard. These included sandpipers, meadow pipits (about a dozen), wheatears, red breasted flycatchers and willow wagtails. The ship's cat unfortunately made short work of the meadow pipits and many of the flycatchers which were very weak, but it soon became apparent that the merlin was a much more experienced hunter and during the 12th and 13th it was seen to catch and devour many pipits and wheatears.

The merlin would perch on the mast until it spotted a likely victim, pursue it out to sea, darting quickly and changing direction at great speed until it pounced, catching the prey between its claws. It would then return to its platform on the mainmast yardarm and immediately proceed with its meal amid a flurry of feathers.

On September 14th around 1800 hrs. GMT the bird was seen to fly towards a west-bound vessel which passed within half a mile of our ship, and we suspected that it had decided to take a trip to America.

Position of ship: $52^{\circ} 30'N$, $20^{\circ} 00'W$.

Note. A similar account of the behaviour of a goshawk aboard m.v. *Roscommon* appeared on p. 182 of *The Marine Observer* for October 1962.

LAND BIRDS AND INSECTS AT SEA

North Atlantic Ocean

m.v. *Trevoise*. Captain L. J. Lennox. Cape Town to Las Palmas. Observers, the entire ship's company.

1st September 1962. After a period of severe rain squalls and variable winds the ship was beset by large numbers of land birds and insects. The latter included large dragonflies, moths, butterflies, small flies and beetles. Various kinds of brightly coloured tropical birds were among the visitors, the largest being herons and the smallest a kind of tiny sparrow. Birds very similar to those found in the U.K. were also present—robins, sparrows, swallows, wagtails, doves and canaries, but mainly

with a much brighter colouring. There were other tropical species with crests and brilliant plumage which could not be recognised. The creatures were obviously very tired as they perched on the ship most of the time and could be approached quite closely. They also seemed to be in a starved condition as the larger birds were continually preying on the smaller ones, and some of the smaller species were even attacking each other, though they mainly preyed on the larger insects.

The birds were first noticed early in the morning when their shrill cries could be plainly heard above the noise of the torrential rain. They seemed to be the cause of numerous echoes on the radar screen. At this time the vessel was about 110 miles from the coast of North Africa, but the birds remained for a further three days by which time the ship was less than 40 miles from the coast. Throughout the period no sea birds were present.

The wind had been NW'ly, force 2 and 3, on the 30th; NW'ly, force 2, on the 31st during the morning, but W'ly, force 2, in the afternoon and evening of that day.

Position of ship at 0000 on 1st September: $16^{\circ} 12'N$, $17^{\circ} 48'W$.

Note. The birds and insects must have been swept out to sea in a purely local storm. It has not been possible to identify any large scale system that could have been responsible.

WEED

North Atlantic Ocean

s.s. *Pacific Fortune*. Captain B. R. Simons, M.B.E. Glasgow to Panama. Observers, all deck officers.

21st-28th August 1962. Although weed was first sighted during the afternoon of the 21st in lat. $36^{\circ}N$, long. $39^{\circ} 30'W$, it was very noticeable this voyage that weed was not present in such large quantities as is normally the case. Usually during the three days before reaching Mona Passage, large amounts of weed are seen lying in bands across the surface, but on this occasion only very small patches were encountered. Sea temp. rose from $77^{\circ}F$. at 1800 on 21st to 85.8° on 24th. It was mainly 82° - 83° for the rest of the voyage. Wind generally E'ly force 4-5 on the 26th and 27th.

Position of ship at 0000 on 22nd: $35^{\circ} 18'N$, $41^{\circ} 24'W$.

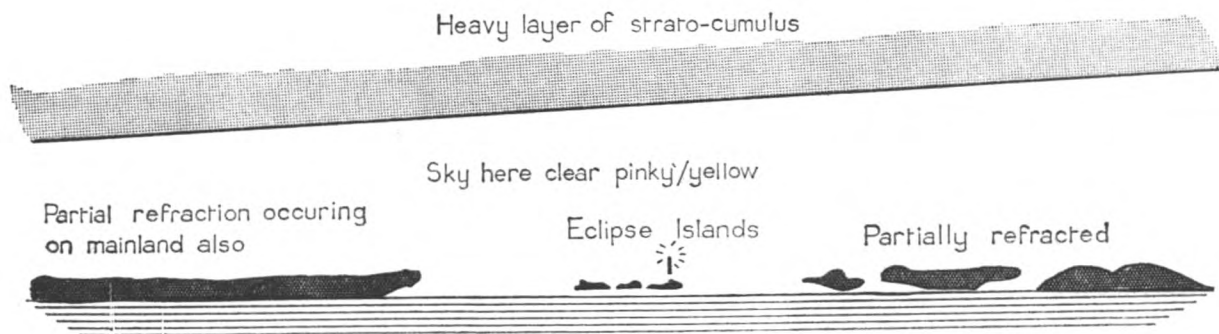
Note. It is not unusual for weed to move and then be widely distributed in this part of the Atlantic. This suggests a change in the oceanic circulation.

ABNORMAL REFRACTION

Australian Bight

m.v. *Queensland Star*. Captain R. White, D.S.C. Melbourne to Singapore. Observer, Mr. B. H. Fells, 2nd Officer.

18th August 1962, 2230-2245 GMT. Eclipse Island, bearing 015° , 26 n. miles, underwent refraction effects shown in the sketch just before sunrise, but the



refracted image persisted until after sunrise. It was noted that when the vessel rolled to port the island faded, leaving only the lighthouse showing. The refracted image would again appear as the vessel resumed an upright position. Air temp. 55°F , wet bulb 48° , sea 58° . Wind variable, force 1-2. Rippled sea, low swell.

Position of ship: $35^{\circ} 36'\text{S}$, $117^{\circ} 42'\text{E}$.

Note. At the time of this observation the sea was warmer than the overlying air—a condition which is favourable for the light rays from a distant object to curve upwards, away from the surface. The phenomena observed by *Queensland Star* may perhaps be accounted for by the fact that the vessel was at, or near, the critical position where the rays began to curve away from the surface; the movement of the ship, although slight, raised and lowered the line of sight sufficiently to cause the island to alternately appear and disappear. The lighthouse, presumably on account of its greater height, was not affected and remained visible all the time.

North Atlantic Ocean

s.s. *City of New York*. Captain L. E. Smith, M.B.E. Birkenhead to Port Said. Observers, Mr. H. M. Townsend, 2nd Officer and Mr. P. Jenkins, 3rd Officer.

18th July 1962, 0000-0100 GMT. Alfanzina Light (height 184 ft.) was still visible from the bridge (H.E. 54 ft.) at a distance of 45 miles when it should not have been seen at more than 23.8 miles. At times it appeared as two distinct lights, one above the other, and although a white light it was showing all colours from white to orange and deep red. The lights of the town of Faro were seen with a complete image above them. Distant ships' lights underwent rapid changes—sometimes they were seen normally, or with an image above them; at times they vanished altogether. Santa Antonio Light (height 151 ft.) was seen at 41 miles, when its maximum range should have been 22.6 miles. Air temp. 69.7°F , wet bulb 63.8° , sea 67° . Sky cloudless. Wind NW, force 3.

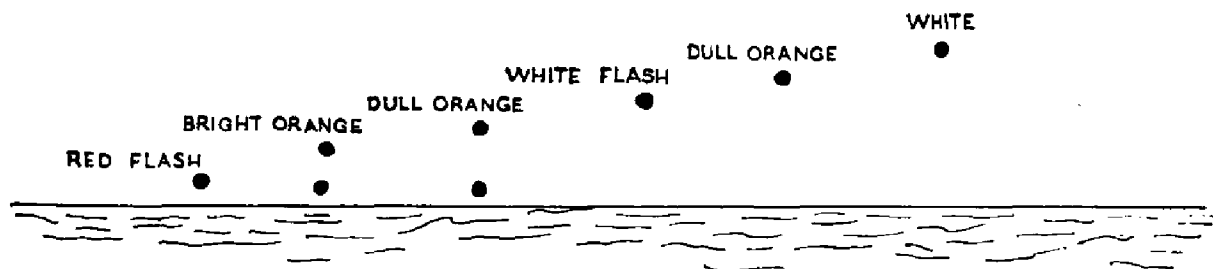
Position of ship: $36^{\circ} 35'\text{N}$, $7^{\circ} 48'\text{W}$.

Note. Objects which are below the horizon and normally invisible are often seen when, as in the present case, the temperature of the air is higher than that of the sea surface, and the visibility is very good. In these conditions the air refracts light rays in such a way that they tend to follow the curvature of the earth and thus bring into view objects which have dipped below the horizon.

Indian Ocean

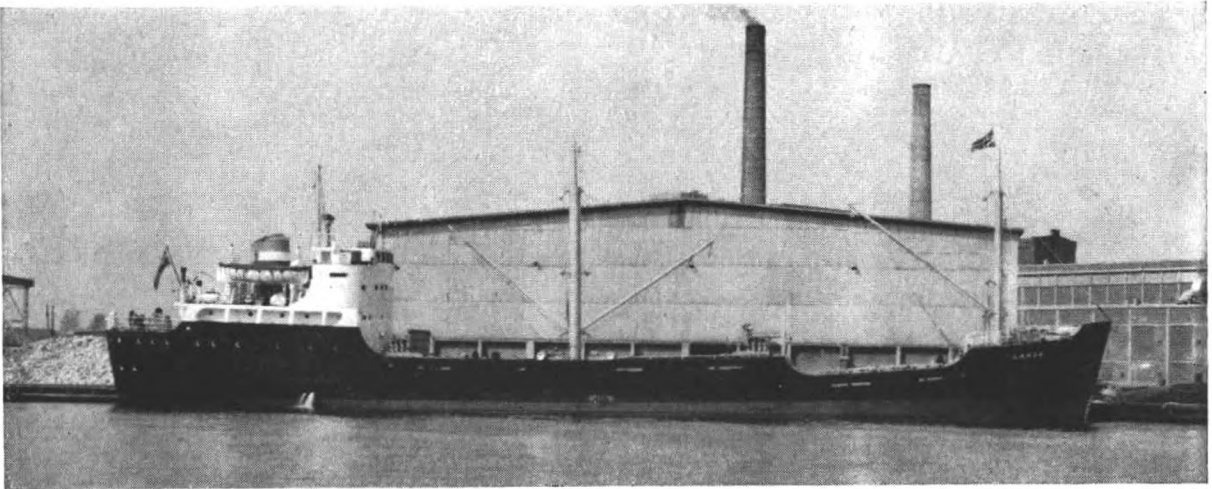
m.v. *Cretic*. Captain V. H. Vizer. Aden to Fremantle. Observer, Mr. G. C. Sanderson, 3rd Officer.

4th July 1962. At 1415 GMT Jupiter suddenly appeared above the horizon with a bright red flash on a bearing of 105° . One image of the planet then rose slowly while the other maintained a steady altitude where it had first appeared. Both

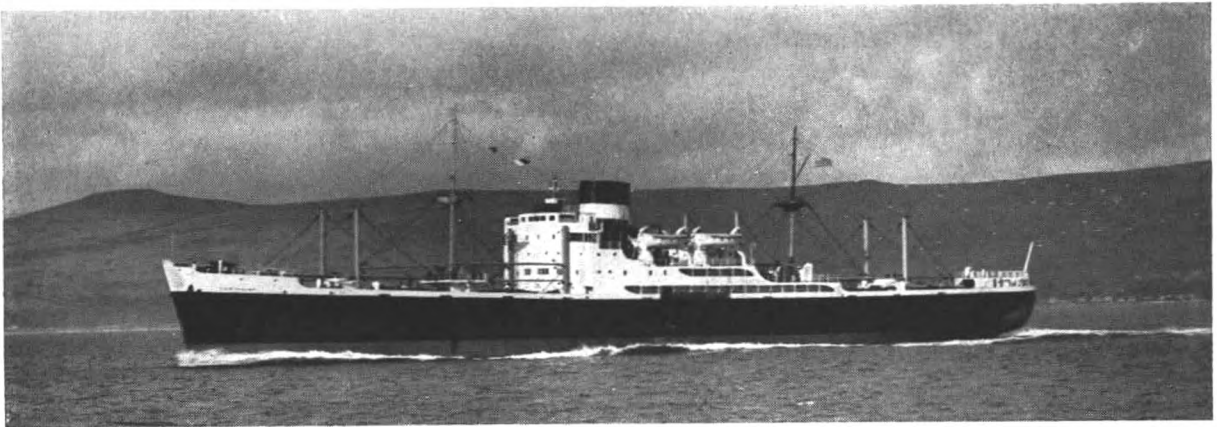


changed gradually from a bright red to an orange colour. At 1422 the images suddenly merged with a bright white flash and the planet continued to rise, slowly changing from orange to white. The sequences are shown in the accompanying diagram. Air temp. 67°F , wet bulb 57° , sea 69° . Wind E, force 2. Fine and clear. Slight sea, low swell.

Position of ship: $30^{\circ} 55'\text{S}$, $113^{\circ} 55'\text{E}$.



Laksa (Chr. Salvesen & Co. Ltd.), Captain T. W. Lawrence.



Corinaldo (Donaldson Line), Captain J. Clinton.



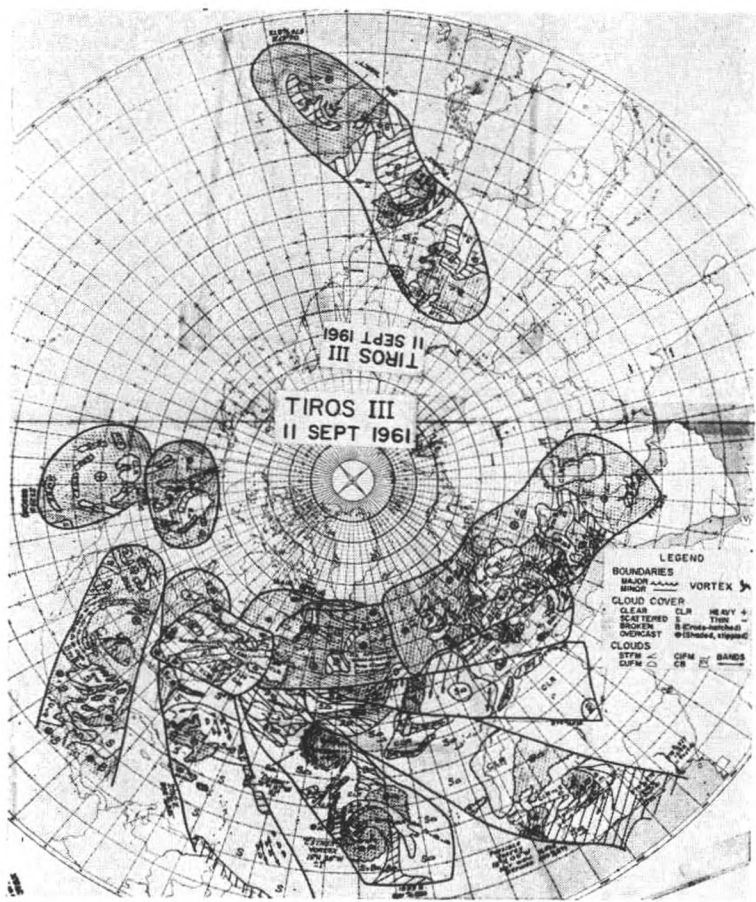
John Biscoe (Government of Falkland Islands), Captain W. Johnston.
By courtesy of British Antarctic Survey

THE FIRST THREE SHIPS IN THE EXCELLENT AWARD LIST (see page 110).



Fig. 1. This diagram shows the meteorological sensors of TIROS. The IR (Infra-Red) package is a multiphase radiometer. The photographs give an idea of the area that can be seen in a single photograph, and the uses of the photographs. Directly beneath the TIROS is a picture of Hurricane 'Betsy' (July 1961). (See page 141.)

Fig. 2. (Right.) A composite chart of nephanalyses based on TIROS III cloud pictures acquired during 11th September 1961. Note Hurricanes 'Carla', 'Debbie' and 'Esther' in the Atlantic, and typhoons 'Nancy' and 'Pamela' in the western Pacific. (See page 141.)



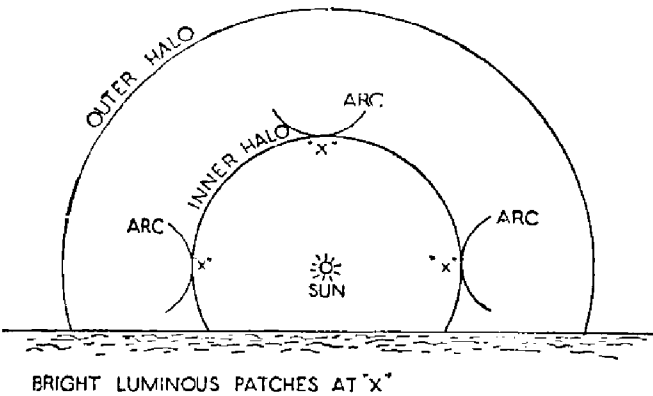
Note. Reports of planets showing double images while setting are by no means rare, but accounts of the same phenomenon happening at the time of rising are less common, no doubt because the occurrence cannot be anticipated since it takes place 'in reverse'. The explanation of the phenomenon is probably connected with the fact that in certain atmospheric conditions (temperature increasing with height), a very narrow 'blind strip' lies around the horizon, the lower edge of which is at a very small elevation above it. In this zone complex refraction effects occur.

HALO COMPLEX

Bristol Channel

s.s. *Esso Hampshire*. Captain P. L. Thomas. Milford Haven to Tripoli. Observers, Mr. D. Smart, 1st Officer and Mr. P. Smith, 4th Officer.

7th August 1962. The halo complex illustrated here was seen at 0625 GMT, all the normal colours being present. The radius of the inner halo was $22\frac{1}{2}^{\circ}$, that of the outer 45° (measured by sextant). Sun's altitude 13° . The sky at the time was



covered by Ci. and Cs., in the direction of the sun. Some Cu. and Sc. were also present elsewhere in the sky. Air temp. 56° . Visibility good.

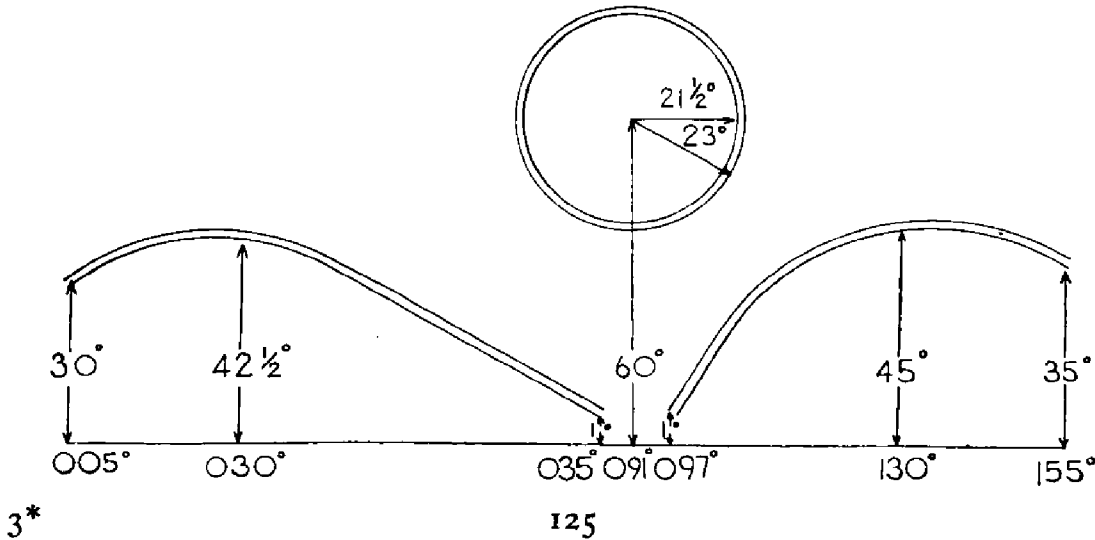
Position of ship: $51^{\circ} 12'N$, $5^{\circ} 42'W$.

Note. s.s. *Esso Hampshire* has observed almost a 'text book' halo complex including the $22\frac{1}{2}^{\circ}$ and 46° halos, and mock suns. However, the phenomena marked 'arc' in the diagram are unusual.

Indian Ocean

m.v. *Herefordshire*. Captain A. N. Williamson. Aden to Colombo. Observer, Mr. D. H. Mobberley, Senior 3rd Officer.

16th September 1962. Between 1945 and 2000 GMT a complete halo, pale silver



blue in colour was seen round the moon, age 17 days, altitude 60° , bearing 091° . The inside radius of the halo was $21\frac{1}{2}^\circ$ and the outside 23° . Two asymmetrical arcs having the dimensions shown in the sketch were seen at the same time. They had the same colour as the halo, but were of a paler shade. The arcs persisted until 2000 and then faded out but the halo continued to be visible until dawn at 0040. Around 2300 the inside radius of the halo increased to 23° and at the same time the layer of Cs. thinned considerably, so that stars of the second magnitude became visible. The halo passed near to the zenith where it became especially bright. Air temp. 81.0°F , wet bulb 76.0° . Wind wsw force 4. $\frac{5}{8}$ Cs.

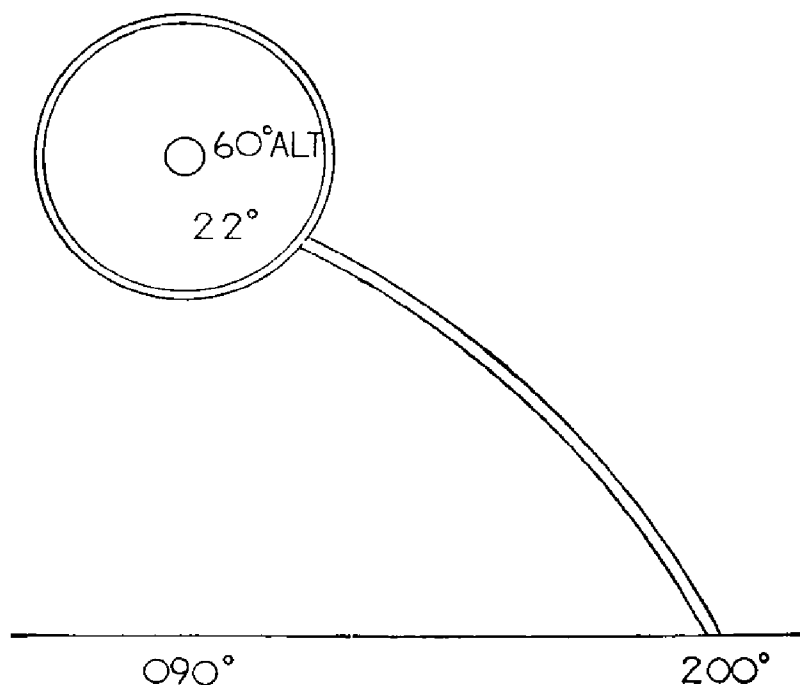
Position of ship: $9^\circ 23'\text{N}$, $68^\circ 21'\text{E}$.

LUNAR HALO

South Pacific Ocean

s.s. *Ceramic*. Captain N. S. Milne. Wellington to Balboa. Observer Mr. S. M. Norwell, 3rd Officer.

16th July 1962. The halo shown in the sketch was first seen at 0620 GMT. It was 22° in radius and completely surrounded the moon which was at an altitude of



60° and bore 090° . At 0630 an arc developed which extended from the halo to the horizon: it persisted for 20 min., until obscured by Ac. Air temp. 65°F , wet bulb 56.5° . Wind SE, force 5.

Position of ship: $26^\circ 38'\text{S}$, $133^\circ 32'\text{W}$.

FOG BOW

off Uruguay

m.v. *Silverbrook*. Captain P. L. Hopkins. Punta Cardon to La Plata. Observers, Mr. D. V. Wood, 2nd Officer and Mr. R. N. Landahl, Apprentice.

26th August 1962. At 1750 GMT the vessel passed through thick fog, some 50–150 ft. in vertical depth, with visibility varying from about $\frac{1}{4}$ to 1 mile. A fog bow was observed to port, the ends of it being very near to the ship: the arc was 4° broad. The bow was mainly white, but faint red and blue coloration was seen in the upper parts. Sun's altitude 28° ; bearing 320° . Air temp. 53°F , wet bulb 51.3° , sea 52.8.

Position of ship: $34^\circ 03'\text{S}$, $52^\circ 44'\text{W}$.

Note. This is a typical fog bow with most of the essential elements. Measurements of the diameters of the various sections of the arc (as distinct from the width) would have been of interest.

REMARKABLE STATIC DISCHARGE

North Sea

m.v. Mitcham. Captain H. G. N. D'Evelin. River Tyne to London. Observers, the Master and Mr. L. K. Livie, Radio Officer.

16th September 1962. At 1200 GMT when well to the eastwards of the Humber, heavy interference was heard on our broadcast receivers. All electric motors in the vicinity of the bridge were stopped in succession to try to find the source of the trouble, but the noise persisted and the radio transmitter began to 'click', with sparks appearing in the R/T aerial condenser, although all switches were off. The Radio Officer then touched the down-lead nut to see if it was loose and received a shock which sent him reeling.

We went out on deck and low over the ship saw a large black rounded cloud from which hung a dark mass shaped very much like the 'cod-end' of a trawl. No precipitation was falling from the cloud which was moving eastwards. Everyone felt a tingling sensation in their scalps as their hair stood on end: the Decca navigator pointers went round the dials until, after 10 min., the cloud was well away from the ship. It would seem that the phenomenon was St. Elmo's Fire, although due to daylight, it was not visible as such. In spite of the static, there was neither thunder nor lightning, and after 15 min. the interference on the broadcast sets had disappeared. The sky was cloudy and the wind W, force 4.

Position of ship: $53^{\circ} 30'N$, $1^{\circ} 00'E$.

Note. The weather chart for noon on 16th September shows that an unstable W to WNW airstream covered Eastern England and the North Sea, with the consequent widespread development of large Cu. and Cb. clouds. It is very probable that the dark mass hanging like 'a cod-end' from the undersurface of the cloud was an incipient waterspout which failed to develop further. With such a cloud overhead, there could exist between it and the sea a large potential difference which could result in quite a large potential difference also being set up between the aerials and the ship's structure. During the afternoon showers developed over Eastern England and a thunderstorm occurred at Spurn Head. It appears that the atmosphere was heavily ionized and the unpleasant effects were associated with a considerable current through the atmosphere. It is strange that no lightning discharge occurred. This observation has proved to be of great interest to physicists and radio engineers.

NUCLEAR EXPLOSION

Pacific Ocean

m.v. Cairnforth. Captain J. Hogg. Makatea to Napier. Observers, the Master, Mr. P. Hewitt, 3rd Officer and Mr. J. Hepworth, Radio Officer.

9th July 1962, 0900 GMT. A high altitude nuclear test was seen at an approx. distance of 2,500 miles. The sky at the time of detonation was observed to become a soft shade of pink up to an altitude of about 5° . There was $\frac{7}{8}$ cloud cover and for a period of about 5 min. it was coloured a distinct blood-red over an arc of approx. 70° between NW and WSW.

Long distance medium wave radio reception in the frequency range 600–2000 kc/s was severely affected by the explosion. M/W A₃ signals from broadcasting stations in Honolulu and New Zealand prior to the detonation were being received at strength 3–4. After 0900 GMT, however, for an indefinite period, both the modulating and carrier wave components of these stations were completely obscured. Lack of stations situated within the normal range of M/F W/T made it difficult to determine the extent of distortion locally. However a test transmission on 500 kc/s between ZKR (Rarotonga) and this station indicated normal communications conditions within a range of 200 miles. On short wave there appeared to be no appreciable change in signal strength and readability of A₃ and A₁ transmissions. There was some slight distortion and loss of signal strength of Kihei (WHUH) on 15 mc/s. A W/T contact was made with Irirangi Naval Radio (ZLO2) on 422.7

kc/s without difficulty; they reported some drifting of this station's crystal controlled transmission, otherwise readability and signal strength were normal.

Position of ship at 0900: $24^{\circ} 00'S$, $159^{\circ} 25'W$.

m.v. *Suffolk*. Captain H. J. D. Sladen. Balboa to Auckland. Observers, the Master, Mr. D. C. R. Sheppard, 3rd Officer and Mr. W. B. Aitcheson, Chief Radio Officer.

9th July 1962. At 0900 GMT the North Western sky was partly covered with towering Cu. clouds, behind which the moon was hidden. Seconds later they were seen to turn a dark purple colour and the sky behind them became illuminated with a soft pink glow, the whole effect being similar to that produced when concealed lighting is switched on. The vessel's white superstructure and the sea surface also assumed the purple colour of the clouds. The glow was first observed over an arc of 80° , from 280° to 360° and reaching to an altitude of 43° as measured by sextant. The altitude and the bearing to north remained constant, but the western bearing moved rapidly to 240° , beyond which it did not extend. Spread through the discoloration of the sky were what were taken to be shock waves—thin curved rays of lime green light. The degree of illumination remained apparently constant to the naked eye until 0908 when it began to diminish. By 0910 the last traces had completely disappeared.

The magnetic compasses were checked frequently during this period and also afterwards but no effects were noticed. The Chief Radio Officer reported that short wave communication suffered no interference, but that all broadcast and M/F reception which had been excellent until 0900 ceased abruptly. It slowly returned and by 0918 was normal again.

Position of ship: $32^{\circ} 40'S$, $173^{\circ} 16'W$.

s.s. *Oriana*. Captain C. Edgecombe. Observers, Mr. M. D. Rushan, Senior 2nd Officer and Mr. R. M. Samuel, Junior 3rd Officer.

9th July 1962. At 0900 GMT (2300 SMT) when the vessel was 1,250 n. miles from Johnston Island, a brilliant green flash was observed, the centre bearing approx. 230° . This lasted for a fraction of a second and was immediately followed by a white flash of similar intensity and duration. A dull red glow then appeared on the sw horizon, spreading over the whole sky and becoming brighter until maximum intensity was reached at 0903. This light was sufficiently bright to allow the features of people on the bridge to be recognised. After 2 min. the light began to diminish, until at 0908 there was no trace of red in the sky.

Between 0900 and 0950 it was noted that M/F and I/F communications were completely obliterated for a period of at least 10 min. Except at the exact time of the explosion, H/F communications seemed unaffected, stations being heard world wide.

Position of ship: $29^{\circ} 13'N$, $150^{\circ} 51'W$.

[*Oriana* is a Canadian Selected Ship.]

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

"The effect of the Johnston Island high-altitude nuclear test observed by the m.v. *Cairnforth* and s.s. *Oriana* at 0900 GMT on the 9th July 1962 was the artificial aurora formed at the magnetic conjugate point of the explosion. The magnetic conjugate point is the point in the Southern Hemisphere which lies on the geomagnetic meridian passing through Johnston Island and at which the magnetic dip angle is equal, but opposite in sign, to the dip angle at Johnston Island. The position of Johnston Island is $17^{\circ}N$, $169^{\circ}W$ and of its magnetic conjugate point, $11^{\circ}S$, $180^{\circ}W$.

The nuclear explosion is believed to have occurred at a height of about 200 miles (i.e. in the F₂ region of the ionosphere) and the observations reported by the m.v. *Cairnforth* indicate that the artificial aurora produced at the magnetic conjugate point extended to a height of about 400 to 500 miles. The actual explosion would have had to have occurred at a height of about 1600 miles above Johnston Island to have been visible from the m.v. *Cairnforth*.

The deterioration in medium and short wave reception was due to increased attenuation in the lower layers of the ionosphere caused by the nuclear explosion. The explosion did, in fact, produce an intense Dellinger type fadeout over the Central Pacific."

AURORA

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

Once again we thank all those responsible for making auroral observations and forwarding them to us at the Balfour Stewart Auroral Laboratory of the University of Edinburgh. The reports in this edition cover the period July to September 1962 and are shown in the list below, which also summarizes very briefly the extracted data. Sketches were received from the *Weather Adviser*, one of them a perfect example of a corona, viewed overhead in the early hours of 22nd August. In some instances approximate times are shown in the list, as no actual times have been given. We should like to stress the importance of reporting the position of the ship, times of observation and wherever possible heights of the forms mentioned.

We were very pleased to have the observations made on board H. W. Tilman's yacht *Mischief* while on a trip to the Davis Strait and Baffin Land area. It was particularly interesting to receive these reports having by coincidence just read Mr. Tilman's account of an earlier voyage to southern waters ("*Mischief*" among the *Penguiuns*) in which there is a description of the author's first sight of a display of aurora australis.

M.v. *Bamburgh Castle* vividly reported an auroral display seen on the night of August

DATE (1962)	SHIP	GEOGRAPHIC POSITION	Λ	Φ	I	TIME (GMT)	FORMS
27th June	<i>Aldersgate</i>	49°48'N 65°36'W	360	61	+75	0200-0600	HA, RA, DR, R DS
20th July	<i>Atlantic Trader</i>	52°45'N 50°25'W	030	63	+74	0015-0220	HA, G
30th	<i>Weather Reporter</i>	53°15'N 16°20'W	070	59	+69	2340-0015	G
31st	<i>Weather Reporter</i>	53°10'N 17°00'W	070	58	+69	0300-0340	G
5th Aug.	<i>Weather Adviser</i>	61°56'N 33°04'W	050	70	+76	0230-0250	R
6th	<i>Weather Adviser</i>	62°07'N 33°00'W	060	70	+76	0120-0205	RB
9th	<i>Birmingham City</i>	60°45'N 61°36'W	010	72	+80	0315-0405	DR
10th	<i>Weather Adviser</i>	62°06'N 33°11'W	060	70	+76	0200-0305	G, R, C, P
17th	<i>Redcar</i>	53°30'N 48°30'W	030	64	+73	2300-2400	RA, R
19th	<i>Redcar</i>					0005-0015	RA, R
22nd	<i>Weather Adviser</i>	58°50'N 19°26'W	070	65	+73	0100-0110	R, C, F, P
25th	<i>Winga</i>	68°46'N 14°50'E	110	67	+76	0036-0044	HA
28th	<i>Mischief</i>	65°30'N 58°52'W	020	77	+81	0200-0330	HB, RB
29th	<i>Mischief</i>	65°00'N 57°20'W	020	76	+81	0115-0615	G, DR, R
30th	<i>Mischief</i>	64°00'N 54°30'W	030	75	+80	0100-0530	RB, R
31st	<i>Bamburgh Castle</i>	55°42'N 43°36'W	040	65	+75	0025-dawn	All forms
	<i>Mischief</i>	63°45'N 54°00'W	030	74	+80	0045-0550	G, HB, DR, R
1st Sept.	<i>Bamburgh Castle</i>	53°30'N 50°48'W	030	64	+75	0001	DS
	<i>Mischief</i>	62°30'N 53°30'W	030	73	+79	0200-0600	G, R
2nd	<i>Mischief</i>	61°50'N 52°45'W	030	72	+79	0001-0500	G, R
3rd	<i>Mischief</i>	61°30'N 52°30'W	030	72	+79	0001-0215	L
	<i>Rialto</i>	57°52'N 29°00'W	060	65	+72	2230	HA
4th	<i>Mischief</i>	60°15'N 50°45'W	030	71	+79	0001-0140	G, R
5th	<i>Mischief</i>	59°15'N 47°45'W	030	70	+77	0200-0330	S
7th	<i>Mischief</i>	56°45'N 41°15'W	040	66	+74	2330-0600	G, HA, HB, RB
9th	<i>Mischief</i>	56°00'N 38°45'W	040	65	+73	0030-0130	G
	<i>Crinan</i>	66°00'N 10°30'E	110	65	+76	2300-dawn	G, HA, DR, P
10th	<i>Mischief</i>	54°30'N 36°30'W	050	63	+72	0115-0630	HA, DR
13th	<i>Mischief</i>	52°45'N 32°00'W	050	61	+70	2300-0230	G, RA, R
19th	<i>Aldersgate</i>	52°06'N 53°00'W	020	63	+75	2315-0210	HB, RA, R, DS
21st	<i>Aldersgate</i>	50°20'N 59°00'W	010	62	+75	0030-0200	HA, DS
22nd	<i>Aldersgate</i>	50°00'N 66°00'W	360	62	+76	0001-0230	G, HA, RA, R, S
24th	<i>Aldersgate</i>	50°54'N 57°22'W	020	62	+75	0030-0500	G, HA, R
	<i>Weather Reporter</i>	58°54'N 19°18'W	070	65	+72	0100	G
25th	<i>Athelprince</i>	53°00'N 48°30'W	030	63	+74	0100-0114	HA
	<i>Aldersgate</i>	52°40'N 50°00'W	030	63	+74	0030-0245	G, HA, HB
26th	<i>Beaverdell</i>	53°34'N 25°28'W	060	61	+70	0001-0130	L
	<i>Weather Reporter</i>	59°12'N 18°45'W	070	65	+72	0145-0522	All forms
	<i>Weather Reporter</i>	59°04'N 19°04'W	070	65	+72	2140-2248	G
27th	<i>Weather Reporter</i>	59°12'N 19°00'W	070	65	+72	0048-0245	G, R
28th	<i>Rialto</i>	Gulf of St. Lawrence	010	60	+74	0300-0315	L
	<i>Weather Reporter</i>	58°59'N 18°45'W	070	65	+72	2045, 2145	G
29th	<i>Weather Reporter</i>	58°54'N 18°57'W	070	65	+72	0003-0545	G
	<i>Alsatia</i>	51°54'N 54°36'W	020	63	+75	~2300-0600	G, RB, R
30th	<i>Bamburgh Castle</i>	52°00'N 52°54'W	020	63	+75	~0001-0700	HA, RA, DR, DS, C

KEY: Λ = geomagnetic longitude; Φ = geomagnetic latitude; I = inclination; G = glow; HA = homogeneous arc; HB = homogeneous band; RA = rayed arc; RB = rayed band; R = rays; C = corona; S = surfaces (DS = diffuse surfaces); DR = drapery or curtain; P = pulsating; F = flaming; L = auroral light seen but no other details available.

30th–31st: “Various types of aurora began to form, mostly in the northern sky. Draperies, bands, arcs, daggers and flaming aurora all appeared with such frequency that it was impossible to record any details of this rapid transformation. . . . At 0305 a band formed in the southern sky and it slowly developed into a flaming horseshoe, a halo and finally a corona. The sky was now totally full of auroral light and at 0335 the whole sky began to pulsate until it became so chaotic that it was almost frightening to watch.” The yacht *Mischief* also saw the display to their south, but it was obscured by cloud from most observers. As we mentioned in the January 1963 edition of *The Marine Observer*, Mr. Birkenshaw, Third Officer of the *Bamburgh Castle*, forwarded film he had taken of this display.

Observers in m.v. *Aldersgate* were kept busy recording activity each night between September 19th and 25th when in the area of the Gulf of St. Lawrence, and we are most grateful for their very detailed reports.

We agree with observers in s.s. *Dorset* that the observation made on 3rd July at 2200 hrs. off the north coast of Africa would not have been aurora, and suggest that the report probably refers to a flashing satellite.

s.s. *Lismoria* reported a possible example of noctilucent cloud, observed at 2300 hrs. on 13th September when the ship was in the Gulf of St. Lawrence, though it was late in the season to see the phenomenon at that latitude. We hope that more observations of these clouds may be made during the coming summer months.

ADDENDA

We regret the omission of the following notes to ships’ observations in the ‘Marine Observers’ Log’ for April 1963.

1. s.s. *Perthshire*. 9th April 1962, Discoloured Water in 2° 25’N, 10° 50’W.

Dr. T. J. Hart, of the National Institute of Oceanography, comments:

“Lines resembling soap suds could be detergents from passing ships. A concentration of young Portuguese men o’ war or some smaller species of *siphonophora* is more probable.”

2. s.s. *Velletia*. 13th May 1962, Observation of a Flying Fox in 16° 39’N, 40° 52’E.

Mr. J. E. Hill, of the mammal section of the Natural History Museum, comments:

“This is almost certainly the Arabian straw-coloured fruit bat, *Eidolon sabaeanum* Anderson, which inhabits the rocky wastes of Southern Arabia.”

551.507.2:551.465.755:551.466.3

Sea State Studies at the Ship Hydrodynamics Laboratory, Feltham

By N. HOGBEN, B.SC., PH.D.

(Communication from National Physical Laboratory, Teddington)

Introduction

An article entitled “Sea State Information and Ship Design” appeared in the January 1961 issue of *The Marine Observer*. This article explained the value to ship designers and operators of wave and weather information collected from ships at sea and particularly its importance in relation to the model test work at the new Ship Hydrodynamics Laboratory at Feltham.

The present article is a sequel which describes some investigations carried out as part of a programme of sea state studies initiated at Feltham to furnish the oceanographic knowledge needed for model testing in waves. The scope of this work is quite wide and includes the general surveillance of existing data sources and literature on sea state.¹ Emphasis is being placed, however, on the need for systematic data covering the principal sea areas where ships operate and especially the main shipping routes. To meet this need, two specific projects have been undertaken on which the attention of this article will be focussed. The first is the processing of the wave data from the Voluntary Observing Ships which is particularly valuable for the present purpose because it is most plentiful on the main shipping routes; the second is a scheme for collecting wave data from the northern fishing grounds where existing information about sea conditions is very limited. The following is a brief

summary of some preliminary work on these projects which is reported in more detail elsewhere.^{2, 3}

The Voluntary Observing Ship Data

As many readers of this journal will know the wave data supplied by the voluntary ships comprise visual observations of the height, period and direction which together with a wide range of other data are reported to the Meteorological Office where they are coded on to punched cards. These wave observations have been included since 1949 in the reports which are received from about 500 ships in normal service all over the world, as well as from weather ships. For classification purposes the surface of the globe has been divided into a grid of 10° squares known as Marsden squares each having a code number. The cards are in fact stored according to Marsden square number and month of the year and cards from the weather ships are kept separate. The disposition of the Marsden squares and the numbers of cards available for each square are recorded on special charts and it may be seen from these charts that these data represent a vast reservoir of wave information covering the oceans of the world and particularly the shipping routes.

In the past, relatively little use has been made of this wave information except for synoptic purposes, because it needs such a long series of observations before they can really be studied climatologically. Now that there are 12 years' observations available a scheme has been put in hand for the processing of the cards to compile extensive systematic wave data in a simple and readily usable form. This processing of the cards consists mainly of sorting and counting operations which yield tabular data of the type shown in Table 1. These tabular data are themselves punched on to summary cards so that they are easily manipulated into other forms. The data, which will in practice be expressed in percentages, show the relative frequencies of occurrence of any combination of wave height and period and thus give at a glance a working picture of both the average and the extreme wave conditions.

Table 1
SPECIMEN TABLE OF RESULTS—SQUARE 183 (DEC., JAN., FEB.)
(Marsden square 183 is the area 50°-60°N, 20°-30°W)

HEIGHT (FEET)	PERIOD (SECONDS)											Row Total
	< 5	5-7	7-9	9-11	11-13	13-15	15-17	17-19	19-21	> 21	X	
< 1	16	3	5	5	0	0	0	0	0	0	8	37
1½	23	0	8	4	5	3	1	0	0	0	0	44
3	74	32	8	15	8	2	1	0	0	0	1	141
5	51	96	39	19	11	2	0	0	0	0	4	222
6½	35	82	57	17	6	1	2	0	0	0	7	207
8	11	45	50	34	12	1	0	0	0	0	10	163
9½	5	43	55	33	18	7	1	2	0	0	5	169
11	5	17	43	23	17	5	1	0	0	0	3	114
13	0	13	30	15	22	5	2	0	0	0	5	92
14	1	9	35	25	25	8	5	0	0	0	4	112
16	0	0	2	0	0	0	0	0	0	0	0	2
19	0	1	1	0	0	1	0	0	0	0	0	3
21	0	0	1	1	1	0	0	0	0	0	0	3
22½	1	0	0	0	1	0	0	0	0	0	0	2
24	1	0	0	0	1	1	0	0	0	0	0	3
25½	0	0	0	1	0	0	0	0	0	0	0	1
30½	0	0	0	2	0	1	0	0	0	0	0	3
Y	1	6	14	7	4	2	1	0	0	0	0	35
Column Total	223	341	334	194	127	37	13	2	0	0	47	1318

The figures are numbers of observations.
X Indicates Period Indeterminate.
Y Indicates Wave Height Indeterminate

As a preliminary step some pilot studies have been carried out to establish suitable data reduction processes and to explore the consistency and reliability of the observations and the way in which they fit in with other data. In these preliminary studies, data for 4 Marsden squares in the North Atlantic have been analysed and reduced to the form of cumulative frequency curves for ease of comparison with other data. Figs. 1a to 1e show a representative selection of curves illustrating the result of the investigation. This may be summarised by saying that the voluntary ship data appear remarkably self-consistent but are not in agreement with corresponding data from weather ships. Thus, although the self-consistency associated with the large sample size offers an assurance that the results are reliable and meaningful in a comparative sense, it must be accepted in the absence of any absolute check that there is some uncertainty about quantitative accuracy. Fig. 1a illustrates the consistency of the voluntary observations by showing the cumulative frequency

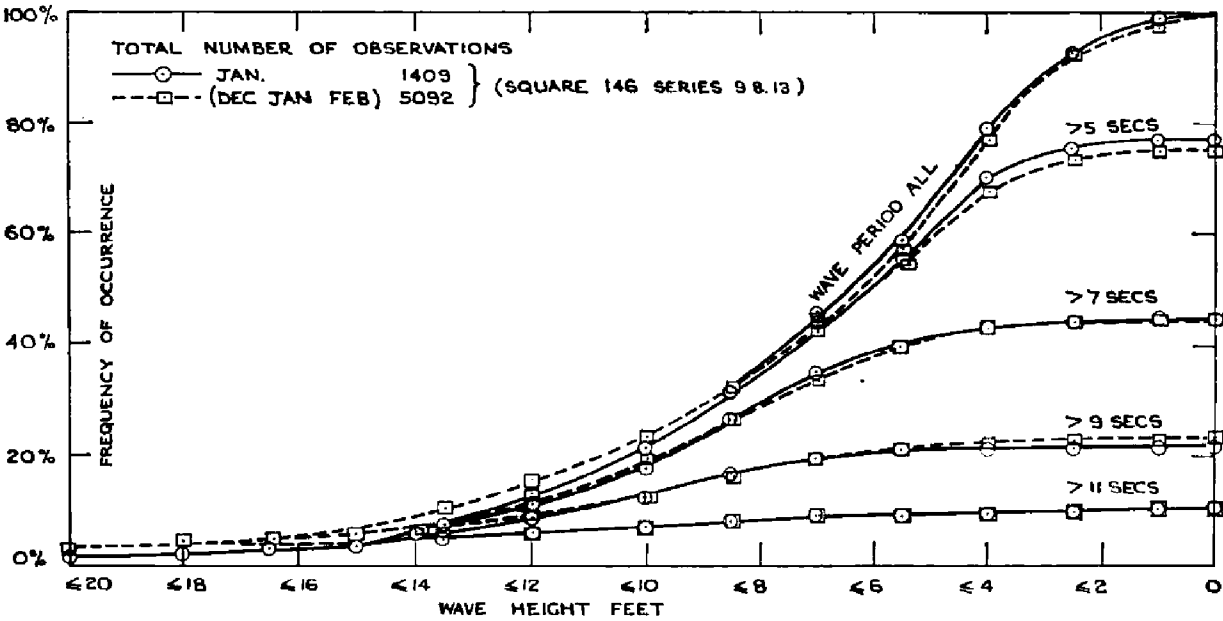


Fig. 1a. Wave Statistics—Square 146—January and (December+January+February) (British Voluntary Observing Ship data). (Square 146 is 40°-50°N, 10°-20°W.)

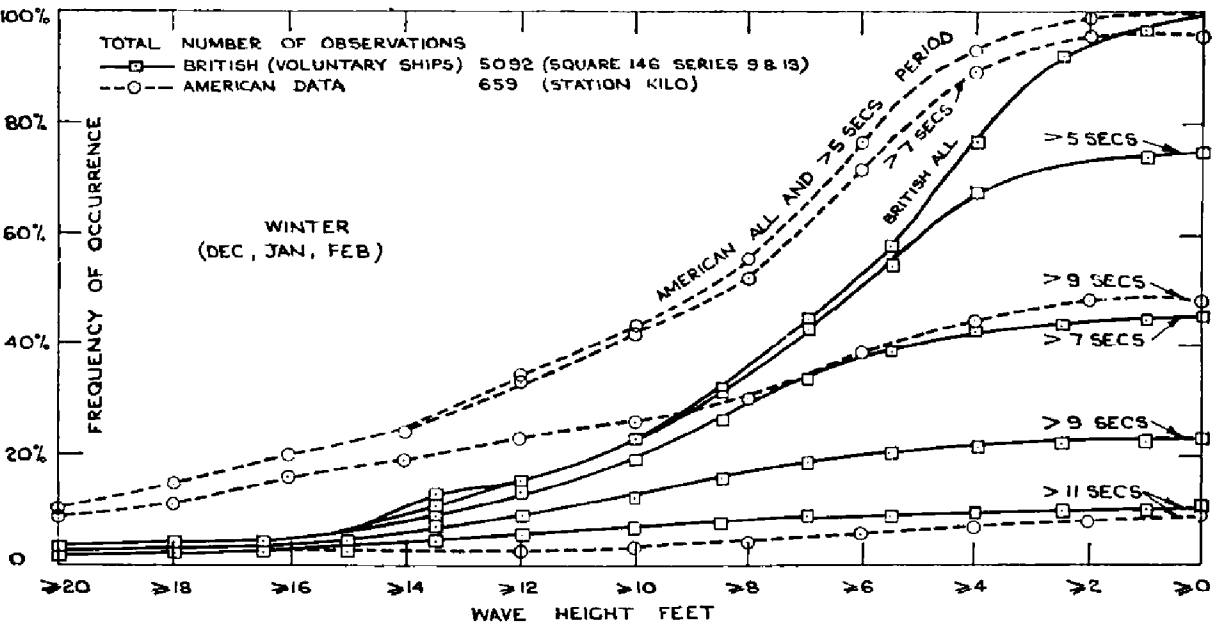


Fig. 1b. Wave Statistics—Station Kilo—Square 146—winter comparison of British Voluntary Ships and American data.*

* This 'American data' is European weather ship data taken from an American atlas.

distributions for January alone in comparison with the corresponding curves for December, January and February combined. Figs. 1b, c and d show typical comparisons between the voluntary ship data and data based on observations from European weather ships taken from an American oceanographic atlas.⁴ These figures, in association with Fig. 1e showing a comparison between a long period of British Weather Ship data and a somewhat shorter period of European (including British) Weather Ship data, exemplify the fact that in all the cases studied observers on weather ships consistently report a greater frequency of high waves than the observers on the voluntary ships. This may be because the voluntary ships are, on average, larger than the weather ships or possibly because the weather ships must remain "on station" at a fixed position in all weathers while the voluntary ships may sometimes 'dodge' the rougher conditions.*

In spite of this doubt about absolute accuracy, however, the voluntary ship data serve a most valuable purpose as a consistent comparative index of sea state offering the required systematic coverage of shipping routes and based on an enormous fund of observations. Thus in view of the very real demand for detailed and comprehensive knowledge of sea state it has been decided that more extensive processing of the voluntary ship data cards on the lines developed in this preliminary investigation shall be undertaken.

Wave Data from the Fishing Grounds

The need for good seagoing qualities is particularly great for trawlers, and a programme of trawler model tests in waves is being undertaken at Feltham. Unfortunately, however, very little information is available about wave conditions in the fishing grounds and the voluntary ship data though plentiful on shipping routes are rather scarce in these areas. Accordingly a scheme has been prepared by Ship Division in collaboration with the White Fish Authority and the Ministry of Agriculture, Fisheries and Food to collect sea state data from the fishing grounds by enlisting the co-operation of specially selected trawler skippers and the scientific teams of research trawlers.

As a development stage of this scheme, special visual observation trials have been

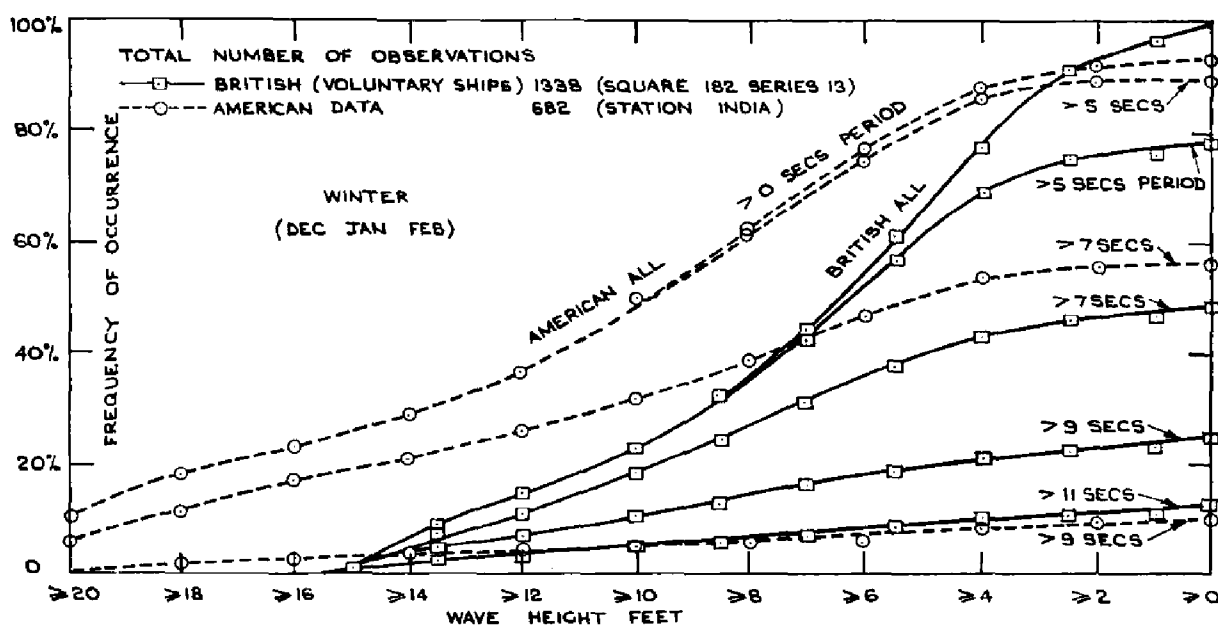


Fig. 1c. Wave Statistics—Station India—Square 182—winter comparison of British Voluntary Ships and American data. (Square 182 is 50°–60°N, 10°–20°W.)

* Aboard the British Ocean Weather Ships the observations are normally made by a meteorologist standing on the after deck, his height of eye being about 14 ft., in consultation, when considered necessary, with the deck officer on watch who has a height of eye of about 30 ft. As the weather ships spend most of their time lying stopped on station, it seems reasonable to suppose that their observations should be fairly accurate.—Editor.

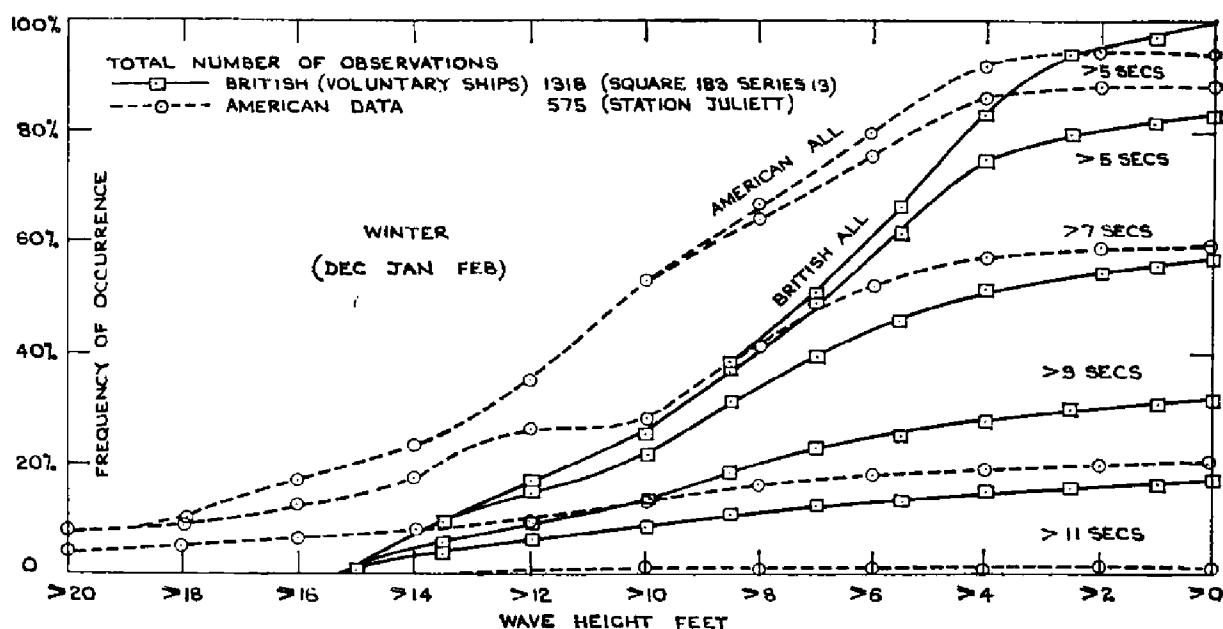


Fig. 1d. Wave Statistics—Station Juliett—Square 183—winter comparison of British Voluntary Ships and American data.

carried out on 2 ships, the s.s. *Cairndhu* on a passage from Grangemouth to Montreal and return in November 1960, and the r.v. *Ernest Holt* steaming from Newcastle to the Faroe islands and return to Grimsby in February 1961. The principal results of these trials are summarised in the representative selection of diagrams (figs. 2, 3 and 4) illustrating the consistency of the observations and in the data sheet (fig. 5) and guidance notes drafted in the light of the experience gained for use by the selected trawler skippers.

During these trials the following quantities were observed:

Wave height
Wave length
Wave direction
Wave period
Crest encounter period
Wind speed
Wind direction
Beaufort number

The trials on the *Cairndhu* were preliminary studies to assist the planning of the *Ernest Holt* trials and only three observers took part. The trials on the *Ernest Holt* were more elaborate and there were six independent observers, including the officer of the watch, and in addition records were made on an N.I.O. shipborne wave recorder.

Figs. 2 and 3 show some typical results indicating the comparison between the observers and the wave recorder. As a general assessment it might be said that while in many cases one or two individual estimates were very far from the mean, the general level of consistency in the observations was good and the means correlated reasonably well with the independent estimates from the wave recorder, where available.

Fig. 4 shows the relationship between the mean observed wave length λ_0 and the mean observed wave period T_0 . This relationship has an important practical significance because the voluntary ships report period but not length, and it is usual to deduce length from period by applying the formula:

$$\lambda_0 = \frac{g}{2\pi} T_0^2$$

where g = acceleration of gravity = 32.2 ft/sec^2 and $\pi = 3.1416$. It can be shown

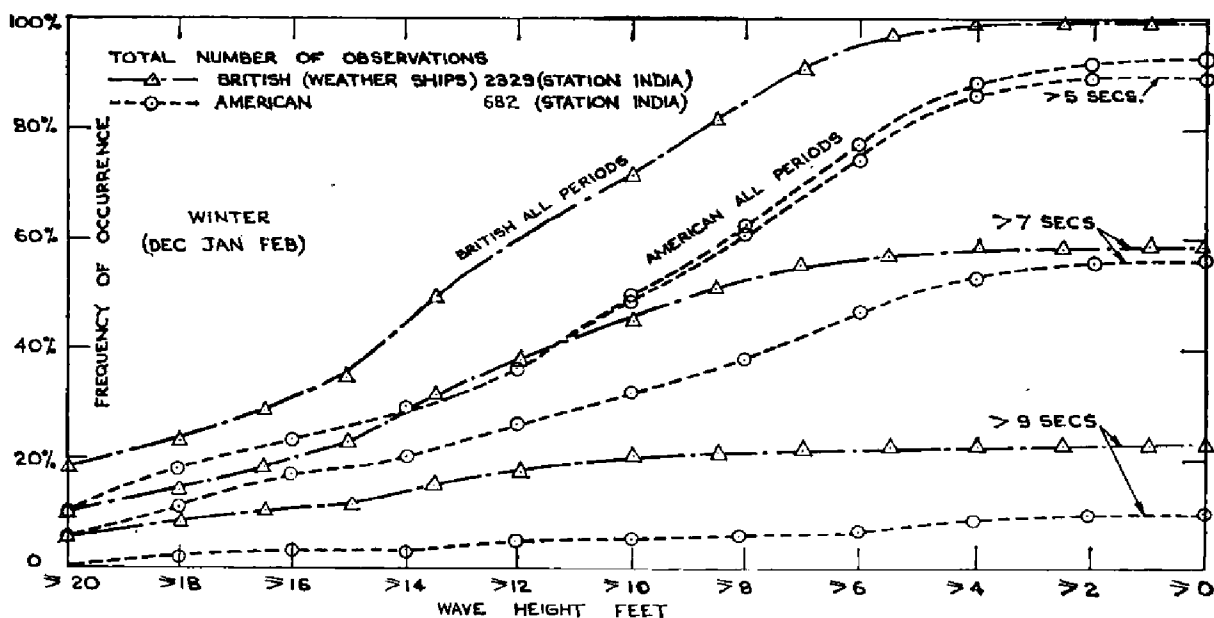


Fig. 1e. Wave Statistics—Station India—winter comparison of British Weather Ships and American data.

- △ ————— Mean of observations.
- - - - - - Visual estimate from Sea State Meter record.
- - · - · - Simplified calculation from Sea State Meter record.
- Trial number: A indicates ship stopped.
- B indicates ship steaming.

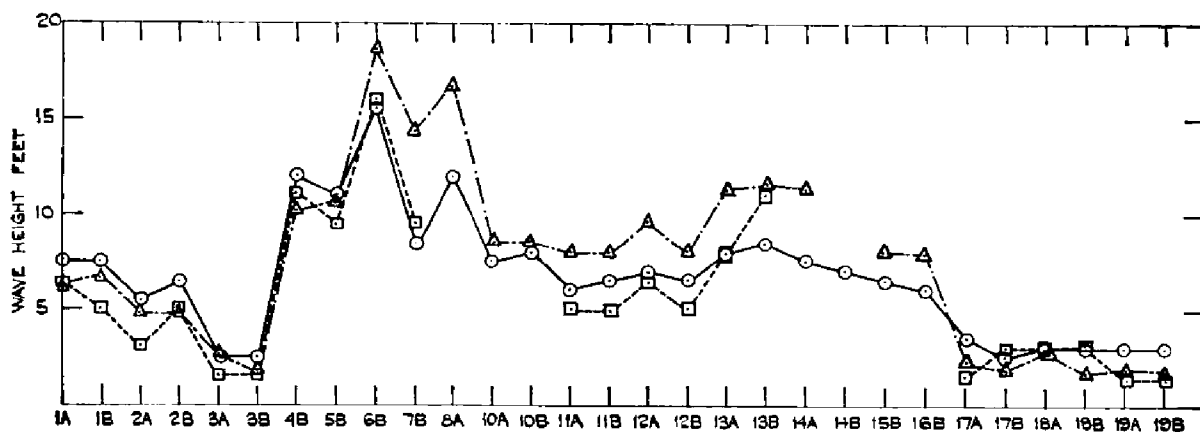


Fig. 2a. Wave height comparisons (Ernest Holt).

- ————— Mean of observations.
- - - - - - Visual estimate from Sea State Meter record (ship stopped only).
- △ - · - · - Simplified calculation from Sea State Meter record.
- Trial number: A indicates ship stopped.
- B indicates ship steaming.

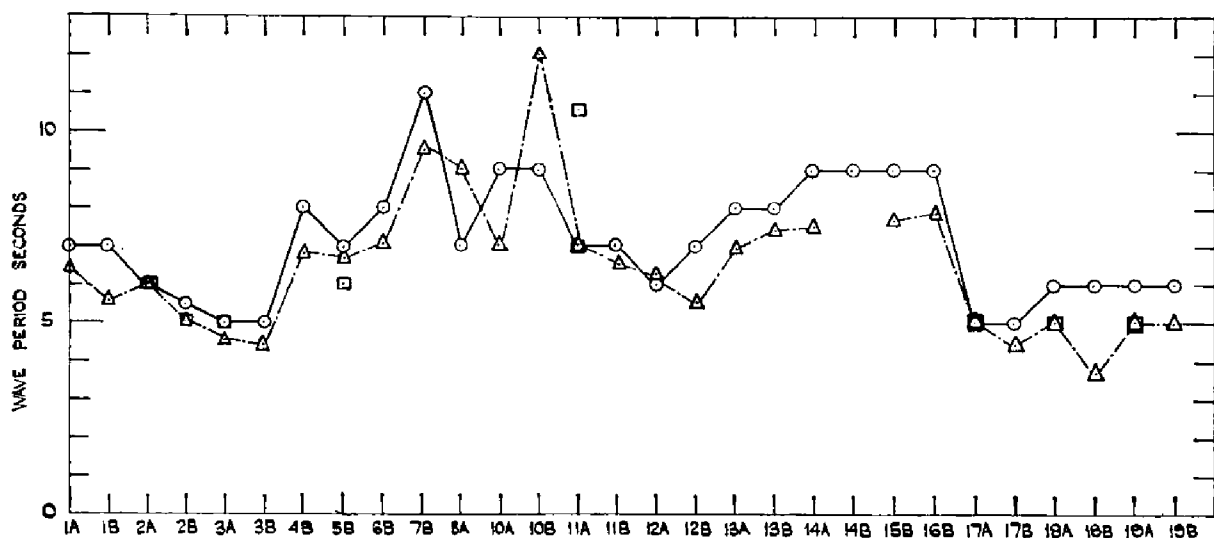


Fig. 2b. Wave period comparisons (Ernest Holt).

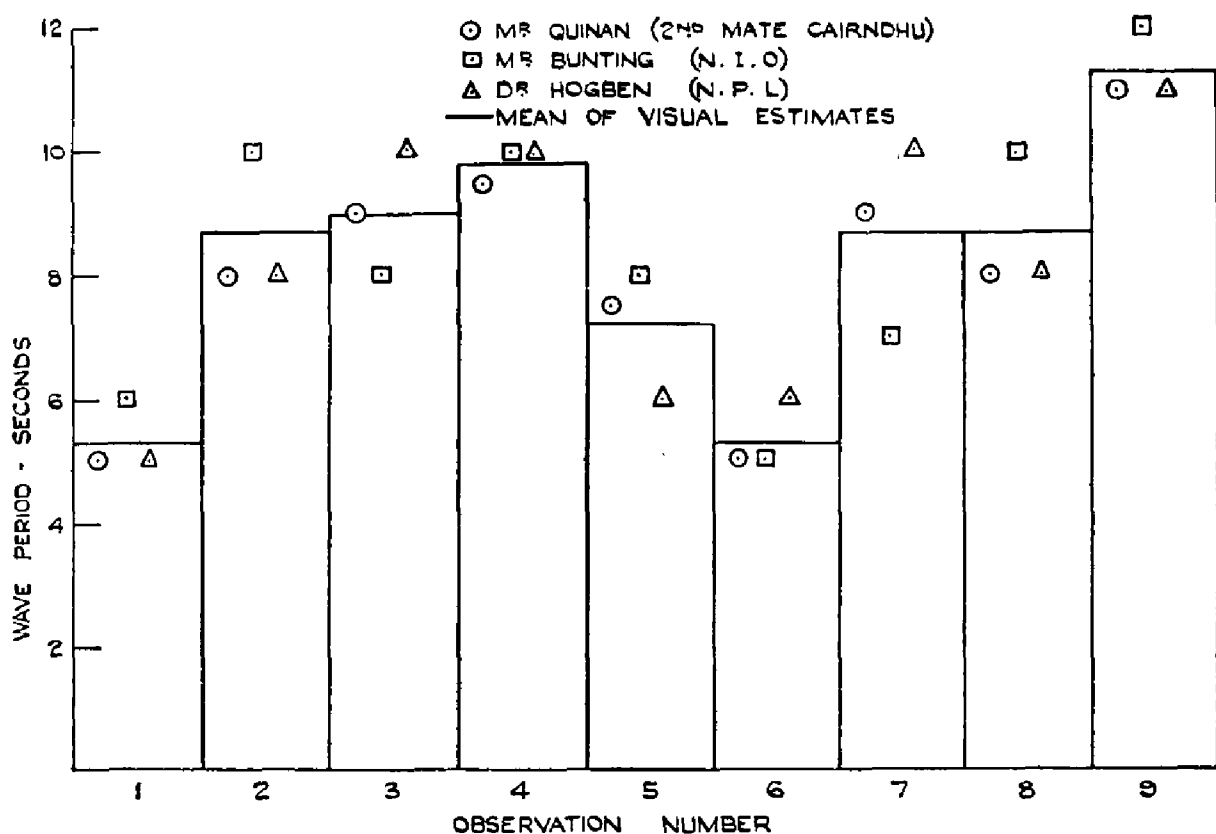


Fig. 3a. Wave period (Cairndhu).

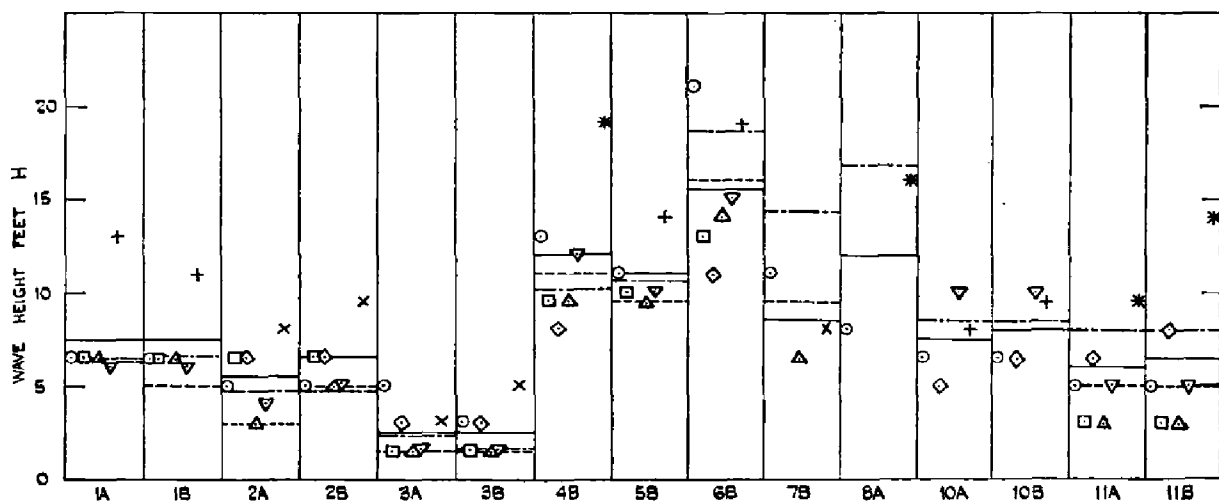


Fig. 3b. Wave height observations (Ernest Holt).

OBSERVER NUMBER	1 ○
	2 □
	3 ◇
	4 △
	5 ▽
SHIP'S OFFICERS	6 +
	7 ×
	8 *

————— H_0 Mean of observations.

- - - - - H_s Visual estimate from Sea State Meter record.

- - - - - $H_{1/3}$ Simplified calculation from Sea State Meter record.

Trial number: A indicates ship stopped.
B indicates ship steaming.

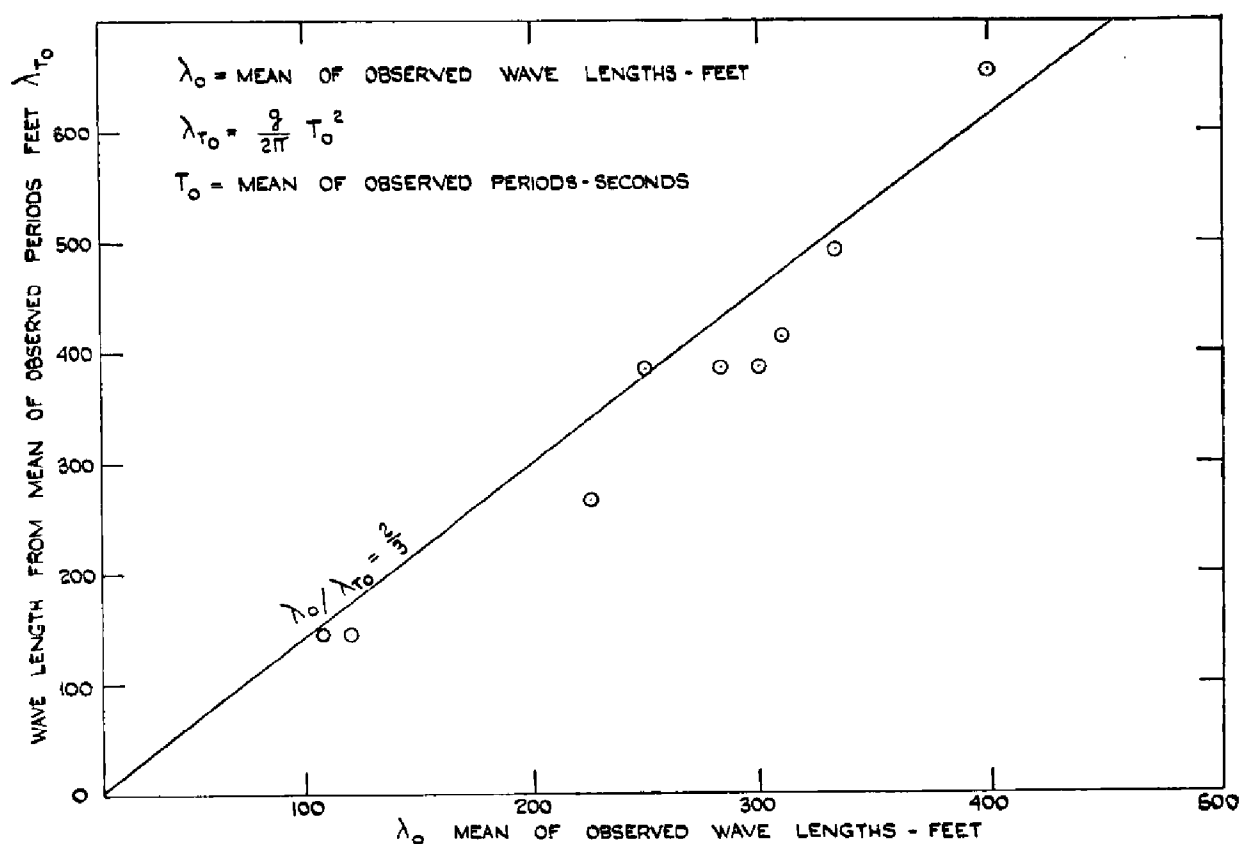


Fig. 4a. Relation of observed length and observed period of waves (*Cairndhu*).

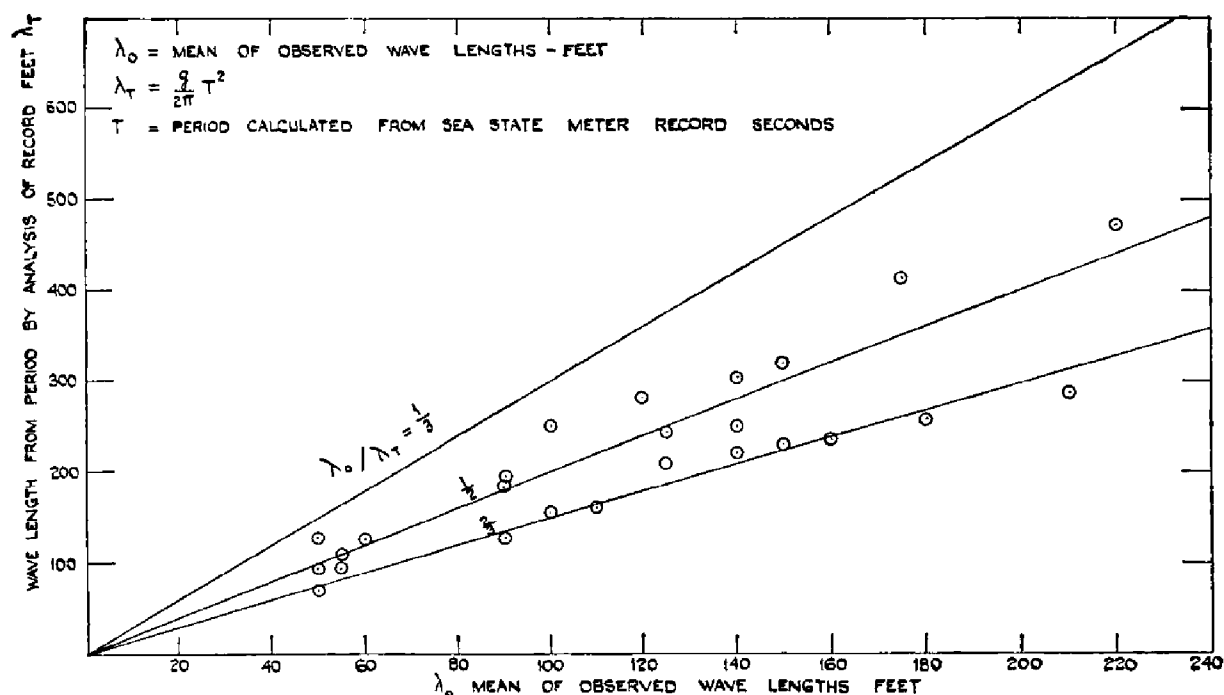


Fig. 4b. Relation of observed length and calculated period of waves (*Ernest Holt*).

theoretically, however, that this relationship which applies accurately to regular waves must be modified in application to the mean, observed lengths and period of an irregular seaway. This point is discussed by Cartwright⁵ who gives a formula which may be written as:

$$\lambda_0 = K \frac{g}{2\pi} T_0^2$$

where K is a factor depending on the nature of the wave spectrum. Experimental values of K are indicated by figs. 4a and 4b and it is of interest to note that the

Cairndhu results which refer to the North Atlantic are in fair agreement with the theoretical value of $2/3$ which is given for the Neumann spectrum.⁶ The lower values indicated by the *Ernest Holt* observations probably result from the different spectral characteristics of the more restricted waters in which these trials were conducted.

The lessons learned about observing technique are summarised in the data sheet (fig. 5)* and associated guidance notes designed for issue to selected trawler skippers as follows.

Notes on the Use of the Data Sheet (Fig. 5)

I. GENERAL REMARKS

These notes are based partly on the instructions issued by the Meteorological Office (*The Marine Observer's Handbook*) and partly on experience gained from special visual observation trials carried out on the r.v. *Ernest Holt*.

The observations are best made from the wheelhouse and each set need not take more than about 20 minutes. Observations are to be made where practicable at the standard synoptic hours, namely 0000, 0600, 1200 and 1800 hours GMT. It is appreciated, however, that this will often not be possible due to darkness or to other commitments such as the shooting of the trawl; observations made at different times will be quite acceptable in such cases.

It is stressed that each wave observation entered should be the mean of about ten separate estimates. When more than one system of waves is present the predominant system should in general be observed and the estimates of height, length, period and direction should all relate to this same system and should represent the average of the well formed waves of the system. In cases where sea waves are superimposed on swell, the observer may make two separate entries, indicating in the

[illegible]

Fig. 5. Wave and wind data record sheet.

* This form is shown here to illustrate the method used by the author for this particular investigation; it is not intended to use this type of form for wave observations by British Voluntary Observing Ships—all the necessary detail for this purpose is contained in the log-books. The associated guidance notes are reproduced here because they include some hints that might be useful to voluntary observers in merchant ships. Some of these will probably be incorporated into Meteorological Office instructions in due course.

space for remarks which is sea and which is swell. Care must be taken to avoid confusion with the waves made by the ship herself.

The following notes may help.

2. GENERAL PARTICULARS

The General Particulars are information readily available in the wheelhouse and require little comment. The ship's heading should be in degrees from true North.

3. WAVE AND WIND ESTIMATES

For the wave and wind estimates a ticking system is used, partly for ease of recording and partly to simplify the subsequent punched card coding and analysis. An estimate which does not lie in the given tick range may be written in the columns marked H (wave height), P (wave period), L (wave length) and B (Beaufort number).

In making these estimates the following notes may serve for guidance.

3.1. Wave Height

This entry should be the average height in feet from crest to trough of the well formed waves of the predominant wave system, based on about ten separate estimates. In making these estimates, an attempt should be made to fix a standard of height in terms of the height of a man or the height of the bulwark, forecastle or other known dimension on the ship. It should be borne in mind that there is generally a tendency to overestimate the height of short waves and underestimate the height of long waves.

Whenever a Dan buoy is moored, its height, which should be known, will be a valuable aid to the estimation of wave height.

The following table defining the coding for state of sea specified by the World Meteorological Organisation may also help.

Table 2
WMO Code 75:3700

CODE FIGURE	DESCRIPTIVE TERMS	HEIGHT *
0	Calm (glassy)	0
1	Calm (rippled)	0-4 in.
2	Smooth (wavelets)	4-20 in.
3	Slight	20 in.-4 ft.
4	Moderate	4-8 ft.
5	Rough	8-13 ft.
6	Very rough	13-20 ft.
7	High	20-30 ft.
8	Very high	30-45 ft.
9	Phenomenal	Over 45 ft.

* The average wave height as obtained from the larger well formed waves of the wave system being observed.

3.2. Wave Period

This entry should be the average time in seconds for a patch of foam or floating object to ride from crest to crest of the well formed waves. A stop watch should be used and the entry recorded should be a mean of about 10 estimates.

If there are no foam patches or natural aids such as seagulls, it will help if a floating object (suitable small blocks of wood are supplied) can be thrown out. It is best if a member of the crew throws objects from a position well forward which can be observed and timed by the observer in the wheelhouse.

Wave period is easier to observe when the ship is either stopped or moving slowly as when trawling. A Dan buoy when moored is an excellent aid for the estimation of wave period.

3.3. *Wave Length*

This should be the average distance in feet from crest to crest of the well formed waves, based on about ten separate estimates. It may be estimated by comparison with known lengths on the ship, e.g. length of foredeck. This is most easily done when the waves are approximately ahead or following.

3.4. *Wave Direction*

This entry should be the direction in degrees (relative to true North) from which the predominant waves are coming. This may be estimated by first judging the direction along which the crest lines of the well formed waves lie and then deducting the direction at right angles to this, from which the waves are coming.

3.5. *Wind Direction*

This should be the direction in degrees (relative to true North) from which the wind is blowing. Study of the ripples or streaks on the sea surface may assist estimation. Care must be taken to correct for the movement of the ship when referring to a wind vane, flag, smoke or other guide influenced by the forward motion.

3.6. *Beaufort Number*

This may be estimated on the basis of the descriptions given in the Beaufort Scale in the *Marine Observers' Handbook*.

CONCLUDING REMARKS

The studies described in this article have been carried out as the development stages of long term plans for the compilation of data defining in a systematic and comprehensive manner the sea conditions in which ships operate both on shipping routes and in the northern fishing grounds. They have served to indicate the reliability to be expected, and the practical problems involved and the long term plans are now being implemented on the basis of the experience gained.

Acknowledgments

This article is published by permission of the Director of the National Physical Laboratory.

Acknowledgment is due to the following organisations for their co-operation:

The Meteorological Office
The Ministry of Agriculture, Fisheries and Food
The White Fish Authority
The Cairn Thomson Line
The Combined Tabulating Installation H.M.S.O.
Mathematics Division N.P.L.
The Co-ordinating Committee for Seakeeping Research
The British Ship Research Association
The National Institute of Oceanography

The author wishes to express his sincere personal appreciation to his colleagues and all members of the above organisations who have contributed so much to the progress of this work.

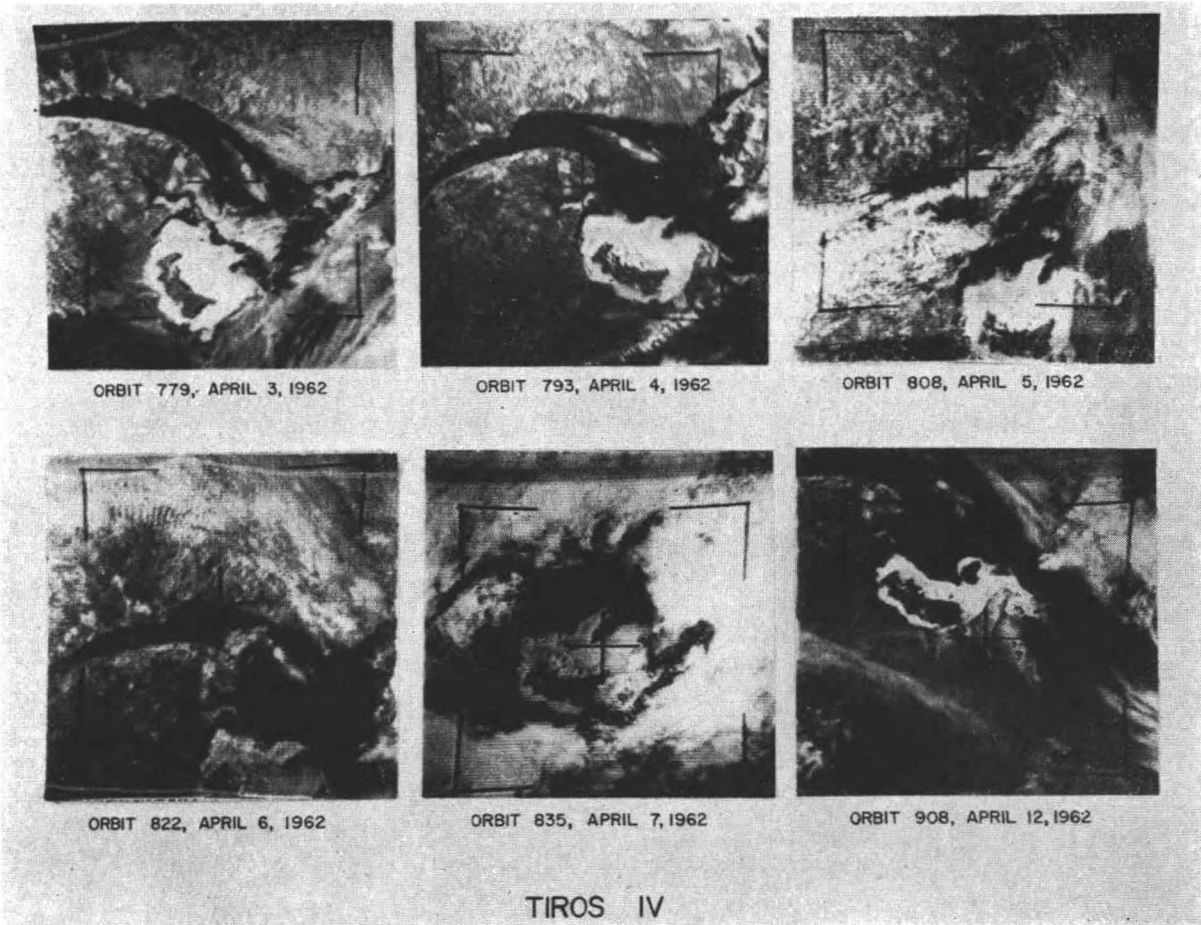
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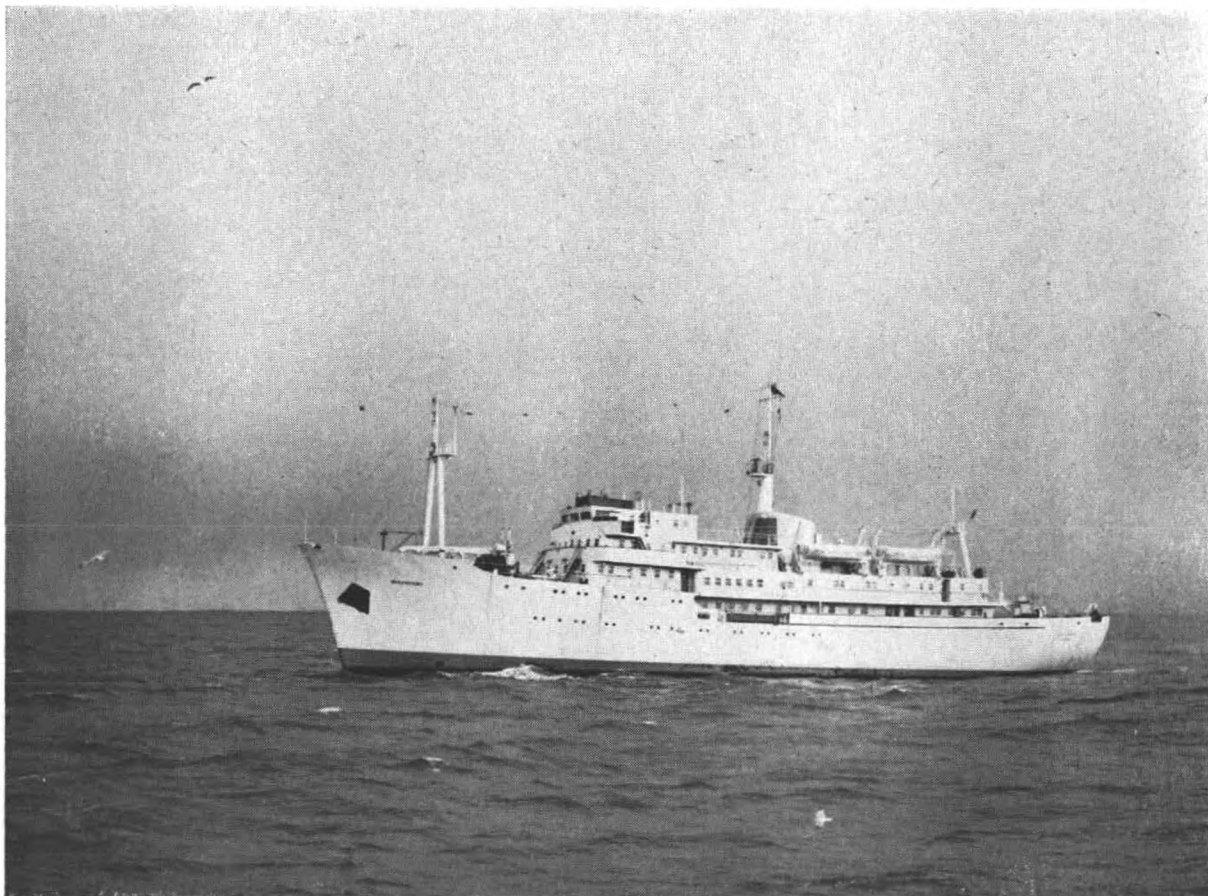
Fig. 3. (Right.) This mosaic was made from a group of photographs taken by TIROS V, the weather satellite, on its 115th orbit, 27th June 1962. The photographs show the River Nile, Red Sea and the Gulf of Aden. Somalia on the east coast of Africa is at the bottom of the picture. Cumulus clouds are present over the Asir mountains, western Saudi Arabia, and parts of Ethiopia. The bright spot off the coast of Ethiopia is sun glint, not clouds. Clouds which appear to be thunderstorms can be seen over Yemen. A few wisps of high cirrus clouds may be seen extending across the coast of Somaliland. (See page 141.)



Fig. 4. (Below.) This series of pictures was taken during Phase II of Project TIREC (TIROS Ice Reconnaissance), a joint Canadian-U.S. effort to evaluate the potential use of meteorological satellites for ice surveillance and reconnaissance. The area shown is the Gulf of St. Lawrence. The persistent bright area seen in all of these pictures is ice around Prince Edward Island.



(Opposite page 141)



R.R.S. Discovery (see page 142).

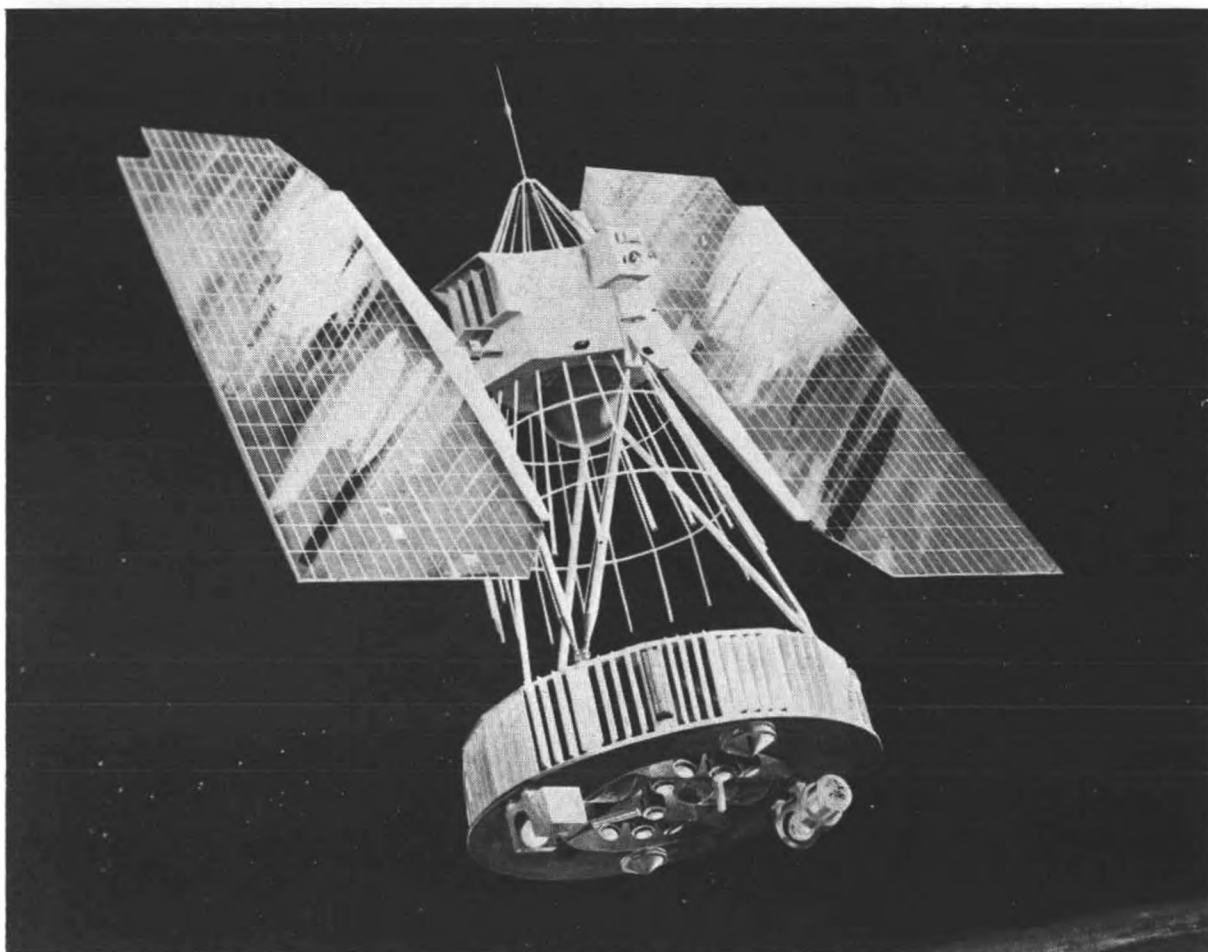


Fig. 5. The NIMBUS satellite. The bottom ring is equipped with cameras and infra-red sensors. The upper part will keep the satellite pointing towards the earth at all times. The paddles are covered with solar cells to furnish the electrical power needed to operate the satellite.

A Satellite View of the Weather

By S. FRED SINGER

(Dr. Singer is the first Director (since June 1962) of the recently established National Weather Satellite Center in the U.S. Department of Commerce, Weather Bureau. He is on leave of absence from the University of Maryland where he is Professor and Director of the Center of Atmospheric and Space Physics.)

The meteorological satellite TIROS (Television and Infra-Red Observation Satellite) was designed to furnish pictures of cloud patterns over the earth, and measurements of radiation emitted and reflected by the earth and its atmosphere (see fig. 1).

The first of these drum-shaped satellites, 19 inches high and 42 inches in diameter, was launched into orbit on 1st April 1960. Within a few hours after launch, TIROS I sent to earth pictures taken from a height of 450 miles. TIROS I completed 1,091 hundred-minute orbits, and sent back over 19,000 usable pictures of cloud patterns, tornado clouds, a hurricane, snow cover, pack-ice, and land forms during its 79-day lifetime. TIROS I was followed by five similar satellites; the latest, TIROS VI, was launched on 19th September 1962.

The cameras of the latest TIROS satellites take pictures of areas of two different sizes: one a square of side 800 miles, the other of side 450 miles. The diameter of the smallest object visible under optimum conditions, i.e. when the camera is looking straight down, is $1\frac{1}{4}$ miles. This resolution decreases progressively towards the edge of the pictures.

Despite the fact that TIROS satellites are limited to 32 pictures per orbit for each camera, the pictures fill large gaps in the conventional weather observation networks. These gaps are the oceans covering seven-tenths of the earth's surface, and sparsely populated land areas, such as the great deserts, and the polar areas. Over the tropical eastern Pacific, the South Indian Ocean, and the southern oceans in general, TIROS photographs furnished the first comprehensive information of the weather systems of these areas.

The cloud pictures received from TIROS are the basis for operational use of the satellite. The pictures are used to prepare nephanalyses, or cloud maps, which are furnished to the master analysis section of the National Meteorological Center, and to field stations in the United States and overseas for use in daily operations. The mechanics of processing the data and preparing the nephanalyses is such that the average time between the acquisition of the pictures and worldwide transmission of the nephanalyses, in either coded or facsimile form, is about two and a half hours.

These nephanalyses are used by meteorologists to confirm, amend, or supplement weather charts based on more conventional weather observations. Fig. 2 shows the nephanalyses for a typical 24-hour period of TIROS operation.

Many different kinds of cloud patterns, ice and snow, and geographic features have been seen in the pictures televised from the TIROS satellites. Figs. 3 and 4 illustrate some of the variety of information that can be obtained.

One of the most spectacular feats of the weather satellite is the discovery and tracking of tropical storms. In the summer of 1961, TIROS III discovered Hurricane 'Esther' and tracked it and seventeen other hurricanes, typhoons and tropical storms in the Atlantic and Pacific Oceans. During August 1962, TIROS V discovered two hurricanes and four typhoons, thus fulfilling its programmed mission as a 'hurricane hunter'.

In other areas where weather information plays a vital role, the TIROS has proved itself to be a valuable tool in forecasting and prediction. Recently an airline pilot on a flight from New York to Africa stated that the TIROS cloud cover map provided him by the Weather Bureau was "so accurate as to be unbelievable".

Research using the satellite pictures has included studies of the formative stages of hurricanes, atmospheric motions, tropical circulations and weather, the distribu-

tions and characteristics of ice and snow, jet streams and associated turbulence, convection phenomena and applications to numerical weather prediction models.

Weather satellites have many non-meteorological applications, some of which have been explored and put to use.

Soon after the launch of TIROS I, it became obvious that ice could be detected and studies were immediately begun to utilise this information. The pictures of Fig. 4 were taken during a joint Canadian-United States project to study the use of satellite pictures for ice surveillance. Findings from these studies are expected to be of great importance to merchant shipping and polar operations.

Similarly, snow surveys are being conducted which may be beneficial in areas of hydrological importance.

Future weather satellites may carry out experiments which will detect forest fires which cause an annual loss in the United States ranging from \$50 to \$300 million per year, and have taken 127 lives in the five-year period ending in 1961. The greatest loss has been from those fires not detected early enough. The satellite may be the answer.

Radiation data from the satellites have been used as a basis for studies of the planetary radiation balance and the correlation of the radiation measurements with cloud cover, the height of cloud tops and with land and ocean surface temperatures.

The NIMBUS satellite (Fig. 5) now under development is expected to be the first satellite which will meet the needs of an operational weather satellite system. NIMBUS will overcome the two basic limitations of TIROS in that it will view the polar regions and will provide continuous observation of the earth's cloud cover.

The wealth of new information resulting from NIMBUS will give scientists an abundance of material for advanced research into causes of atmospheric motions and planetary circulation. The cloud climatology of the earth, particularly over its oceans and polar regions may be completely revised as the data are accumulated and analysed.

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The Royal Research Ship "Discovery"

By H. F. P. HERDMAN, D.SC.

(Dr. Herdman, of the National Institute of Oceanography, has been closely associated with the building and equipping of *Discovery*.)

In a recent number of *The Marine Observer** reference was made to the passing of a notable ship—the *Discovery II*. Her successor, the *Discovery*, which was commissioned on 17th December 1962, has recently been at sea on proving trials, and will shortly be leaving to take part in the International Indian Ocean Expedition. Designed and built by Hall, Russell and Company, of Aberdeen (after tank trials on a model at the National Physical Laboratory), the new ship is considerably larger than her predecessor, her principal dimensions being:

Length (overall)	..	..	..	..	261 ft.
Breadth (moulded)	..	..	..	..	46 ft.
Depth (moulded)	..	..	..	..	18 ft.
Draught (mean)	..	..	..	..	15 ft. 4 in.
Tonnage (gross)	..	..	..	..	2665

To achieve the flexibility in speed so necessary for a research vessel the *Discovery* is propelled by diesel-electric machinery, designed by Associated Electrical Industries, with three Ruston and Hornsby diesel engines as the prime movers. The propulsion motor (of double-unit construction) develops 2,000 s.h.p. and drives a single screw. The main electrical equipment, comprising the propulsion generators,

* *The Marine Observer*, January 1963, p. 45.

propulsion motor, bow propeller motor and the trawling and coring winch motors operates on the constant current system in which the various armatures are connected into a series loop, with isolators which provide loop continuity when the associated armature is not in use. Control of the main propulsion motor is from either engine room or bridge, that of the bow propeller is from the bridge console only.

Auxiliary current, up to 1,435 Kw., at 225 volts D.C., is generated by tandem machines on the main generators and two auxiliary diesel engines. 100 Kw. of single-phase alternating current, at 230 volts, 50 cycles is also available for scientific use.

Maximum speed is 14 knots, with a designed economic speed of 10–11 knots on two generators. In practice it has been found that $9\frac{1}{2}$ knots can be reached on one generator, but that this leaves us a little short of auxiliary power, except in daytime. Fuel and stores are carried for a cruising range of some 15,000 miles and an endurance of 70 days.

Built to Lloyd's highest requirements, including Class II stiffening for navigation in ice, and to meet M.O.T. present and, where possible, pending regulations for foreign-going vessels the *Discovery* has, in addition, many special features in her construction. By the use of aluminium for all superstructure above the foc's'le deck there has been a considerable saving in top-weight, and the extra deck thus made possible allowed for adequate room for the main laboratories and officer's accommodation. Altogether, laboratory and ancillary spaces occupy some 3,400 sq. ft., compared with an area of 870 sq. ft. available for similar needs in the *Discovery II*. These laboratories are sited throughout the ship, with the meteorological office in the after end of the funnel, and they cater for a wide range of subjects, from the study of the upper air, through the ocean, to the structure of the sea bed. She can carry 18 scientists.

Ease of manœuvre is a highly desirable attribute in a research vessel, no matter what her size; it has, in *Discovery*, been achieved by fitting a lateral thrust unit forward, in conjunction with a rotary vane type of steering gear and a semi-balanced rudder. The thrust unit consists of a two bladed reversible propeller in a tunnel athwartships, centred 24 ft. 6 in. abaft the fore perpendicular and 7 ft. 6 in. below the L.W.L. By courtesy of the National Physical Laboratory it was possible to site and 'fair' this tunnel so that there was a minimum loss of forward speed for a given horse-power. Powered by a 350 h.p. electric motor, in the constant current loop, the thrust developed is, approximately, 4 tons and, with the ship stopped in a wind of force 4, this power is sufficient to turn her through 360° in rather less than 8 minutes. It must be borne in mind however that there is a considerable loss of thrust with forward speed; this may exceed 50% at a speed as low as 2 knots. By use of this bow propeller it will be possible to keep the water-bottle, coring and net wires vertical with the ship hove-to head-to-wind. Hitherto, in the *Discovery II*, head-to-wind working was only possible by using forward speed, together with rudder, to bring the ship's head back when she fell off.

Among other special features such as the absence of rigging for masts, and side stanchions to support overhanging decks, the *Discovery* has a trunk or well through the hull forward which enables scientific apparatus to be fixed on a plate, or raft, and lowered directly into the sea. Forward of this well sluice valves have been fitted through which it is hoped, at a later date, to use an underwater periscope. Provision is also made for fitting, and connecting to all main services, a portable or 'package' laboratory at the after end of the foc's'le deck, and at the after end of the upper deck is a constant temperature laboratory, with a separate deep freeze compartment adjoining. 'Fresh' salt water, which can be pre-cooled, is supplied direct to this laboratory, through plastic pipes and a non-metallic pump, for circulation through special tanks in which deep-sea animals can be kept alive for experimental purposes. A scientific cinema and lecture theatre, with a dark room and a general photographic laboratory adjoining, occupy a space in the middle of the ship, abaft the Asdic room, on the same deck.

Deck equipment for scientific purposes includes two large electric winches and three small steam winches, steam for which is provided either by a waste heat boiler on the main diesel exhaust line, or by a separate oil-fired packaged boiler in the engine room. Of the electric winches the coring winch forward carries 10,000 metres of warp, tapering from a diameter of 16 mm. inboard to 13 mm. outboard and the trawl winch aft three warps, a tapered length of 10,000 metres (14–12 mm. diameter) and two lengths, each of 2,250 metres of 16 mm. diameter, for mid-water trawling. The small steam winch forward carries 10,000 metres of 4 mm. diameter wire cord for lowering water-bottles, and the after one has, at the moment, 6,350 metres of the same cord for vertical net work. The steam winch amidships will mainly be used for lowering instruments which require a conductor-cored cable.

Load recording equipment has been fitted forward to record the strain on the coring winch. Aft, two sets of the same gear (which uses a load cell) have been fitted on the lead from the winch to each of the gallows. These gallows are operated hydraulically. A 3-ton electric capstan on the after deck completes the equipment.

Navigational equipment includes a Sperry Mark XX gyro compass with the appropriate repeaters, a Sperry Tiller Steerer, Kelvin and Hughes Type 14/12 True Motion Radar, Kelvin and Hughes Type 26B Echo Sounder, Bergen Nautik Log, Decca Navigator and Plotter, VHF Port R/T and two anemometers mounted on 10 ft. poles, one each side of the fore-mast, associated with wind speed and direction dials in the wheel house. Radio equipment generally comprises the latest Marconi world range telegraphy and R/T sets, with a separate R/T installation for ship-to-ship communication when engaged on a scientific programme which includes 'two-ship' working. In addition to the ordinary chartroom (which is combined with the wheel-house) a scientific plotting office is situated on the boat deck, just below the bridge. Here are fitted the recorders of the Precision Depth Echo Sounder and the towed magnetometer, the 'slave' radar set, a Sperry course recorder, a speed and distance repeater from the Bergen Nautik log, gyro repeater and a distant recording sea thermometer. Other instruments will be fitted at a later date. A large chart table also is provided.

Other meteorological equipment includes a screen each side of the bridge, containing wet and dry bulb and distant reading electrical thermometers; instruments for recording solar radiation and net flux of radiation, a precision aneroid barometer, a portable shelter for filling balloons and storage for 48 cylinders of hydrogen. In the meteorological office are the recording instruments for radiation and wet and dry temperature readings and fittings for radio sonde receiving apparatus to be installed when considered necessary. In addition to special meteorological work *Discovery* will carry out the full duties of a British Selected Ship.

An electric clock system throughout the ship is powered by a battery-operated Mercer electric chronometer, and this instrument also supplies impulses to apparatus requiring exact time control. It also regulates the frequency of the alternating current needed for scientific purposes.

The ship's company is 45 officers and men, and of these all the petty officers and a number of the ratings have served in the *Discovery II*, some of them for many years. All, with the exception of deck and catering boys, are now accommodated in single-berth cabins. Separate messes are provided for all branches and the general arrangement of these, with their pantries, the galley and the main cold storage space, is such that they form a separate block amidships. The galley, which is fitted out to the latest standards, has, among other equipment, three electric stoves, a Rotapan steamer, a large mixer and waste disposal unit.

Extensive propeller and vibration trials for the British Ship Research Association and a 'shake-down' cruise of just over a month have led us to believe that the *Discovery* is a very good sea boat and will, when all get to know her, prove a worthy successor to the *Discovery II*.

A Useful Ship Observation

By W. S. GARRIOCK

(At the time, Mr. Garriock was one of the senior forecasters at the Central Forecast Office, Bracknell.)

Very foggy weather persisted around London for nearly a week between the evening of Monday, 3rd December 1962, and the morning of Friday, 7th December. 'Persistent fog' warnings were issued with the B.B.C. forecasts on the 3rd, 4th and 5th December for several areas, including the London area. On Thursday evening, however, listeners to the B.B.C. forecast at 5 minutes to 6 o'clock heard this hopeful news for the south-east region:

"Tomorrow the fog will thin out during the morning, and in the afternoon it is likely to clear practically everywhere."

This was the first intimation that the long spell of fog around London was at last expected to end, and it may be of interest to ship observers to know that the forecast was made possible by an observation from O.W.S. *Weather Surveyor* on station 'J' near 52°N 20°W.

Weather maps drawn at the Central Forecast Office, Bracknell, Berkshire, showed the following sequence of events. A large anticyclone moved across the North Sea into Germany on the 2nd December, and persisted for several days with a ridge towards England, giving conditions favourable for fog and frost. Although some dense fog occurred on Monday the 3rd in many parts of the Midlands, Yorkshire and Lincolnshire, the worst day was Tuesday. On this day a small high pressure system over south-east England was accompanied by a very large area of persistent dense fog centred on a line from Exeter to Flamborough Head and including London, Manchester, and South Wales. During Wednesday the fog and frost persisted all day in an area of calm near London. The fog thinned in most other parts of England, however, as light southerly winds set in ahead of a weak trough moving north-east off Ireland. By Thursday the fog was persistent only around London and in parts of the Thames valley where winds were still calm.

But early on Thursday afternoon the forecaster found a small depression forming near station 'J' and forecast that it would deepen and move north-east. If it deepened sufficiently and quickly enough while high pressure remained over Germany, then south to south-west winds over England could be expected to increase and clear the

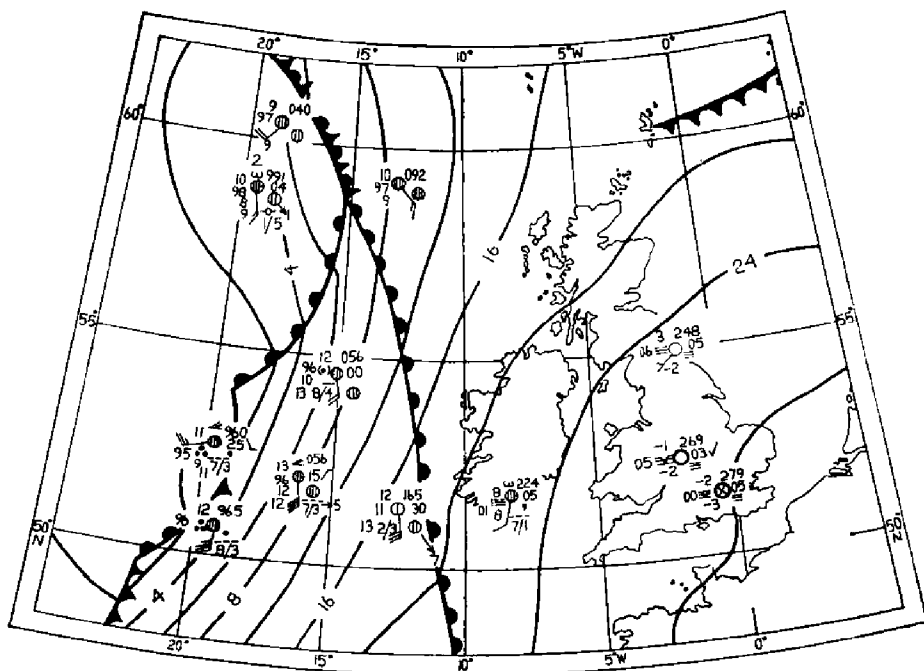


Fig. 1. The weather situation at 1800 GMT 6th December 1962. A small wave depression near station 'J' was showing signs of deepening.

remaining fog in south-east England. At 1500 G.M.T. from station 'J' came the report that pressure had fallen 5.4 mb. in 3 hours. This gave the forecaster the first confirmation that the deepening was actually occurring, so that he felt able to give quite a confident forecast of the clearance of fog in south-east England. In figs. 1 and 2

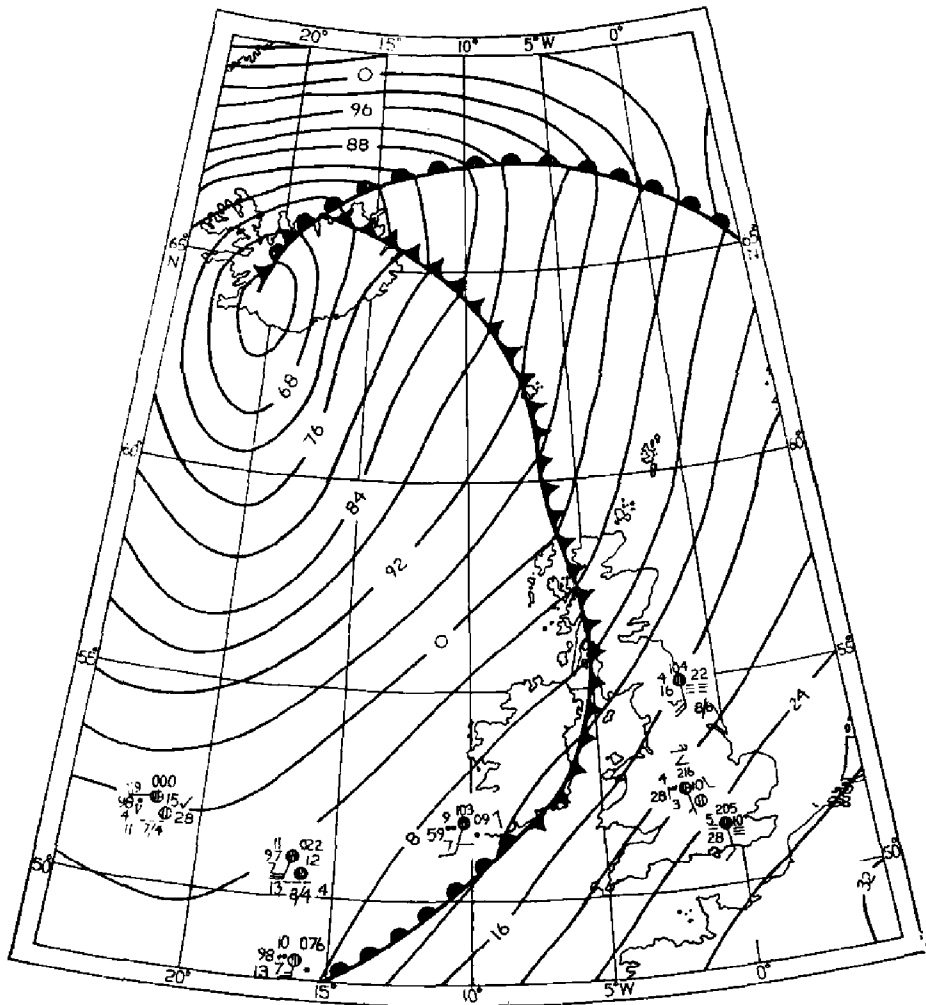


Fig. 2. The weather situation at 1800 GMT 7th December 1962. The wave depression has become a deep depression near Iceland and London fog has been cleared by increasing winds. the evening weather maps can be compared for Thursday and the following day. The increased number of isobars over England on the Friday was sufficient to give the required increase of wind near London to lift the fog during the afternoon, and many people (including the forecaster) heaved a sigh of relief.

The ocean weather ships are of course strategically placed over the sea area to give useful weather information as well as other services to aircraft and shipping. In the nature of things the weather ship network over the sea is very limited and must be augmented by observations from shipping routes, and the weather charts prepared at Bracknell are covered with reports from Selected Ships. The forecaster watches out for their names and call signs as they move across the ocean from chart to chart, as these reports may be a vital link in the chain of evidence required to produce or confirm a forecast. On some occasions it may be that pressure or pressure change is important but on other occasions the interesting point may lie in the wind speed and direction, or the state of sea. Cloud forms and heights, dew-points, sea and air temperatures, are all useful indications of the properties of an air mass, and as such form basic material for forecasting, apart from the more obvious and spectacular past or present weather phenomena such as fog, rain, thunder etc. The forecaster depends for much of his success on the regular supply of observations from the Selected Ship reports from the shipping routes.

Editor's note. This incident gives a good illustration of the value of a lone observation from a ship. It was just chance that the significant pressure fall happened to be at the position of the weather ship. (See also page 114.)

NOTES ON ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM JANUARY TO MARCH 1963

RELEVANT WEATHER FACTORS

January. Early in the month and continuing on into February there was high pressure extending from Greenland to the North Sea. Depressions moved from off the eastern United States northwards to Baffin Bay and eastwards to Spain from whence they moved further eastwards to the Mediterranean or north-eastwards to the Barents Sea and the Kara Sea—the location of much cyclonic activity. This represents a great change from normal in the general circulation. Ocean current mechanisms associated with the greatly reduced Azores high and Icelandic low must have been much affected. Average pressure over Iceland was 30 mb. above normal during January, 15 mb. below normal over the Azores and 2.5 mb. below normal over the Kara Sea. Another interesting fact is that pressure over the North Pacific Low was 17.5 mb. below normal. The temperature of the Russian side of the Polar Basin was 5°C on average below normal, Baffin Bay and Davis Strait were 7°C above normal and the North Pacific up to 10°C above normal. Much of the continent of Europe was 10°C below normal but the land mass of Asia including Siberia was up to 10°C above normal.

It is worth considering some of the climatic elements in this very unusual month. The exchange of air between the Arctic and the continent of Asia must have been below normal leaving abnormally cold air on the Russian side of the Polar Basin. The high level of cyclonic activity over the Barents and the Kara Seas caused the very cold air to flow from the Russian side of the Arctic into Europe and also caused Arctic pack to drift from the Polar Basin into the Barents Sea and east of Greenland. This latter process had gone on intermittently since the intensely cold spell in the British Isles of December 1961 and the area of Arctic pack off eastern Greenland reached an unprecedented extent. Over this area developed the high pressure that became so stable and brought the phenomenally cold weather to the whole of North-west and West Europe. Associated, also, was a high level of cyclonic activity in the North Pacific which brought abnormally warm air to the Pacific side of the Arctic. Baffin Bay was abnormally warm because the normal southward flow of Arctic air over this area was diverted by the high pressure east of Greenland towards Europe. This will undoubtedly have a considerable effect on the West Atlantic iceberg season of 1963.

February. Pressure continued above normal from North-west Europe to Greenland and became above normal over north-eastern Canada. Pressure was 17.5 mb. below normal over the North Russian coast towards 100°E and also continued below normal from the Azores to the eastern Mediterranean. Air masses continued colder than normal over the Russian side of the Arctic and western Europe but were warmer than normal over Greenland, the Canadian Arctic and the Asiatic areas adjacent to the Bering Sea. Depression tracks extended from off North America to south of Greenland and thence to the Barents Sea, Kara Sea and Russian Arctic. There was also a southerly track from east of Florida to the north of the Mediterranean and then north-eastwards to the Russian Arctic. It was apparent that the Atlantic atmospheric circulation was returning to normal but east of Greenland and over the Barents Sea and Kara Sea the circulation continued abnormal.

March. There was a complete change in the general circulation during March. There was general depression activity across the North Atlantic from the Canadian east coast to the British Isles and Scandinavia. Pressure was high over western Europe while temperatures continued below normal over Scandinavia but were above normal over western Europe and east of Greenland. Temperatures continued below normal over most of the Arctic.

CANADIAN ARCTIC ARCHIPELAGO INCLUDING BAFFIN BAY, HUDSON BAY AND STRAIT

January. Few direct ice observations are available for this month. However observations of pack ice, the low incidence of icebergs further south during February and March and climatic data suggest that this month was very unusual. The predominating southerly surface air flow, the abnormally high level of depression activity and the high temperatures suggest considerable movement of pack ice in Baffin Bay with icebergs drifting into the closed current circulation in the far north. The thickness of the pack ice was probably less than normal with considerable amounts of open water. Individual land stations of western Greenland observed about 200 icebergs near the glaciers towards 70°N; elsewhere further north individual stations observed less than 20 icebergs.

There is little or no information available at present concerning Hudson Bay and Strait and Foxe Basin. Climatic data suggest a somewhat heavier than normal season.

February. Warm Atlantic water appears to have penetrated extensively well north towards the Arctic Circle, however this does not appear to have had any effect on conditions in the far north of Baffin Bay. There were the normal areas of fast ice off Baffin Island and western Greenland with consolidated pack ice in the far north towards Smith Sound. More than 200 icebergs were observed by individual land stations of western Greenland towards 70°N but very little information is available concerning the remaining iceberg population. However large numbers of icebergs must have existed circulating in the northern half of Baffin Bay.

March. Sea areas off western Greenland and off eastern Baffin Island appeared to be abnormally free of fast ice and the number of icebergs towards the south of Baffin Island

appeared to be well below normal. Otherwise, normal seasonal developments were experienced.

DAVIS STRAIT AND THE LABRADOR SEA

January-March. The whole of this area apart from a narrow belt off the Labrador coast was filled with water with surface temperature above 0°C. There was a narrow belt of light pack ice extending less than 100 miles off the Labrador coast while the amounts of heavier pack ice off Baffin Island appeared considerably less than normal. Only isolated icebergs were reported off the Labrador coast. Individual land stations observed less than five icebergs off the West Greenland coast except towards Cape Farewell where 100 to 150 icebergs were reported associated with small amounts of pack ice moving round from the Denmark Strait. During March one land station reported 200-300 icebergs west of Cape Farewell. A reconnaissance of the International Ice Patrol reported on 14th March that 118 icebergs were counted south of Cape Chidley of which 72 were south of 57°N. The average rate of drift along the Labrador coast was $7\frac{1}{2}$ nautical miles per day, which is below normal.

BELLE ISLE STRAIT

January-March. Small amounts of young and very light pack ice surrounded the northern extremity of Newfoundland and filled the entrance to the Belle Isle Strait during January. In February the Strait was filled mainly with brash with some light pack ice while during March very close pack ice predominated. During February and March pack ice was drifting southward along the Newfoundland coast obstructing the entrance to the Strait. The mass of ice was everywhere below normal.

ST. LAWRENCE RIVER AND GREAT LAKES

January. Early in the month there was much open water in Lake Huron and Lake Superior and fast ice had formed in the narrow connecting waters. There was much pack ice in Lake Erie and Lake Ontario which were covered with a complexity of mainly light ice with localised open water. Towards the end of the month the ice on Lakes Erie and Ontario had consolidated with widespread hummocking particularly to east of Lake Erie. Towards the end of January most of Lakes Huron and Superior were covered except over the deeper water but it was only towards the end of the month that River St. Lawrence began to contain extensive areas of ice below Quebec.

Early in the month shipping began to experience difficulties in the Great Lakes and in the connecting waters.

February. Towards the end of February Lakes Huron and Superior were almost covered by light and medium winter ice with hummocking but there were considerable areas of open water over Lake Ontario. Early in March most of this lake was clear of ice.

March. Towards the end of March Lake Ontario was open apart from a considerable area of concentrated ice at the north-east exit around Kingston. There was much open water on the north-east side of Lake Superior and about half of Lakes Huron and Erie were open water but much winter ice remained with large floes and hummocking. The connecting water-ways of the Lakes remained congested with ice. After a light ice year the whole river above Quebec was clearing rapidly by the middle of March.

GULF OF ST. LAWRENCE

January-March. During January, the Gulf contained mainly light nondescript ice, while the eastern half of the Gulf and areas north of Anticosti Island were open water. There was a rapid increase in the area and thickness of ice during February and by the end of the month the ice filled the whole of the Gulf and Cabot Strait and pack ice flowed through the Strait into the Atlantic. Towards the end of March there was much open water in the River St. Lawrence estuary and to the north of the Gulf. There was open water where the Gulf is shallow. Considerable areas of winter ice existed in the south-east of the Gulf filling and extending well beyond Cabot Strait into the Atlantic. This has been a light ice year for the Gulf of St. Lawrence and we have received few indications of there being any navigational difficulties experienced by ships. The *Brita Dan* (3,700 tons dead weight) arrived at Montreal on February 28th which is the earliest date in the year in the history of the port on which an ocean-going vessel has berthed there to discharge her cargo. The Danish cargo ship *Thora Dan* docked at Montreal on Tuesday, March 12th, almost a fortnight after two other ships arrived but was officially the first vessel in port this year. The Master received the traditional gold cane. Later reports indicated that from time to time the river continued to be obstructed by jams between Montreal and Quebec until April.

GREAT BANK AND WATERS OF EASTERN NEWFOUNDLAND

January-March. During this period the seasonal movement of pack ice along the Newfoundland coast was well below normal in extent and in thickness. By the end of March the pack ice had penetrated on to the north of the Great Bank and icebergs were drifting south-eastwards at about 1 knot towards the north-east of the bank. (See Table 1.)

GREENLAND SEA

January-March. The area of polar pack reached an extent greater than any previously recorded. Although the area of fast ice along the Greenland coast was not in excess of normal the area of close polar pack extended well beyond the Greenwich meridian in the north and almost to Jan Mayen and North-west Iceland in the south. This area continued to increase during February. The edge was opened to the south-west and south, very open pack extending well south-west of Jan Mayen and almost to Northern Iceland. Individual land stations of eastern Greenland reported up to 50 icebergs moving southwards in the polar pack. During January isolated icebergs were reported off North-west Iceland. There was much light pack ice in fjords and inlets of western Spitsbergen. This situation had not materially changed apart from a slight decrease in the area of polar pack by the end of March.

DENMARK STRAIT AND ICELANDIC WATERS

January-March. Sea temperatures were above normal in the Denmark Strait with relatively small amounts of pack ice south of 65°N extending to about 50 miles from the coast. At the southern tip of Greenland there was more extensive polar pack ice with icebergs. Individual land stations at the extreme southern end of Greenland reported up to 150 bergs. Up to 5 bergs only were observed moving south-westwards off South-east Greenland by individual land stations. South of 65°N the area of polar pack was well below normal. To the north of this the polar pack was generally in excess of normal reaching to within almost 50 miles of the Icelandic coast. The outer edge of the polar pack was open and associated with isolated icebergs.

The flow of the east Greenland current south of 65°N appears again to be weak. Sea surface isotherms and bathythermograph observations from ocean weather ships at station 'C' suggest that cold water was subsiding south of Greenland and the flow of cold water round to the Davis Strait was probably below normal in strength.

BARENTS SEA

January-March. The area of polar pack ice was greatly in excess of normal. East and south of Bear Island the polar pack appears to have penetrated south of 74°N and well west of 20°E. Coastal areas south-east of the Barents Sea probably experienced much fast ice in excess of normal, both in area and thickness, with above normal hummocking. There were no reports of icebergs.

BALTIC SEA (see Table 2)

January and February. The whole of the Baltic Sea area experienced severe conditions during this period. It was evident that the southern half of the Baltic experienced one of the severest winters on record. There were reports of large numbers of ships in great difficulties in the sea lanes from the North Sea to the Southern Baltic. For example, there was a report on

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							
		60	58	56	54	52	50	48	46
Number of bergs reported south of limit	JANUARY	*	2	2	1	0	0	0	0
	FEBRUARY	*	3	3	2	0	0	0	0
	MARCH	*	> 115	> 112	> 112	> 108	> 92	> 20	0
	Total	*	> 120	> 117	> 115	> 108	> 92	> 20	0
Number of bergs reported east of limit	JANUARY	2	1	1	0	0	0	0	0
	FEBRUARY	3	3	3	1	1	0	0	0
	MARCH	> 115	> 115	> 115	> 98	> 65	> 37	> 23	0
	Total	> 120	> 119	> 119	> 99	> 66	> 37	> 23	0
Extreme southern limit	JANUARY	53° 34'N, 55° 48'W on 13.1.63							
	FEBRUARY	52° 00'N, 50° 47'W on 25.2.63							
	MARCH	46° 30'N, 47° 00'W on 25.3.63							
Extreme eastern limit	JANUARY	53° 34'N, 55° 48'W on 13.1.63							
	FEBRUARY	52° 00'N, 50° 47'W on 25.2.63							
	MARCH	46° 30'N, 47° 00'W on 25.3.63							

* Probably large 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.

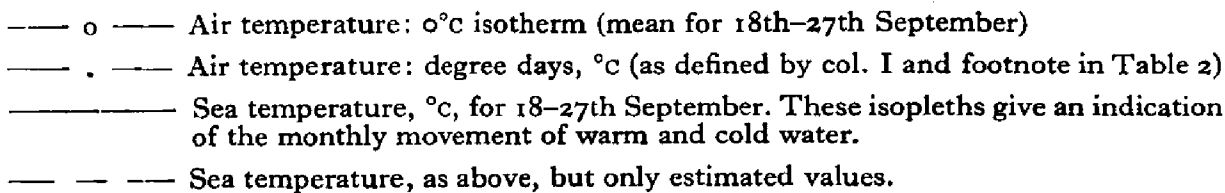
Table 2. Baltic Ice Summary: Jan.-Feb.-March

NAME	JANUARY 1963										FEBRUARY 1963										MARCH 1963												
	ICE DAYS					NAVIGATION CONDITIONS					DEGREE-DAYS	ICE DAYS					NAVIGATION CONDITIONS					DEGREE-DAYS	ICE DAYS					NAVIGATION CONDITIONS					DEGREE-DAYS
	A	B	C	D	E	F	G	H	I	A		B	C	D	E	F	G	H	I	A	B		C	D	E	F	G	H	I				
Kiel ..	9	31	23	0	22	22	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—						
Tonning ..	1	31	31	31	0	0	0	31	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—						
Husum ..	1	31	31	31	0	0	6	25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—						
Emden ..	6	31	21	0	3	3	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—						
Lubeck ..	1	31	31	13	18	29	1	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—						
Gluckstadt ..	1	31	31	10	21	30	1	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—						
Bremerhaven ..	1	31	31	0	31	29	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—						
Flensburg ..	8	31	24	22	0	7	17	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—						
Riga ..	1	31	31	27	0	20	11	0	503	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—						
Pjarnu ..	1	31	31	31	0	0	2	29	511	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1073						
Leningrad ..	1	31	31	31	0	0	31	0	672	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1208						
Viborg ..	1	31	31	31	0	0	31	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1531						
Stettin ..	1	31	31	12	2	31	0	0	418	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—						
Gdansk ..	2	31	26	0	23	24	0	0	378	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	674						
Klaipeda ..	1	31	26	0	2	13	0	0	490	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	640						
Tallin ..	19	31	10	0	3	8	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	949						
Ventspils ..	1	31	30	2	14	27	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—						
Helinski ..	1	31	31	29	0	31	0	0	549	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—						
Mariehamn ..	29	31	3	2	0	3	0	0	172	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1304						
W. Norrskar ..	1	31	25	0	21	17	6	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	596						
Turku ..	1	31	23	21	0	20	1	0	475	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—						
Mantyluoto ..	9	31	21	12	0	15	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1142						
Vaasa ..	1	31	31	31	0	0	17	14	603	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—						
Oulu ..	1	31	31	31	0	0	6	25	741	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1381						
Lulea ..	1	31	31	31	0	0	0	31	796	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1531						
Bredskar ..	1	31	30	14	0	27	3	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1591						
Alnosund ..	1	31	30	24	0	30	0	0	560	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1154						
Stockholm ..	1	31	31	31	0	31	0	0	422	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	909						
Kalmar ..	1	31	31	29	0	31	0	0	402	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	728						
Visby ..	0	0	0	0	0	0	0	0	232	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	531						
Goteborg ..	6	31	16	4	7	11	2	0	336	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	626						
Skelleftea ..	1	31	31	31	0	0	6	25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—						
Rovtaa ..	1	31	31	31	0	0	0	31	877	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—						
Yspihajja ..	1	31	31	31	0	0	17	14	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—						
Aarhus ..	7	31	19	0	18	10	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—						
Copenhagen ..	9	31	22	1	12	10	4	0	236	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—						
Oslo ..	10	20	11	7	0	4	0	0	613	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	449						
Kristianfjord ..	11	31	21	12	3	12	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1100						

CODE:
A First day ice reported.
B Last day ice reported.
C No. of days that ice was reported.
D No. of days continuous landfast ice.
E Accumulated degree-days of air temperature (°C) where known.*

F No. of days of pack-ice.
G No. of days dangerous to navigation, but assistance not required.
H No. of days assistance required.
I No. of days closed to navigation.

* These figures give a rough measure of first the probability of the formation of sea ice, and later the progress of the growth of the thickness of the ice. They are derived from observations taken at 0600 GMT, and are the sum of the number of degrees Centigrade below zero experienced at this time for each day during the period of sustained frost.



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February 19th of six ships being ice-bound in Oslo Fjord and on February 24th a report of 200 ships being locked in the ice on the Kattegat. In the Kiel Canal towards the middle of February ice and ice fields consisting of heavy floes made navigation possible for high powered and strongly constructed ships only. Throughout the period ice breakers were working continuously in the Sound, the Great Belt, the Little Belt and the main part of the Kattegat. The distribution of ice in the approaches from the North Sea to the Southern Baltic were greatly influenced by wind. There were considerable areas of open water against the Swedish coast while great masses of ice formed in the shallow water along the East Danish coast which tended to move and to block established leads to the east. There was considerable congestion in and around the Danish Islands. At times the capacity of the ice breaker services became strained and it was impossible to assist ships that were not equipped to meet the adverse conditions.

Fast and pack ice were all in excess of normal over the whole of the Baltic but there was no indication of any great movement of the pack ice in the southern or northern parts of the Baltic (proper). For details of the conditions at specific points see Table 2.

March. Towards the end of March sea routes through the Danish Isles were navigable. However, the Gulfs of Bothnia, Finland and Riga remained full of close, or very close and continuous, and hummocked pack ice. Fast ice in these areas was generally about 2 ft. thick. The open sea south of 55°N was rapidly clearing.

NORTH SEA

January-March. Throughout these months the Belgian, Dutch, German and Danish ports were very badly affected by ice. Conditions were too complex and widespread to summarise. Conditions were never as severe as those in the approaches to the Baltic but an extremely abnormal season was experienced. All the main European ports of the southern North Sea and the associated inland water-ways were blocked during the severe weather. However, by the end of March conditions were considerably better and most ports were able to operate although much ice remained.

BRITISH PORTS

A full report on ice in British ports in the recent severe winter will be given in a later number of *The Marine Observer*.

INDIAN EXCELLENT AWARDS

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

The Indian Meteorological Department had 47 Selected and 60 Supplementary Ships on its list of voluntary observing ships during the year ended 31.3.1962. 781 logbooks

NAME OF VESSEL	CAPTAIN	OBSERVING OFFICER(S)	RADIO OFFICER(S)	COMPANY
<i>State of Bombay</i>	S. K. Kaikobad	S. L. P. Rodrigues .. J. P. Patel ..	C. D. Janshi .. S. Villait ..	Shipping Corporation of India, Ltd.
<i>Rajula</i>	G. A. Brignall	R. S. D'mortlock .. C. W. Alexander .. H. J. M. Pountney ..	K. F. Dholoo .. A. R. Steel .. M. Phillips ..	British India S.N. Co., Ltd.
<i>Amra</i>	N. C. Bruce ..	M. I. Turner .. A. M. Barker .. A. Rasaretham .. N. F. Edwards ..	K. J. Rourke .. J. Sheeham ..	British India S.N. Co., Ltd.
<i>Kampala</i> ..	D. S. Hutton ..	D. C. Price ..	L. J. S. Cohn .. M. Nichols ..	British India S.N. Co., Ltd.
<i>Andamans</i> ..	W. Travers ..	P. R. Rao .. A. M. Fadra ..	M. Roychoudhary ..	Shipping Corporation of India, Ltd.
<i>Mohammedi</i> ..	—	S. A. Rodrigues .. V. N. Goel ..	V. N. Kalle .. B. Y. Sowani ..	Mogul Line, Ltd.
<i>Jalazad</i>	S. K. Mishra ..	N. S. Adwani .. H. Writer .. S. K. Mansukhani ..	V. Borges ..	Scindia S.N. Co., Ltd.
<i>Sirdhana</i> ..	H. C. Turner ..	A. R. Boddy .. P. Vennell ..	L. Blackford ..	British India S.N. Co., Ltd.
<i>Jaladhruv</i> ..	C. B. Sutherland	A. W. Kirtikar .. M. P. Dhondy ..	S. Mukerjee ..	Scindia S.N. Co., Ltd.
<i>Jalamayur</i> ..	A. J. Bracken	A. S. Purandare .. A. B. Pradhan ..	K. J. Kajarekar ..	Scindia S.N. Co., Ltd.
<i>Jalamanjari</i> ..	N. E. Wickham	N. P. Narula .. K. K. Wadhia .. R. B. Balasulramium ..	S. G. Rangnekar ..	Scindia S.N. Co., Ltd.
<i>Bharatbhushan</i> ..	P. L. Matches	H. J. Daji .. P. G. Patel ..	J. George ..	Bharat Line, Ltd.

consisting of 9118 meteorological observations were received from these ships 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 and 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 is customary to give awards in the form of books to Captains, Observing Officers and Radio Officers of ships whose meteorological work has been adjudged to be 'Excellent' and who have been on the ships concerned for six months or more during the award year. Accordingly the ships shown on p. 152 have been selected for an Excellent Award for the year 1961-62.

Along with these ships, the following ships have been selected for the award of 'Certificate of Merit' for commendable work done during the same year.

- | | | |
|----------------------|-------------------------|----------------------|
| 1. s.s. Mozaffari. | 2. s.s. Indian Shipper. | 3. m.v. Jalamudra. |
| 4. s.s. Bharatratna. | 5. s.s. Jalaputra. | 6. m.v. Jalajawahar. |
| 7. s.s. Saudi. | | |

The Excellent Awards and the Certificates of Merit are being sent to those concerned separately.

Book Reviews

Biometeorology. Proceedings of the Second International Bioclimatological Congress held at the Royal Society of Medicine, 4-10 Sept. 1960, organised by the International Society of Biometeorology. Ed. by S. W. Tromp, London (Pergamon Press) 1962. pp. xxxii; 687. £7.

This handsomely produced volume contains some 46 papers, and at least the substance of the discussions, given to six formally arranged sessions; a further 23 papers submitted to the Congress, but not necessarily presented at these sessions; reports from the Chairmen of seven Working Groups and finally a brief index (this last amounting to little more than a listing of titles of papers). There is a short introductory section with a thought-provoking Presidential Address by Professor F. Sargent (University of Illinois) and a list of participants.

Biometeorology (or Bioclimatology—the terms seem interchangeable) is the study of the interrelations and interactions between biological systems and mainly, but not exclusively, those features of the physical environment which are the concern of the meteorologist. The contributions and discussions—in English (49 papers), French (9 papers) and German (11 papers)—are each prefaced by a three-language summary (in a few cases too short to be informative), grouped according to the several sessions, viz. High Altitude Bioclimatology (3 papers, pp. 3-44); Tropical Bioclimatology (12 papers, pp. 45-112); Biometeorological Classification (3 papers, pp. 113-152); Meteo-Pathological Forecasting (3 papers, pp. 153-208); Urban Bioclimatology (4 papers, pp. 209-272); Thermoregulation in Animals and Man in relation to Bioclimatology (2 papers, pp. 437-472); Human Bioclimatology-Bronchial Asthma (2 papers, pp. 473-483); Ionisation of the Air (4 papers, pp. 484-509); Physico-chemical State of the Blood (1 paper, pp. 510-522); Entomological Bioclimatology (2 papers, pp. 523-536); Phytological Bioclimatology (12 papers, pp. 537-642), and the reports by the Chairmen of the Groups (pp. 643-684).

Although, in my hearing, a distinguished meteorologist discussed the volume as "containing nothing new", many, and amongst them meteorologists, will be grateful for a convenient, and mainly non-specialist, compilation (there are more than 1100 refs.), in which the impact of weather and climate on a wide range of human activity, is examined.

Readers of this journal will doubtless be interested in several papers on the adaptation to hot and cold climates. Sargent and Zaharko present evidence (from war-time experience) that heat adaptation takes a good deal longer than the week

or so allowed for acclimatising recruits; whilst Davis and Joy consider that "it does not appear that the mere act of living in a cold climate, even under field conditions, is any guarantee that man will cold acclimatise to the full potential of his ability"—indeed a type of shock treatment in a controlled environment seems desirable. Tropical clothing is the subject of a number of papers, and in one, Renbourn comes down firmly against the exclusive use of artificial fibres; it also seems that the reasons for the preference by desert Arabs for dark-coloured fabrics instead of the apparently more suitable light coloured clothing are still obscure. An important topic, which was not dealt with, is that of bacterial and allied activity as affecting the storage, etc., of goods; however, papers in the section on "Urban Bioclimatology" discuss many factors relevant to the problem, particularly those connected with tropical sunshine.

Inevitably questions of classification arose. Some of the papers attempted to delineate 'comfort zones'; but doubts and reservations about the validity of many such attempts are illustrated by Boyko's view that Bioclimatology should rest firmly on biological grounds; and by Sargent's rather drastic statement that "there is no 'climate' in the proper sense; there are only reactions of a physical state of atmosphere and a physiological state of living being"—sentiments apparently in line with Landsberg's view that the rôle of the Meteorological Service is to collect reliable data which can now be machine-processed to the many prescribed requirements.

Although expensive for the individual purchaser, this volume should find a place in libraries, large and small, serving the needs of any who find themselves concerned with "Biometeorology".

R. W. G.

The Master and His Ship, by Charles H. Cotter. 9 $\frac{3}{4}$ in. \times 6 $\frac{1}{4}$ in. pp. 242. *Illus.* The Maritime Press, Ltd., London 1962.

In the preface of this book the author rightly reminds us that "it is wrong to think that with the passing of the sailing ship seamanship became an obsolete art—the skill necessary for handling a modern mechanically propelled vessel is no less exacting than that required for handling a ship under canvas." We can hope that this book will be read and understood by some of those who seem to think that the 'push button sailor' is all that is needed now that automation and electronics are tending to play such a prominent part in ship operation.

The author explains that the book "comprises a series of essays on seamanship topics which should be of interest to mariners in general and Master Mariners in particular." It is divided into twelve chapters: mechanics and its application to seamanship; the ship's equipment; the principles of ship handling; anchor work; handling a ship in harbour or port; the ship at sea; assisting another vessel in need of aid; the ship in rough seas; fires on ships; collisions; dry docking and grounding; and abandoning ship and survival in boats. A pretty comprehensive list!

The approach to the subject through the medium of mechanics is a very practical and sensible one, because so much of the theory of ship handling and ship behaviour is dependent on this. The advice given in the various chapters is very practical and commonsense and in many cases is illustrated by actual examples. The book is illustrated with some useful drawings and diagrams.

The 'meat' of each chapter is very practical and gives advice which could be of great value to the master of any ship. It is a pity, therefore, that the author has chosen to include in many of the chapters a lot of elementary detail which is more applicable to a second mate than a master mariner; for example, we are told "the windlass fitted in the forward end of the ship is primarily used for handling the anchor cables . . .", that "mooring hawsers should be fitted with rat guards" and "starboard hand buoys are conical in shape". These details may prove somewhat annoying to a Master Mariner reading the book and they unnecessarily add to its length. Also these elementary facts seem rather out of place against the back-

ground of the advanced and sometimes difficult problems of the ship master upon which the book endeavours—very successfully—to give advice. It is obvious that the author, who is an extra master and lecturer at a navigation school, knows his job.

Apart from the defects which have been mentioned, this should be a useful reference book for any ship-master to have; aboard ship one never knows when one is going to get into trouble.

C. E. N. F.

Personalities

RETIREMENT.—COMMODORE J. W. CAUNCE, R.D., R.N.R., recently completed his last voyage in command of the *Queen Elizabeth* and retired from the Cunard Steam Ship Company on 31st January after 41 years' service with them.

John William Caunce, on his mother's side, came from the family Lunds of Tarleton who built and ran schooners until the turn of the century. He served his time with the Pacific Steam Navigation Company, joining the s.s. *Bogota* in 1916. In November 1916 the ship was torpedoed; young Caunce was picked up by a Spanish tramp and landed at Gibraltar. After passing for 2nd mate he joined the s.s. *Quilpue* as 3rd Officer. In 1922 he joined the Cunard line as 3rd Officer of the *Scythia*. Subsequently he served in several Cunarders, among them the *Berengaria* and *Lancastria*. In 1939 he was junior 2nd Officer of the *Mauretania*, and three months after the liner sailed on her maiden voyage, war broke out. As an officer in the Royal Naval Reserve he was then called up for active service.

His first war-time appointment was Group Officer, Mine-Sweeping Trawlers, Harwich, then followed a period as Commander, Mine Sweeping at Granton, and in May 1942 he was appointed in command of all mine-sweeping operations within the area of Liverpool. By January 1944 he was Commander, Mine Sweeping, Gibraltar, then Senior Officer, Escort Trawlers attached to Gibraltar and the Azores.

Released from naval service in October 1945 he returned to the Cunard and after service as 1st and Chief Officer in the *Queen Elizabeth* he was appointed to his first command, the *Fort Miami*, in 1946 and was later Master of the *Valacia*. After a period as Staff Captain in the *Mauretania*, *Caronia*, *Aquitania*, *Queen Mary* and *Queen Elizabeth* he was appointed Master of the *Parthia*, then the *Franconia*, *Britannic* and *Queen Mary*. In July 1962 he was made Commodore of the Cunard Line and appointed to Command the *Queen Elizabeth*. Commodore Caunce's record with the Meteorological Office goes back to 1919 when he was in the *Orduna*. Since then he has, in 23 years, sent us 95 logbooks, 32 of which have been classed 'excellent'. In 1954 he was presented with an inscribed barograph in recognition of his long and zealous voluntary service to the Meteorological Office. We wish him health and happiness in his retirement.

E. R. P.

RETIREMENT.—CAPTAIN C. L. DE HAUTEVILLE BELL, D.S.C., R.D., R.N.R., retired from the sea on 9th January, 1963 after nearly 45 years' service with the Canadian Pacific Line.

After two years' training in H.M.S. *Conway*, Charles Leigh de Hauteville Bell joined the Canadian Pacific Line as a cadet in the R.M.S. *Melita* in May 1918.

Passing for Second Mate in 1921 and for Master four years later, and after serving in the usual Officer grades, Captain Bell was appointed to his first Command, the *Beaverlake* in 1946.

Captain Bell subsequently commanded *Beaverglen*, *Empress of Britain*, *Empress of England* and *Empress of Canada*, being appointed Company's Commodore in that vessel in December 1961.

Joining the R.N.R. as a sub-lieutenant in 1925, Captain Bell was promoted Commander in 1940 and Captain R.N.R. in 1944. During the Second World War he commanded destroyers for three years and was Commodore of Convoys.

Captain Bell was awarded the Reserve Decoration in 1939 and the D.S.C. in 1942.

His association with the Meteorological Office dates back to 1921, whilst serving in the *Melita* and in 17 years he has sent in 51 logbooks, 26 of which have been classed 'excellent'. He received an Excellent Award in 1948.

We wish him health and happiness in his retirement.

J. R. R.

RETIREMENT.—COMMODORE G. A. WILD recently completed his last voyage in command of the *Canberra*.

Geoffery Alan Wild, after two years at the Nautical College, Pangbourne, spent a year in the Barquentine *St. George* and finished his apprenticeship with the New Zealand Shipping Company.

In April 1923 he joined the P. & O. Line and during the Second World War was engaged in trooping with their larger passenger vessels. He sailed for two years in the *Ile de France* which was then being managed by the P. & O. for the Ministry of War Transport.

In 1951 he was appointed to his first command, the *Shillong*, and his subsequent commands have been *Iberia*, *Strathnaver*, *Canton*, *Corfu*, *Chusan*, *Strathaird*, *Arcadia*, *Himalaya* and *Canberra*, the last named being recruited as a selected ship by the Canadian Meteorological Service at a time when there was no room on our own voluntary observing fleet list. He was appointed Commodore of the P. & O. fleet in June 1961.

Commodore Wild's record with us goes back to 1930 and in 13 years he has sent us 36 logbooks, 11 of which were classed as 'excellent'. In 1931 he received an Excellent Award. We wish him many years of health and happiness in his retirement.

J. C. M.

RETIREMENT.—CAPTAIN C. H. KENYON retired on the 31st December 1962 at the age of 58, owing to ill-health, having served all his sea career, of over 42 years, with Furness Withy and Company.

Charles Henry Kenyon joined Furness Withy as an apprentice in the *Rhode Island* in October 1920, passing for Second Mate in 1925 and for Master in 1930.

After serving in the usual grades Captain Kenyon was appointed to his first command, the *Dromore*, in 1947, and subsequently commanded *Stamford Victory*, *Pacific Ranger* and *Newfoundland*, which vessel he commanded for ten years.

Captain Kenyon has an excellent record with the Meteorological Office. Observing since 1937, in 14 years he has sent in 38 logbooks, 17 of which have been classed 'excellent'. He received Excellent Awards on eight occasions between 1951 and 1960 whilst in command of *Newfoundland* which in 1957 was listed in the best three of the year, and a photograph of the ship was published in *The Marine Observer*.

We wish him renewed health and happiness in his retirement.

J. R. R.

ADDENDA

The Marine Observer, January 1963, p. 44, ROUTEING CHARTS:

The North Atlantic charts for the months of September and December are now available. The chart for March is in the press.

ERRATUM

The Marine Observer, January 1963, Page 23:

Footnote: *for* only British ship *read* only British Ocean Weather Ship.

Fleet Lists

GREAT BRITAIN (Information dated 27.3.63)

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 Captain, Observing Officers and Senior Radio Officers are given as ascertained from the last written return 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> ..	28.3.63	W. R. M. Lightbody, M.B.E.	I. Wilson, D. Porter, A. Hartwell ..	J. Stuart ..	Elder Dempster Lines
<i>Achilles</i> ..	11.3.63	R. G. Boyd ..	M. J. Knights, A. G. Rutherford, R. B. Stephens ..	J. Shuttleworth ..	A. Holt & Co.
<i>Adelaide Star</i> ..	26.10.62	I. McInnes ..	P. Hutchings, A. Briggs, J. Smith, A. Hepburn ..	C. R. Frost ..	Blue Star Line
<i>Aden</i> ..	6.7.62	R. B. Nowell ..	L. J. Morrow, T. P. Watkins, J. W. Perry ..	A. Weeks ..	P. & O.-Orient Lines
<i>Adventurer</i> ..	*	L. J. Sharman, R.D.	P. Clements, J. Maddison, D. A. Holbert ..	P. J. Goulden ..	Harrison Line
<i>Afric</i> ..	14.1.63	R. T. Welch ..	I. D. Allen, S. Carr, J. M. Borrell, A. Harries ..	B. Cochlin ..	Shaw Savill Line
<i>Aiana</i> ..	9.11.62	H. G. Chafer ..	D. C. Cooke, H. G. Goulden, M. Storr ..	H. Convery ..	Trinder Anderson & Co., Ltd.
<i>Albany</i> ..	28.12.62	C. D. Rarcliff ..	M. K. Molineaux, R. A. M. Brown, T. Brice, R. Hagger ..	D. M. Watson ..	Royal Mail Lines
<i>Albistan</i> ..	24.8.62	T. D. Dumont ..	M. Curd, D. Wright, P. J. Tindale ..	— Drummond ..	Strick Line
<i>Aldersgate</i> ..	14.12.62	M. H. F. Smith ..	N. J. Evans, W. H. Whitelaw, M. Virjee ..	J. D. Rush ..	Silver Line
<i>Alert</i> ..	*	I. P. Ruddock ..	D. Alford, D. MacDonald, A. Fulton, J. Lowe ..	R. MacDonald ..	H.M. Postmaster General
<i>Alva Bay</i> ..	29.12.60	R. G. Roberts ..	E. Thiebe, E. Fehr, A. Philippot ..	J. P. Christie ..	Alva S.S. Co., Ltd.
<i>Amalric</i> ..	11.1.62	C. Beck ..	J. Borrell, W. Thomson, F. R. Mees, J. Habersfield ..	G. Kerr ..	Shaw Savill Line
<i>Amazon</i> ..	1.3.63	G. S. Grant, R.D.	B. Hotter, J. LeBrecht, F. Morton, R. Burnett, A. Norman ..	F. Goodall ..	Royal Mail Lines
<i>Andania</i> ..	19.12.62	A. Bridgwater ..	D. A. Roche, R. Stansfield, R. Wadsworth, M. McGoldrick ..	J. Martin ..	Cunard Line
<i>Andes</i> ..	10.1.63	L. Peterson ..	T. B. Casey, I. Farquharson, C. J. W. Bush, A. R. G. Everett ..	S. Sewell ..	Royal Mail Lines
<i>Anselm</i> ..	23.8.62	J. Whayman, C.B.E., D.S.C., R.D.	J. Iglloe, D. Lewis, J. Brierly ..	A. Newcombe ..	Booth Line
<i>Apapa</i> ..	27.11.62	P. M. Ralston ..	A. E. Maxwell, F. T. Bullen, F. Morrison, R. Kinsella ..	G. Gilling ..	Elder Dempster Lines
<i>Arabia</i> ..	27.6.62	J. G. Bradley ..	J. Ford, A. Marsh, I. Grindrod, D. Ridley ..	H. M. Burson ..	Cunard Line
<i>Arabistan</i> ..	25.3.63	W. H. D. Marker ..	C. G. Dane, W. Carruthers, M. Hobbs ..	— Rollason ..	Strick Line
<i>Aragon</i> ..	26.11.62	T. Stevens, C.B.E.	C. I. B. Paton, E. Sanchez, G. R. Cowap ..	L. Mathews ..	Royal Mail Lines
<i>Arakaka</i> ..	22.11.62	S. Armitage ..	P. A. Brown, A. V. Pratt, K. D. Smith ..	P. M. Howell ..	Booker Line
<i>Araukuan</i> ..	28.3.63	R. Brown ..			Trinder Anderson & Co., Ltd.

NAME OF VESSEL	LAST RETURN RECEIVED	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
<i>Aramaic</i> ..	22.1.63	J. Williams	J. H. Saunders, B. Collingwood, R. Lescombe	—, Bray	Shaw Savill Line
<i>Argentina Star</i> ..	22.1.62	E. R. Pearce, O.B.E.	B. Wood, R. Bilton, D. Wadley	—, Penn	Blue Star Line
<i>Argyllshire</i> ..	20.9.62	T. N. Soane	W. F. Sutherland, A. R. MacIntyre, J. Cowie	G. Martyn	Clan Line
<i>Arianza</i> ..	30.11.62	T. W. F. Bolland	J. D. Williams, W. R. Walker, J. Clarke, R. Forrester	F. R. Dunk	Royal Mail Lines
<i>Arthur Albright</i> ..	24.12.62	S. J. Bristow	D. C. Snook, E. G. Livermore, E. Hatch	H. Hughes	James Fisher & Co., Ltd.
<i>Asia</i> ..	11.2.63	H. Delegh	I. K. Rudgard, N. Douglas, J. Pratt, B. A. Newcomb	A. Gandon	Cunard Line
<i>Asphalion</i> ..	*	G. Carney	M. J. Boddington, M. Hanney	G. Fisher	A. Holt & Co.
<i>Asiyanax</i> ..	*	C. W. Povey	R. S. Gruno, A. E. Longbottom, M. J. Kevan	C. Sargent	A. Holt & Co.
<i>Athelcrest</i> ..	23.1.63	D. Elliott	A. C. Wehner, E. G. Kennard, C. J. Morrissey	R. O'Dwyer	Athel Line, Ltd.
<i>Athelfoam</i> ..	14.1.63	C. C. Billson	W. F. Martinson, G. Wilson, W. Chillingworth, R. T. W. Davies	I. Duthie	Athel Line, Ltd.
<i>Athelmere</i> ..	10.12.62	C. R. J. Roberts	R. E. Garisch, J. M. Cross, W. H. Martin	M. F. Hayes	Athel Line, Ltd.
<i>Athelprince</i> ..	5.10.62	T. C. Gorst	W. B. Thomas, K. L. Crowther, M. R. Davenport	A. Feenan	Athel Line, Ltd.
<i>Athenic</i> ..	22.3.63	G. Heywood	R. Primrose, B. Hills, J. H. Clark, J. Brook	H. Knight	Shaw Savill Line
<i>Athlone Castle</i> ..	27.2.61	A. G. V. Patey	M. Alford, T. Blythe, G. Gadsby	L. Brew	Union Castle Line
<i>Aureol</i> ..	7.12.60	T. E. M. Jenkins	G. Newton, J. R. Turner, D. R. W. Reeve	F. W. J. Broomfield	Elder Dempster Lines
<i>Australia Star</i> ..	19.11.62	L. W. Evans	I. Travis, C. Churcher, H. Ellis, C. Veno	L. Cooper	Blue Star Line
<i>Australind</i> ..	5.10.62	J. D. Blake	L. Chatfield, T. M. Dene, C. R. Shuttleworth		Trinder Anderson & Co., Ltd.
<i>Author</i> ..	21.2.63	W. E. Williams	H. E. Roberts, J. A. Billington, M. Walsh, G. Cubbin	T. Harris	Harrison Line
<i>Ayrshire</i> ..	8.2.63	P. MacMillan	T. Johns, T. Plant, A. Sillars	G. Macindoe	Clan Line
<i>Ballistic</i> ..	*	E. C. Thompson	C. A. Baker, M. Robinson, C. Morris	A. W. Stevens	Strick Line
<i>Bamburgh Castle</i> ..	4.3.63	J. MacVean	J. M. Allison, A. K. Magrath, T. Lazarus	S. J. Bowes	W. A. Souter & Co., Ltd.
<i>Bankura</i> ..	13.9.62	D. S. Hutton	J. C. Taylor, P. J. Pederson, J. Evans, T. E. Roderick	D. Wilson	British India Line
<i>Baron Ardrossan</i> ..	18.3.63	T. B. McLeod	D. M. Cowell, T. Gilmour, J. Kirk	D. D. Rocca	Hogarth Line
<i>Baron Glenconner</i> ..	17.10.62	J. Minards	W. Batchelor, T. Gilmour, R. Craythorn	A. D. Carruthers	Hogarth Line
<i>Barrister</i> ..	8.3.63	R. Sutcliffe	I. Barbour, T. Slaughter, E. Garner	G. M. Hargreaves	Harrison Line
<i>Baskerville</i> ..	7.12.62	R. J. Langley	R. Warren-Perry, J. Simmons, M. J. Forwood, J. Allen	A. Newman	Runciman Line
<i>Bassano</i> ..	7.1.63	B. Waldie	M. Elvin, B. Gash, E. Metham	I. Kelly	Ellerman's Wilson Line
<i>Beaverbank</i> ..	6.2.63	W. Ellarby	G. M. Brown, P. V. McCullough, S. C. Rowlands	G. Burnett	Bank Line
<i>Beavercoe</i> ..	15.10.62	F. W. Roberts	P. Williams, I. Moore, R. McKay, D. Fenton	J. N. Coutts	Canadian Pacific Line
<i>Beaverelm</i> ..	*	W. E. Williams	R. Treharne, B. Clarke, —, Denham	G. Arup	Canadian Pacific Line
<i>Beaverglen</i> ..	15.2.63	W. E. Williams	T. Pool, J. Lewis, J. Griffin, J. W. Hooley	M. J. Crook	Canadian Pacific Line
<i>Beaverpine</i> ..	*	J. A. N. Bazant	T. B. Pool, S. S. Shaw, C. E. Turner	S. R. Sutherland	Canadian Pacific Line
<i>Benhope</i> ..	7.12.62	W. D. Cowie	G. Stalling, J. Munroe, A. C. Cromie	N. A. MacKenzie	Ben Line
<i>Benvannoch</i> ..	*	K. H. Montgomery	J. L. Waterson, A. Syme, J. Ritchie, W. Milne	J. Smith	Ben Line
<i>Bhamo</i> ..	7.9.62	W. D. E. Campbell	—, Lowden, I. O. Brien, W. Fitzgerald	N. Gilbert	Henderson Line
<i>Birmingham City</i> ..	5.10.62	J. R. Campbell	A. G. Pound, P. Vittle, A. F. Ashton, D. Williams	I. C. Gear	Bristol City Line
<i>Bishopsgate</i> ..	13.12.62	J. Tew	R. Jones, J. Fogarty, P. Hammond	W. Rance	Silver Line
<i>Black Prince</i> ..	18.12.62	F. A. Kemp	J. M. D. Smethurst, W. R. Parish, B. C. Hodges	S. M. Marchant	Prince Line
<i>Bombala</i> ..	5.10.62	J. A. Carter	C. R. Wood, R. G. Williams, R. H. Sutton, N. M. Macleod	D. A. C. MacRae	British India Line
<i>Booker Venture</i> ..	25.2.63	H. L. Holland	J. Prior, —, Hoskins, W. E. Kirkbride	—, Everitt	Booker Line
<i>Braemar Castle</i> ..	7.2.63	L. Vernon, M.B.E.	R. Tilley, F. Gallon, J. Gathercole, K. MacKenzie	A. Webb	Union Castle Line
<i>Brasil Star</i> ..	14.3.63	J. A. Etches	R. Howlett, P. Hudson	H. Wilton	Blue Star Line
<i>Bravo</i> ..	6.2.63	D. D. McIntosh			Ellerman's Wilson Line
<i>Breconshire</i> ..	23.7.62	J. G. Reeve	D. Lindsay, R. Stringer, T. Johnson	W. A. Wade	Glen Line
<i>Brisbane Star</i> ..	5.9.62	T. Ramsay	M. F. Williams, J. Witcher, D. Smith	I. Humphreys	Blue Star Line
<i>Bristol City</i> ..					Bristol City Line

NAME OF VESSEL	LAST RETURN RECEIVED	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
City of Liverpool	27.2.63	T. S. Dennis	B. F. Keith, W. G. Wilson, R. G. MacMahon, I. G. Morrison	J. Leuchars	Ellerman Lines
City of London	21.8.62	R. W. Tyrell	J. B. Pendry, B. K. Keith, J. S. Morton, D. D. Jameson	C. A. Meade	Ellerman Lines
City of Lucknow	12.10.62	B. T. Wortley	M. Raison, D. Brown, J. Bloore, T. Parkhouse	R. Stringer	Ellerman Lines
City of Manchester	12.12.62	T. F. Symons	R. A. Lindsay, J. Waddleton, O. E. Roberts, C. R. Spencer	C. B. Smith	Ellerman Lines
City of Melbourne	5.6.61	J. W. Wotherspoon	J. Addison, H. Swinney, J. E. Frost	J. Beilby	Ellerman Lines
City of New York	15.2.63	A. H. G. Jones	M. Lee, A. F. Woollacott, M. J. Raison, H. M. Townsend	J. Brierley	Ellerman Lines
City of Oxford	3.5.62	T. Lovell	W. G. Wilson, D. Cullen, J. Martin	P. V. Jennison	Ellerman Lines
City of Pretoria	29.1.63	N. Groundwater	J. Drury, A. Calquhoun, H. Owen, T. Dickson	P. M. Kerr	Ellerman Lines
City of Swansea	24.8.62	D. Quinn	P. Rose, W. Locker, P. G. Weldon	P. M. Hodgson	Ellerman Lines
City of Wellington	31.1.63	E. M. Jenkins	L. Nel, P. Jackson, M. Smith, R. Roberts	D. P. Wood	Ellerman Lines
City of Winchester	10.1.63	T. F. Symons	H. E. Rogers, J. Gibson, J. Drury	D. Bonathan	Ellerman Lines
Clan Macaulay	10.12.62	J. G. Smith	D. I. McMin, T. Hunter, O. T. Ross	R. F. Cole	Clan Line
Clan Macdonald	6.2.63	H. D. T. Lockyer	P. Austin, H. Risser, D. K. Morris, A. S. W. Grant		Clan Line
Clan Macdonnell	5.3.63	F. E. J. O'Hea	D. J. Innes, R. J. Bews, K. R. Hogg	C. E. Randall	Clan Line
Clan Macgillivray	15.1.63	F. H. S. Petherbridge	A. M. Ewing, I. Currie, R. Harden	D. A. P. Galbraith	Clan Line
Clan Macgregor	*	A. M. Kennedy	E. C. Harvey, D. Hedges, W. Dancer	I. Kelly	Clan Line
Clan Macintyre	20.9.62	J. O. Woodall	D. M. Grant, G. S. Gann, G. R. Spittal	W. S. Joice	Clan Line
Clan Macintosh	20.9.62	S. S. Davidson	A. M. Ewing, G. Mannell	W. Wiggins	Clan Line
Clan Maclearen	21.2.63	W. F. Freestone	G. H. Watt, N. F. Wray-Cook, I. H. Stott, J. Shaw	J. L. Baird	Clan Line
Clan Macleay	14.1.63	S. R. J. Woods, D.S.C.	I. Riddell, J. Nutt, C. A. Binks		Clan Line
Clan Macleod	13.9.62	R. Harber	R. A. Milne, W. T. Maltman, J. Sutherland	M. S. Bowden	Clan Line
Clan Macnair	29.5.62	T. A. Watkinson	M. B. Fowkes, H. Styra, N. Wallace, C. Robinson	R. W. Moore	Clan Line
Clan Macnair	1.1.62	J. P. Dunphy	P. B. Bradley, M. Parankar, J. Chalie	J. K. Paterson	Clan Line
Clan Macnair	2.5.62	W. Rodger	M. B. Whiteford, P. C. Byrne, P. Kemp	P. Entwistle	Clan Line
Clan Macnair	24.4.62	A. F. Banks	W. Dancer, C. F. Hedges, G. Stokes	W. Gay	Clan Line
Clan Macnair	16.8.62	R. B. Linsley	W. J. Jarmin, C. Ross, D. Whiteley	B. M. Davies	Clan Line
Clan Macnair	7.12.62	J. Clinton	D. Campbell, J. MacDonald, I. Robertson, H. H. Grant		Donaldson Line
Clan Macnair	27.3.63	A. C. Jones	R. Noal, E. Buckle, P. Organ	T. J. Lillis	Shaw Savill Line
Clan Macnair	31.10.62	I. North	B. C. Dennis, T. Wright, J. Carr	A. Macinnes	Federal Line
Clan Macnair	17.9.62	R. B. Bryant	D. C. McGugan, A. T. Johnston, H. J. Moss	W. S. Stone	Donaldson Line
Clan Macnair	12.10.62	V. H. Vizer	G. C. Sanderson, A. Wilson, M. Hughes	M. Garrett	Pacific S.N. Co., Ltd.
Clan Macnair	25.1.63	R. J. Buckley	T. K. Whyte, J. Cockburn, K. Inglis	E. Cathcart	Shaw Savill Line
Clan Macnair	22.3.63	W. E. Hinde	H. Traynor, C. Anderson, T. Wilson	D. M. Quilty	J. & J. Denholm, Ltd.
Clan Macnair	22.3.63	L. B. Fleming	B. W. Bedworth, J. Laxton	J. A. L. MacDonald	Harrison Line
Clan Macnair	22.3.63	J. E. Bury	P. G. Davis, J. R. Jackson, M. Mann	I. G. M. Connell	Sugar Line
Clan Macnair	5.9.62	D. W. Hutchinson	B. J. Goodall, E. Gowland, K. L. Crowther	D. R. Lake	New Zealand Line
Clan Macnair	23.1.63	— Connolly	— Downs, — Holmes, — O'Driscoll, — Sharp	V. Dalton	Pacific S.N. Co., Ltd.
Clan Macnair	25.2.63	G. A. Gibbons	E. Clements, I. Jones, C. Sturcke	— McPherson	Shaw Savill Line
Clan Macnair	18.10.62	D. S. Leicester	J. J. Barrowcliff, G. Hepple, G. Cole	D. Finlayson	Royal Mail Lines
Clan Macnair	28.6.61	R. Frisby	A. P. Herbert, — McEwan, — Oliver, — Clarke	W. Thomson	Lampport & Holt Line
Clan Macnair	15.1.63	C. B. R. Goodman	P. Crouch, W. Fleming, D. Chambers	— Williamson	Shaw Savill Line
Clan Macnair	6.7.62	G. W. Dobson, O.B.E.	A. E. R. Burton, A. Ware-Diamond, J. F. Code	A. Thompson	Glen Line
Clan Macnair	22.5.62	T. Fraser	C. W. Marshall, N. Coupland, D. Southworth	D. Alcock	Bibby Line
Clan Macnair	7.1.63	I. C. Davison	T. W. John, A. E. French, D. H. Williams	M. O'Donoghue	Royal Mail Lines
Clan Macnair	31.12.62	J. D. Lloyd		M. Holroyd	Federal Line
Clan Macnair				A. S. Ferguson	Sir Wm. Reardon Smith & Sons

<i>Devonia</i>	..	25.9.62	I. K. Bowerman	..	M. F. Davison, M. Ledger, P. Simms	R. Bennett	British India Line
<i>Diomed</i>	..	13.2.63	W. T. D. McMillan	..	J. R. O. Davies, B. Ball, H. Moore, S. Minshall	H. Larkin	A. Holt & Co.
<i>Discovery</i>	..	..	C. Alexander	..	J. A. D. Scott, L. Swanson, E. Anstead	A. Chapman	National Institute of Oceanography
<i>Donegal</i>	..	12.11.62	R. Willcocks	..	J. Alexander, S. Cottell, W. Cowan	M. Byrne	Trinder Anderson & Co., Ltd.
<i>Dorset</i>	..	31.1.63	J. S. Laidlaw	..	A. P. I. McGulgan, P. Simpson, C. J. Highfield, R. Lott	A. Hirst	Federal Line
<i>Drina</i>	..	5.10.62	G. B. Medlycott	..	R. P. Harris, P. Campbell, D. Bell	..	Royal Mail Lines
<i>Dryden</i>	..	..	—, Mylchrest	..	J. J. Deignan, G. L. Hogan, W. D. Jones	B. Thompson	Lampo & Holt Line
<i>Dunedin Star</i>	..	1.3.63	R. H. Stark	..	D. G. Westgate, J. R. Rawding, P. Birkenhead	J. Linn	Blue Star Line
<i>Dunera</i>	..	10.8.62	R. Baker	..	..	..	British India Line
<i>Durango</i>	..	24.1.63	M. Larrive	..	R. Little, B. Box, R. Brooks	D. Finlayson	Royal Mail Lines
<i>Durham</i>	..	6.2.63	R. G. Hollingdale	..	B. C. Davis, N. Drummond, D. Watt, R. Michael	P. Newman	New Zealand Line
<i>Eden</i>	..	24.5.62	R. D. Jones	..	M. R. Eden-Smith, J. C. Jardine, G. B. Panes, P. Campbell	J. Duignan	Royal Mail Lines
<i>Edenmore</i>	..	25.3.63	N. Coubrough	..	R. Driver, J. Rutherford, A. Cole	W. J. Keating	Furness Lines
<i>Edinburgh Castle</i>	..	23.7.62	G. W. B. Lloyd	..	..	..	Union Castle Line
<i>Edward Wilshaw</i>	..	..	W. H. Cross	..	I. Sutherland, B. Wise, W. G. Pattison, W. Watson	S. Culpin	Cable & Wireless, Ltd.
<i>Elmbank</i>	..	1.10.62	A. F. King	..	D. Christie, I. B. Hanson, F. J. Austin	I. Pegg	Bank Line
<i>Empire Star</i>	..	27.3.63	G. T. King	..	J. Thomson, R. D. Mayes, P. Brecknell	A. E. Adams	Blue Star Line
<i>Empress of Britain</i>	..	8.2.63	L. H. Johnston, M.B.E.	..	P. Denham, P. Adair, J. C. Griffin, P. Coulthurst	J. Mann	Canadian Pacific Line
<i>Empress of Canada</i>	..	28.12.61	I. P. Dobson, C.B.E., D.S.C.	..	D. Lumbard, N. Hebdon, F. M. Andrews	P. B. McNab	Canadian Pacific Line
<i>Empress of England</i>	..	26.1.62	C. L. de H. Bell, D.S.C.	..	J. Spruce, G. St. C. Smith, J. Carmichael	P. B. McNab	Canadian Pacific Line
<i>English Star</i>	..	4.2.63	E. C. Laidlaw	..	C. D. Church, D. S. Newbold, P. Cahill	R. Davies	Blue Star Line
<i>Ernest Holt</i>	..	15.2.62	E. A. Binnington	..	..	..	Ministry of Agriculture, Fisheries & Food
<i>Essequibo</i>	..	27.6.62	G. C. W. Meldrum	..	W. Shanks, E. Long, T. Whittaker	A. E. Vaughan	Royal Mail Lines
<i>Essex</i>	..	3.1.63	S. G. Robinson, M.B.E.	..	D. Prime, P. Ireland, G. Webber	J. Bilton	Federal Line
<i>Esso Cambridge</i>	..	22.3.63	T. S. McMaster	..	G. Harvey, F. G. Gair	R. L. Harbut	Esso Petroleum Co., Ltd.
<i>Esso Canterbury</i>	..	18.2.63	K. G. Goody	..	A. Greenwood, W. F. Firman, C. B. Nicholas, E. Harrison	W. H. Ellis	Esso Petroleum Co., Ltd.
<i>Esso Exeter</i>	..	14.8.62	J. A. MacLeod	..	G. D. Newell, M. W. Murrish, J. Furneaux, D. O. Duthfield	A. Lambert	Esso Petroleum Co., Ltd.
<i>Esso Hampshire</i>	..	25.10.62	I. H. Palmer-Felgate, O.B.E.	..	T. Crompton, B. Neyer, L. C. Rowse, J. D. Bell	—, Hirst	Esso Petroleum Co., Ltd.
<i>Esso Pembrokehire</i>	..	1.2.63	E. Tyrell	..	R. H. A. Hart, J. O'Sullivan, S. Waite, M. Jewell	A. W. Hutchinson	Esso Petroleum Co., Ltd.
<i>Eucadia</i>	..	8.3.63	G. Ramage	..	W. K. West, D. Langwell, C. Langlands, D. Barclay	A. MacPhail	Anchor Line
<i>Explorer</i>	..	1.11.62	E. A. Bruce	..	P. S. Burn, J. Craig	J. Steven	Department of Agriculture & Fisheries for Scotland
<i>Farsitan</i>	..	25.3.63	R. Connacher	..	B. E. Mathews, A. M. J. Jenkins, A. B. Aylward	B. Christian	Strick Line
<i>Fidra</i>	..	7.9.62	W. Ross	..	W. N. Anderson, A. Smith	Chr. Salvesen & Co., Ltd.	Chr. Salvesen & Co., Ltd.
<i>Firbank</i>	..	7.1.63	L. O. Moody	..	F. Saunders, R. J. Jolly, J. Acheson, A. Prentice	J. G. Procter	Bank Line
<i>Flamenco</i>	..	24.5.62	G. E. Turner	..	A. C. Gordon, J. D. Archer, S. J. D'Arcy	M. Killian	Pacific S.N. Co., Ltd.
<i>Forthfield</i>	..	..	W. H. Pugsley	..	G. W. Bell, A. Huxen, R. J. Smith	..	Hunting & Son, Ltd.
<i>Frederick T. Everard</i>	..	25.3.63	G. Brown	..	G. M. Henderson, A. Livingstone	G. Thomas	F. T. Everard & Sons, Ltd.
<i>Freno City</i>	..	27.8.62	A. Justen	..	I. D. McLeod, P. Roberts, E. D. Bush	J. Lynch	Sir Wm. Reardon Smith & Sons
<i>Galway</i>	..	14.12.62	E. J. Ridout	..	A. O'Connor, J. May, G. Willoughby	D. N. Ascott	Trinder Anderson & Co., Ltd.
<i>Georgina V. Everard</i>	..	21.3.63	L. Andersen	..	M. P. Salmon, G. C. Preston, N. Spurling	A. Thomson	F. T. Everard & Sons, Ltd.
<i>Glanely</i>	..	..	F. I. Day	..	M. Terry, M. Robinson, A. Lomie	D. Nield	W. J. Tatem, Ltd.
<i>Glenartney</i>	..	3.1.63	R. G. Rippon	..	P. A. Read, J. Hunter, J. Barlow	W. Britton	Glen Line
<i>Glenearn</i>	..	3.1.63	A. Millard	..	C. J. Halling, P. Dodge, R. Carlie	..	Glen Line
<i>Glengarry</i>	..	22.3.63	N. Willis	..	N. G. Simpson, I. S. Grant, A. Gregg	W. H. Redmayne	Glen Line
<i>Glengyle</i>	..	19.12.62	R. Johnston, R.D.	..	B. O. Martin, H. K. Timbrell, J. Thorburn, R. H. Smith	S. Stoker	Glen Line
<i>Glenlyon</i>	..	22.3.63	W. K. Hole	..	..	..	..
<i>Glenorchy</i>	..	15.2.63	H. S. Clarke, M.B.E., D.S.C.	..	P. A. Leece, P. K. B. Elder, P. R. Home	D. McQueen	Glen Line
<i>Glenpark</i>	..	24.10.62	J. Lothian	..	L. Onandia, M. Thomson, H. Munro, R. Glen	J. Sellar	Glen Line
<i>Glenroy</i>	..	29.11.62	R. B. Tiplady	..	G. Harcombe, E. Williams, T. Inglis	J. Carr	Glen Line

NAME OF VESSEL	LAST RETURN RECEIVED	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
<i>Gloucester</i> ..	13.3.63	D. E. Moran	A. E. McNeill, R. E. Barnard, A. J. Lang	M. A. Thompson	Federal Line
<i>Gloucester City</i> ..	7.1.63	E. Irish	J. Whitcher, W. Coombes, J. D. Read, N. Childs	M. Brett	Bristol City Line
<i>Golfito</i> ..	4.1.63	A. Thomson	T. Llewellyn, A. Booth, D. Roberts	P. Kelly	Elders & Fyffes, Ltd.
<i>Gothic</i> ..	8.2.63	G. Campbell	M. G. Coghill, M. A. Hollyoake, L. J. Harrison	B. McGovern	Shaw Savill Line
<i>Gothland</i> ..	*	T. Sanderson	I. L. Stevens, R. F. McDougall, H. Graydon	M. S. Hill	Currie Line, Ltd.
<i>Governor</i> ..	*	C. S. S. Boam	N. M. Whyte, J. M. Williams, W. Donaldson	J. Barrie	Harrison Line
<i>Great City</i> ..	4.3.63	H. Lloyd-Evans	A. F. Watts, W. Fleming, J. Crawford	C. Knight	Sir Wm. Reardon Smith & Sons
<i>Haparangi</i> ..	31.7.62	W. J. Stevens	G. Martin, J. Thomson, J. Rutherford, M. Keat	B. Kay	New Zealand Line
<i>Hauraki</i> ..	15.10.62	E. F. H. Allen	J. F. Clarkson, M. S. Mahoney, M. E. Tomlin	D. Bissell	New Zealand Line
<i>Hector</i> ..	10.10.62	C. F. Lock	C. G. Briggs, A. Betts, R. Holder	G. I. Lambert	A. Holt & Co.
<i>Hector Heron</i> ..	26.9.62	S. K. Williams	P. Lansbury, J. Sutherland, M. Nall	R. Robertson	Hector Whaling, Ltd.
<i>Helene</i> ..	14.8.62	C. T. Collett	G. A. Helm, C. Pague, D. Daniel	P. Le Q. Johnson	A. Holt & Co.
<i>Hemiglypta</i> ..	22.3.63	A. A. Nicol	D. H. Mobberley, E. H. Jones, F. P. Owen	I. Agus	Shell Tankers, Ltd.
<i>Herefordshire</i> ..	23.11.62	A. N. Williamson	S. T. Culshaw, M. J. Mills, W. J. Hooley, M. W. Elsom	W. Ferry	Bibby Line
<i>Hertford</i> ..	6.2.63	D. H. Chadwick		P. A. Lloyd	New Zealand Line
<i>Himalaya</i> ..	4.2.63	L. H. Howard	M. G. Bishop, J. L. Hazell, R. Niblett	D. E. A. Watts	P. & O.-Orient Lines
<i>Hinakura</i> ..	13.3.63	N. L. Warren	C. Greenwood, D. Holding, W. Anderson, W. Chaplin	F. Watts	New Zealand Line
<i>Hororata</i> ..	24.12.62	C. P. Robinson			New Zealand Line
<i>Hubert</i> ..	28.3.63	J. H. Stoker	W. M. Crossley, J. Igoo, R. E. Price	V. P. Dalton	Booth Line
<i>Huntingdon</i> ..	27.3.63	J. D. Guyler	A. R. Pope, D. C. Blackman, A. S. Jackson, B. Summerill	D. L. Byne	New Zealand Line
<i>Hurunui</i> ..	19.3.63	S. C. Andrews	W. Killackey, M. W. Carrell, J. M. Jackson, A. J. Crawford		New Zealand Line
<i>Illyria</i> ..	31.12.62	R. G. James	M. Sargent, F. Irons, B. Kay	H. Preen	Shaw Savill Line
<i>Imperial Star</i> ..	18.10.62	G. L. Evans, O.B.E.	R. D. Brenner, B. R. Wood, J. Mann	D. R. Whitehead	Blue Star Line
<i>Innesmoor</i> ..	23.1.63	E. Howlett	J. R. Fox, —, Duncan, R. Fearnley	P. M. Lockhart	Runciman Line
<i>Inverness</i> ..	*	J. I. Rose	I. S. Gavin, I. McNeil, F. Dank	H. Saville	J. & J. Denholm, Ltd.
<i>Ionic</i> ..	20.11.62	R. G. Grant	F. O'Moran, R. O'Neill, P. Draisey, I. Cameron	—, Waterhouse	Shaw Savill Line
<i>Iron Barque</i> ..	20.3.63	D. S. Brady	J. W. McLean, J. H. Reay, D. Martucci	W. J. Ferguson	Common Bros., Ltd.
<i>Iron Crown</i> ..	14.2.63	R. G. McKay	A. Stathers, J. R. Pigott, L. T. Cusiter	D. O. Williams	Common Bros., Ltd.
<i>Izac Carter</i> ..	30.10.62	W. J. Coull	T. Kennedy, W. D. Lorimer, A. Craig, P. Holton	D. Smith	Runciman Line
<i>Ixtion</i> ..	25.3.63	F. N. Fisher	R. S. Grono, —, Davies, E. A. Owen, M. Morrison	J. T. Morgan,	A. Holt & Co.
<i>Yamaica Planter</i> ..	17.8.62	M. Ferguson		D. Fisher	Kaye Son & Co., Ltd.
<i>Yamaica Producer</i> ..	14.12.62	T. A. Kidd	H. R. Mason, M. Hennessey, M. Carr, H. Rayner	G. A. Winters	Kaye Son & Co., Ltd.
<i>Yaron</i> ..	23.11.62	R. T. Harries	I. B. Thomson, J. W. Cottier, B. M. Loly	D. H. Davies	A. Holt & Co.
<i>John Biscoe</i> ..	28.5.62	W. Johnston	R. N. Cumbers, M. J. Cole, T. Woodfield	M. Evans	Government of Falkland Islands
<i>Kentnorth Castle</i> ..	3.4.62	W. C. J. Swift	J. Nisbet, M. Jamieson, T. Pool, E. C. Baden	N. Roberts	Union Castle Line
<i>Kenuta</i> ..	24.5.62	D. I. Jones, D.S.C.	A. B. Powell, D. J. Good, G. Gordon	J. R. Masterman	Pacific S.N. Co., Ltd.
<i>Kenya</i> ..	28.12.62	B. A. Rogers, D.S.C.	I. W. Dancer, K. W. Marks, J. R. Morrison, R. Wilson		British India Line
<i>King Arthur</i> ..	19.3.63	G. B. Craig	G. R. S. Holder, C. Gowans, J. Macauley	R. T. Bates	King Line
<i>Kohistan</i> ..	18.3.63	C. S. Bartlett	J. Bruce, P. H. Alexander, A. D. Harvey	L. J. Kidd	Strick Line
<i>Koyan</i> ..	21.2.63	J. Johnston	A. Temple, M. Williamson, J. Binnie	I. Henderson	Henderson Line
<i>Lagambank</i> ..	1.3.63	F. Feint, R.D.	C. S. Stitt, A. M. D. Lavires	P. Jennison	Bank Line
<i>Laksa</i> ..	23.1.63	T. W. Lawrence	K. MacRae, H. G. MacKay, J. Taylor	S. Cowan	Chr. Salvesen & Co., Ltd.
<i>La Pampa</i> ..	*	T. H. Turner	R. Perera, W. Watterson, I. Haughton	J. M. Murray	Burries Markee, Ltd.
<i>Laurentia</i> ..	31.12.62	T. S. Graham	W. S. Doodson, N. C. Campbell, A. T. Johnston	D. Mathews	Donaldson Line
<i>Leeds City</i> ..	27.3.63	I. Thornhill	I. McIver, M. Thomas, L. A. Best	Sir Wm. Reardon Smith & Sons	
<i>Leicestershire</i> ..	22.1.63	H. Kerbyson	C. Marton, P. Saunders, M. Wood	E. Unsworth	Bibby Line

<i>Limerick</i>	..	22.8.62	C. H. Parry	..	P. Tazer, W. Owen, J. Hilton	..	S. W. Ebel ..	Trinder Anderson & Co., Ltd.
<i>Lindisfarne</i>	..	22.8.62	H. Dishman	..	K. Fitzakerly, J. Conn, D. Farner	..	..	W. A. Souter & Co., Ltd.
<i>Lisnoria</i>	..	11.4.62	R. McNie	..	A. Buchan, J. MacDonald, R. Brewster	..	J. Limpitlaw	Donaldson Line
<i>Lisurno</i>	..	19.7.62	W. Walker	..	M. W. Salsbury, J. P. Grantham, J. Peterborough	..	T. E. Stronge	Ellerman's Wilson Line
<i>Loch Avon</i>	..	11.4.62	T. W. F. Bolland	..	A. Griffith, B. Cater, T. Cobb	..	I. Greenhalgh	Royal Mail Lines
<i>Loch Garth</i>	..	13.8.62	C. Wightman	..	M. Markowicz, R. Dalglish, J. Clark, G. Nickson	..	F. E. Page ..	Royal Mail Lines
<i>Loch Govan</i>	..	14.12.62	F. J. Swallow	..	S. D. Orme, R. G. L. Oliphant, B. E. Melton, R. J. Brockbank	..	L. Patterson	Royal Mail Lines
<i>Loch Loyal</i>	..	12.11.62	W. S. Thomas	..	S. Pryce, D. Foote, B. Kidwill	..	D. Stevenson	Royal Mail Lines
<i>Logna</i>	..	24.12.62	J. Clark ..	..	J. Low, C. F. Irvine, L. J. A. Gibb, W. Sinclair	..	..	Chr. Salvesen & Co., Ltd.
<i>London Pride</i>	..	22.3.63	A. Murgatroyd	..	A. M. Fleet, A. Touche, G. A. Gurman	..	S. Tobin ..	London & Overseas Freighters, Ltd.
<i>Longstone</i>	..	29.3.63	G. Robison	..	G. Lewis, R. Charlton, M. Dixon ..	..	J. Jackson ..	W. A. Souter & Co., Ltd.
<i>Magdapor</i>	..	7.7.61	J. G. Nuttall	..	J. H. Larbalester, B. Ross, H. Foulkes	..	P. Connell ..	Brocklebank Line
<i>Mahamada</i>	..	16.10.62	C. S. W. Gray	..	J. R. Taylor, G. W. Sinclair, B. Shawcross	..	C. M. Pellowe	Brocklebank Line
<i>Mahser</i>	..	4.3.63	J. G. Nuttall	..	S. P. McGlue, D. Matthews, I. S. Roberts, P. Slade	..	P. Y. Wright	Brocklebank Line
<i>Manchester City</i>	..	13.2.63	J. E. Jones	..	D. R. Perry, K. D. Hunter, A. G. Tester, P. Pickering	..	P. A. Byrne	Manchester Liners
<i>Manchester Faith</i>	..	27.8.62	D. S. Millard	..	J. Kilner, G. Hogg, H. Lawson, D. Whitworth	..	W. McPherson	Manchester Liners
<i>Manchester Fame</i>	..	26.7.62	L. Taylor	..	A. B. Gummerson, J. Rimmer, T. J. Harrison, A. S. Bashford	..	G. Norton ..	Manchester Liners
<i>Manchester Mariner</i>	..	22.3.63	E. W. Espley	..	D. Martin, J. Kirkham, A. Copland	..	M. Doran ..	Manchester Liners
<i>Manchester Merchant</i>	..	15.6.62	W. Hine ..	..	J. Birkenhead, W. Glanville, G. Rutherford, J. Illingworth	..	..	Manchester Liners
<i>Manchester Muller</i>	..	30.7.62	F. Downing	..	L. Clark, J. Watson, D. M. Oliver, N. W. Cockshoot	..	E. Heywood	Manchester Liners
<i>Manchester Port</i>	..	27.7.62	T. H. Lynn	..	D. Deer, D. Smith, G. Hannaford, J. Bell	..	W. Anderson	Manchester Liners
<i>Manchester Progress</i>	..	15.2.63	F. Lewis	..	I. R. Harrison, M. Butler, A. S. Bashford, P. Cullen	..	..	Manchester Liners
<i>Manchester Regiment</i>	..	31.5.62	A. Starnier	..	D. Martin, D. Wells, T. Hancock, G. Evans	..	T. Berry ..	Manchester Liners
<i>Manchester Shipper</i>	..	16.5.62	W. E. G. Oliver	..	C. C. Morris, G. Evan, D. Whitworth, K. Rourke	..	J. Reid ..	Manchester Liners
<i>Manchester Spinner</i>	..	1.5.62	M. E. Bewley	..	B. Simpson	..	..	Manchester Liners
<i>Manchester Vanguard</i>	..	27.11.62	J. E. Askew	..	R. G. Ashling, R. Lowe, R. G. Procter	..	Reed ..	Manchester Liners
<i>Manipur</i>	..	11.1.63	A. B. Davies	..	P. D. Peters, W. Coles, A. Stallard, C. Wright	..	M. Hearne ..	Manchester Liners
<i>Marabank</i>	..	..	C. S. Holbrook, M.B.E.	..	I. E. Hall, D. B. Davis, C. Cogle ..	..	A. J. Dunne	Brocklebank Line
<i>Marango</i>	..	21.11.62	A. Gillis ..	..	E. G. Metham, P. Ogram, J. Pettenger	..	J. Muddle ..	Bank Line
<i>Maron</i>	..	15.10.62	A. R. Davidson	..	G. Wood, J. H. Watterson, M. E. Edward	..	W. Anderson	Ellerman's Wilson Line
<i>Marland</i>	..	15.1.63	J. C. Long	..	D. F. W. Stone, D. Murphy, I. R. Poole ..	..	G. T. Pearce	A. Holt & Co.
<i>Matheran</i>	..	7.12.62	P. A. Chubb, R.D.	..	B. Lowe, D. Moore, P. Whitmore ..	..	A. McL. Adams	Brocklebank Line
<i>Matina</i>	..	19.3.63	S. A. Jones	..	J. Grisdale, J. Crossley, I. Hughes	..	R. McMurtrie	Brocklebank Line
<i>Mauretania</i>	..	22.10.62	C. H. Watson	..	P. I. Kendall, C. R. Lucas ..	..	C. McCarthy	Elders & Fyffes, Ltd.
<i>Melbourne Star</i>	..	31.10.62	S. E. Hooper	..	K. Procter, P. Daniel, A. Knott ..	..	T. H. L. Boyd	Cunard Line
<i>Merchant Duke</i>	..	12.7.62	R. E. Baker	..	W. C. Johnston, F. Holder, H. D. Patterson	..	W. Morrison	Blue Star Line
<i>Middlesex</i>	..	6.12.62	O. R. Bates	..	P. R. Barr, W. E. Lewis, G. Cross	..	A. H. G. Wall	Drake Shipping Co., Ltd.
<i>Monarch</i>	..	31.8.62	J. R. Campbell	..	R. S. Aitken, J. Marshall, R. P. H. L. Thomas	..	R. Heath ..	Federal Line
<i>Montreal City</i>	..	22.3.63	H. Gilchrist	..	W. Simpson, P. J. Wright, E. R. Mace, K. D. Miller	..	C. Wilkin ..	H.M. Postmaster General
<i>Muristan</i>	..	29.8.62	J. T. Knox	..	W. Hill, M.B.E., J. Frost, P. Alderdice	..	S. M. Belshaw	Bristol City Line
<i>Nestor</i>	..	15.1.63	R. S. Hopper, D.S.C.	..	M. D. Gall, M. S. Knight, R. A. Mason, T. C. R. Jones	..	B. V. Jones	A. Holt & Co.
<i>Newcastle Star</i>	..	22.1.63	F. W. Harris	..	D. Lindsay, R. Stringer, M. Parsons	..	J. Clarke ..	Blue Star Line
<i>New York City</i>	..	11.12.62	J. D. W. Davies	..	P. J. Wright, D. Watchorn, P. Gibbard, P. Noble	..	C. Wilkin ..	Bristol City Line
<i>New Zealand Star</i>	..	15.1.63	C. Blakey	..	G. Thompson, J. Gray, J. Jones ..	..	T. Morrison	Booth Line
<i>Nordic</i>	..	9.10.62	I. G. Dryburgh	..	M. Ogilvy, J. C. Croucher, M. Hindmarch	..	D. N. Barlow	Prince Line
<i>Norseman</i>	..	22.1.63	L. H. Edmeads	..	J. H. Neal, R. R. Valvona, P. R. Shaw	..	R. F. Steele	Cable & Wireless, Ltd.
<i>Northern Star</i>	..	11.10.62	M. J. Heron	..	M. J. Collins, N. Case-Green, I. P. Carr	..	C. L. Carpenter	Shaw Savill Line
<i>Northumberland</i>	..	12.10.62	J. H. B. Weston	..	C. Brownings, A. J. Course, I. Griffith	..	B. Culimore	Federal Line
<i>Nottingham</i>	..	10.12.62	R. P. Openshaw	..	P. J. Zeally, A. Winstell, M. Ell, A. Astom	..	B. Percy ..	Federal Line
<i>Oakwood</i>	..	22.11.62	W. E. Bellamy	..	E. Ord, G. Turnbull, R. Boucher ..	..	K. Burnett ..	J. I. Jacobs & Co., Ltd.
<i>Obuasi</i>	..	..	..	..	A. R. Lester, W. Jemson, D. Parnum, G. P. Heartwell	..	A. Jones	Elder Dempster Lines

NAME OF VESSEL	LAST RETURN RECEIVED	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
<i>Ocean Monarch</i>	•	R. Marshall	R. B. Dickson, T. Aven, P. Miller	J. Hynes	Furness Lines
<i>Orcades</i>	14.9.62	E. G. H. Riddelsdell	J. M. Hanbridge, N. P. O'Donnell, P. R. Mitchell	R. C. Crompton	P. & O.—Orient Lines
<i>Orion</i>	22.2.63	E. V. Harris	P. J. Quinn-Young, M. Gowan-Taylor, B. E. Pear-	F. Harrop	P. & O.—Orient Lines
<i>Oronsay</i>	4.12.62	S. Ayles, R.D.	tree		
<i>Orsava</i>	22.3.63	E. G. H. Riddelsdell, R.D.	A. Blackstock, C. Edgecombe, J. Meredith, L. S. Scorgie	P. Parrish	P. & O.—Orient Lines
<i>Otaio</i>	27.3.63	K. Barnett, R.D.	M. Weston, J. Cooke, R. Date, R. Cooke	L. Sutton	New Zealand Line
<i>Otake</i>	7.1.63	T. F. J. Alderman	P. Petherbridge, M. Hill, T. Anderson	D. Courtenay	New Zealand Line
<i>Otra</i>	3.7.62	W. S. Sinclair	J. Corrigan, B. Wishart, D. Polson, F. Eagle		Chr. Salvesen & Co., Ltd.
<i>Pacific Envoy</i>	6.3.63	A. H. Cooke	M. G. East, G. M. Pugh, P. E. Hammond	O. Riches	Furness Lines
<i>Pacific Fortune</i>	27.3.63	B. R. Simons, M.B.E.	C. E. Nicholls, A. Hodges, D. Whitaker, D. MacLeod	F. Fletcher	Furness Lines
<i>Pacific Northwest</i>	24.8.62	L. W. Cooper, O.B.E.	B. W. Lyson, R. V. Hann, D. C. G. MacLeod	Z. Faure	Furness Lines
<i>Pacific Reliance</i>	19.2.63	G. Killick	L. Stephenson, A. Hardy, T. Aven, R. Urry	W. Peddie	Furness Lines
<i>Pacific Stronghold</i>	13.9.62	A. Brown	R. R. Savage, F. B. Moore, J. Coker	J. C. Yates	Furness Lines
<i>Pampas</i>	17.5.62	W. M. Wheatley	B. Summerill, W. R. Strevens, J. H. Escolme, J. W. E. Thwaites	H. J. McGivern	Royal Mail Lines
<i>Papanui</i>	29.11.62	R. B. Hood	D. Carmichael, M. Eglon, C. P. Springthorpe, T. Thomson	K. G. Anderson	New Zealand Line
<i>Paparoa</i>	27.7.62	P. R. Moulton	D. B. Stewart, H. G. Williams, N. Coupland	M. Moore	New Zealand Line
<i>Paraguay</i>	25.2.63	G. C. Chatterly	M. Rayson, J. Flood, B. Hotter	T. Kehoe	Royal Mail Lines
<i>Paraguay Star</i>	3.1.63	R. Phillips	M. Pyer, M. Dent, R. A. Cooper, P. Griffin	G. Scott	Blue Star Line
<i>Pardo</i>	16.5.62	N. M. Lloyd	S. Gledhill, R. Brook, B. Sugden, D. Wilson	F. Baker	Royal Mail Lines
<i>Pendennis Castle</i>	14.11.62	A. Hurst	J. King, A. C. P. Tidmarsh, N. Forde-Horne	P. Williams	Union Castle Line
<i>Pennyworth</i>	29.3.63	J. D. O. Green	J. F. Pringle, —, Scollay, T. Smith	C. Carmody	R. S. Dalgliesh, Ltd.
<i>Perim</i>	30.1.63	S. C. Llewellyn	D. Farrar, M. N. Hulkes, P. R. Cutmore	R. J. E. Chapman	P. & O.—Orient Line
<i>Persus</i>	12.2.63	G. W. Houchen	W. Brown, M. Thompson, R. Evans, D. Goodwin	R. J. Hinchliffe	A. Holt & Co.
<i>Persic</i>	7.1.63	W. Graham	E. R. Snow, I. McIntosh, J. Neil, D. Cole	W. Peat	Shaw Savill Line
<i>Perthshire</i>	21.8.62	R. J. Freeman	F. L. Kilmartin, D. M. Geddes, C. A. Thomson	P. M. Treharne	Turnbull, Martin & Co.
<i>Photina</i>	•	I. Y. Batley	J. W. Spencer, I. B. Barker, W. S. Banks	K. T. Jones	Stag Line, Ltd.
<i>Piako</i>	•	J. F. Anderson	R. Burroughes, R. Jones, A. Doig	I. Russell	New Zealand Line
<i>Pilcomayo</i>	14.3.63	W. F. T. Dan	R. Greaves, I. Park, B. Darling	T. B. O'Flaherty	Royal Mail Lines
<i>Pipiriki</i>	25.5.62	A. Lang	I. Thomson, R. M. Barton, J. Hook, C. Webber	W. B. Aitchison	New Zealand Line
<i>Pizarro</i>	14.9.62	E. W. Dingle, M.B.E.	G. Ashworth, P. Chadwick, —, Davidson, B. V. Waterson	C. McCarthy	Pacific S.N. Co., Ltd.
<i>Port Adelaide</i>	11.10.62	C. R. Townshend	R. A. King, B. M. Eaton, M. Jarvis	C. Hill	Port Line
<i>Port Auckland</i>	7.11.62	E. E. Roswell	G. J. Botterill, J. Cullen, F. Hope, D. Parry	H. Horrocks	Port Line
<i>Port Brisbane</i>	9.7.62	D. J. Cloke	G. Hay, P. E. M. Kelway, C. Burtenshaw	P. Mangan	Port Line
<i>Port Fairy</i>	27.7.62	W. Clough	J. W. Fisher, L. G. Williamson, D. Paskins	D. McSweeney	Port Line
<i>Port Hobart</i>	31.1.63	R. H. Finch	I. Hogben, J. Betts, R. Simpson		Port Line
<i>Port Invercargill</i>	3.12.62	R. A. Wight	P. J. Shaw, J. W. Gunn, R. L. Jones	B. Flinders	Port Line
<i>Port Jackson</i>	4.12.62	V. G. Battle	R. H. Mitchell, J. McKinnon, M. G. Mills	F. Halford	Port Line
<i>Port Launceston</i>	21.2.63	H. B. Conby	C. Boyd, A. Hodson, R. Chalk	S. Connell	Port Line
<i>Port Lincoln</i>	7.3.63	J. M. Read	T. J. Steddy, J. R. Clarke, B. R. Queree	J. W. Barry	Port Line
<i>Port Macquarie</i>	31.1.63	F. J. Lavers	K. S. Cruden, E. Coolen, D. L. B. Marriott, D. Addison, C. Burtenshaw	T. Hargrave	Port Line
<i>Port Napier</i>	1.3.63	C. J. H. Gorley	P. A. Bates, R. N. Cubin, G. Rosie	A. Hudson	Port Line
<i>Port Phillip</i>	22.11.62	L. J. Skailies	M. P. Luce, I. B. Ronkin, P. A. Bates	R. Robertson	Port Line
<i>Port Pirie</i>	1.5.62	J. S. Moate	R. K. Sturge, G. D. Shearn, J. S. Napier	E. Loft	Port Line
<i>Port Townsville</i>	20.11.62	W. J. Eastoe	G. N. Squire, T. R. Howe, D. H. Parkin	—, Hutchinson	Port Line
<i>Port Victor</i>	12.7.62				

Port Vindex ..	30.10.62	A. Brown	J. Lloyd-Jones, J. Cartmell, J. Crowsley ..	J. Ruthven-Murray	Port Line
Port Wellington ..	15.5.62	C. A. Hodson	J. G. Gunn, D. Hart, E. L. G. Nightingale ..	J. Hinds ..	Port Line
Port Wyndham ..	19.7.62	V. A. Hunt	I. W. Watson, M. J. Sebbage, R. Hyde ..	R. Slater ..	Port Line
* Potaro ..	16.7.62	J. Chester	J. Wisden, G. Wardell, G. Humer, G. Foxton ..	P. Doris ..	Royal Mail Lines
Potosi ..	20.11.62	P. D. O'Driscoll	J. Gardner, D. Bird, K. Swift, D. Houghton ..	C. Maguire ..	Pacific S.N. Co., Ltd.
Pretoria Castle ..	7.7.60	J. D. B. Fisher	— Robson, — Ramsay, N. T. Alford ..	E. H. Pitt, D.S.C. ..	Union Castle Line
Queen City ..	10.12.62	J. Vaughan	D. R. McDarren, G. Ellerby ..	H. Stennett ..	Sir Wm. Reardon Smith & Sons
Queen of Bermuda ..	18.2.63	M. E. Musson	P. Crone, E. Jones, C. Townsley, J. Baston ..	R. Maddrell ..	Furness Line
Queensland Star ..	18.2.63	R. White, D.S.C.	R. Brisset, T. C. Johnson, R. H. Ellis ..	R. Crawford ..	Blue Star Line
Raeburn ..	24.12.62	F. W. Grist	P. Lloyd, D. Wells, J. Williams ..	P. Birkenshaw ..	Watts, Watts & Co., Ltd.
Rakaia ..	14.4.61	F. S. Angus	P. J. B. Low, K. W. Mayhew, K. M. Lingard, G. C. Stalker ..	R. Birkenshaw ..	New Zealand Line
Ramillies ..	13.8.62	W. J. Thomas	C. Thomas, B. Goldthorpe, O. Rowlands, D. Miller ..	J. M. Lyons ..	J. Cory & Son, Ltd.
Ramon de Larrinaga ..	18.2.63	L. Daniel	P. C. Dobbs, T. McJ. Hamill, B. Stewart ..	R. Stephenson ..	Larrinaga S.S. Co.
Ramore Head ..	31.1.63	E. C. Rea	K. B. Lowery, J. M. Bisby, E. M. Smith ..	D. Byron ..	Head Line
Rangitane ..	19.12.62	R. G. Rees	J. M. Sargent, J. Crowder, A. MacKinnan, G. Johnson ..	W. Davenport ..	New Zealand Line
Rangitoto ..	11.1.63	C. E. Legg	N. R. Houghton A. M. Murchie, R. V. Jones ..	W. Shepard ..	New Zealand Line
Raphael ..	10.10.62	S. I. Stark	R. I. Glover, A. S. Young, M. Jessup ..	F. Pender ..	Lampport & Holt Line
Rathlin Head ..	3.12.62	J. Burns	R. M. Fuller, L. Pilling, B. Rehse ..	A. V. Davidson ..	Head Line
Redcar ..	25.3.63	J. D. Pederson	P. Stead, R. M. Hunt, G. L. Munday ..	J. McNally ..	Bolton S.S. Co., Ltd.
Regent Eagle ..	12.10.62	G. A. Chadwick	R. Fuller, G. Reid, R. Mitchell ..	R. Milner ..	Regent Petroleum Tankship Co., Ltd.
Regent Falcon ..	22.8.62	R. Peters	W. N. Humphreys, K. Swift, P. A. Chadwick, J. McCombie ..	H. Playford ..	Regent Petroleum Tankship Co., Ltd.
Regent Royal ..	28.3.63	D. I. Jones	P. Henderson, A. Britain, A. Allen, D. Butcher ..	H. Whitticase ..	Regent Petroleum Tankship Co., Ltd.
Reina Del Mar ..	11.1.63	H. Lawson	L. Gresie, L. Fordyce, H. Thomson ..	T. Hurley ..	Pacific S.N. Co., Ltd.
Renueva ..	3.4.62	K. Janes ..	R. Hellyer, K. R. Bennett, A. D. Foulkes, D. S. Haynes ..	G. A. Parker ..	New Zealand Line
Restormel ..	18.10.62	D. W. Sowden	P. Hudson, D. M. Smees, H. Blagdon ..	A. Eldridge ..	J. Cory & Sons, Ltd.
Rhodesia Castle ..	6.12.62	H. Greenhill	R. Burnett, M. Emery, G. Blakie, N. H. Saville ..	T. Peake ..	Union Castle Line
Rialto ..	13.8.62	L. Daniel	— Roberts, W. MacFarland, J. Tidswell ..	D. Leeson ..	Ellerman's Wilson Line
Richard de Larrinaga ..	7.11.62	J. M. Lycett	R. Murray, G. Harker ..	R. Stephenson ..	Larrinaga S.S. Co.
Richmond Castle ..	21.6.62	J. Burns	G. B. Goldsmith, D. Cowie, D. Robertson, T. C. Doughty ..	I. Miller ..	Union Castle Line
Ripon ..	14.1.63	G. S. Wake	T. F. Jones, P. R. Robinson, P. R. Agar ..	P. G. Prestidge ..	Bolton S.S. Co., Ltd.
River Afton ..	27.2.63	E. A. Snaith	W. Dallas, J. Jenkinson, R. Copeland, J. Bothwell ..	J. D. Smart ..	Hunting & Son, Ltd.
Ronanby ..	9.11.62	A. Fee ..	P. Truman, D. Ramsay, A. B. Wright, E. Brenner ..	P. McHugh ..	Sir R. Ropner & Son, Ltd.
Roonagh Head ..	14.9.62	W. C. J. Swift	J. Morrison, J. McLean, G. Sanguine ..	D. J. McKeown ..	Head Line
Royal Castle ..	22.8.62	A. M. Somerville	J. Bulkeley, R. Maier, C. Baugh, D. Lovering ..	W. D. Harris ..	Union Castle Line
Royalton ..	27.2.63	A. Hocken	W. I. Taylor, J. P. Skinner, M. Hamilton ..	J. McNeill ..	Hall Bros. S.S. Co., Ltd.
Ruahine ..	11.1.63	A. D. MacNab	P. Palframan, H. Best, A. D. Stuart ..	C. L. Lambe ..	New Zealand Line
Runa ..	19.2.63	G. H. Readman	R. Artley, F. B. Pounder, R. J. Cockburn ..	P. Driscoll ..	Glen & Co., Ltd.
Runswick ..	25.6.62	D. M. Small	D. R. Shorthouse, G. D. Atkinson, D. B. Norton ..	A. I. Forbes ..	Headlam & Son, Ltd.
Rutpool ..	12.10.62	H. Grunmill	J. J. Moran, D. Osborne, D. Taylor, M. Dabbs ..	G. V. S. Rogers ..	Sir R. Ropner & Son, Ltd.
Sacramento ..	31.10.62	W. F. Swann	A. Ashley, G. Smethurst, M. Scanlan, A. Gatt, J. Macadam ..	P. H. Griffiths ..	Ellerman's Wilson Line
Sagamore ..	5.3.63	A. Weller	C. Thompson, W. D. Hughes, R. G. Boulding, D. Peacham ..	T. Britt ..	Furness Lines
Saint John ..	28.12.61	T. Wilcockson	J. C. Read, C. Rowntree, —, Jenkins ..	M. Jeffery ..	South American Saint Line
Salamanca ..	31.12.62	W. J. Campbell	F. Wilson, G. A. Waterson, J. R. Keddie ..	J. Walsh ..	Pacific S.N. Co., Ltd.
Salaverry ..	15.2.63	R. T. Riley		A. Coady ..	Pacific S.N. Co., Ltd.
Salinas ..	27.3.63	J. W. Leask		A. Thomson ..	Pacific S.N. Co., Ltd.
Salmela ..					Chr. Salvesen & Co., Ltd.

NAME OF VESSEL	LAST RETURN RECEIVED	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
<i>San Fortunato</i> ..	•	J. Gay ..	R. Brown, G. Boyle, I. Morten ..	R. Inman ..	Shell Tankers, Ltd.
<i>Santander</i> ..	14.3.63	A. S. MacLean ..	S. Roscoe, D. Bishop, I. D. Barr ..	W. Clarkson ..	Pacific S.N. Co., Ltd.
<i>Sarniento</i> ..	24.8.62	E. Gowland ..	T. McCombie, D. Ellis, D. Pugh ..	D. Waugh ..	Pacific S.N. Co., Ltd.
<i>Scottish Hawk</i> ..	31.1.63	J. H. Thorn ..	S. A. Hulse, P. D. Penn, J. W. Wilcock ..		Scottish Tanker Co., Ltd.
<i>Scottish Star</i> ..	•	M. R. Bremberg ..	M. Cramb ..		Blue Star Line
<i>Serenia</i> ..	21.2.63	J. C. Nettleship, O.B.E. ..	B. M. Hampson, T. F. S. Frapp, P. Taylor ..	J. R. V. Winchester	Shell Tankers, Ltd.
<i>Shackleton</i> ..	5.6.62	D. H. Turnbull ..	R. H. Thompson, V. J. Wheatley, J. Martin ..	J. Lamb ..	Government of Falkland Islands
<i>Shropshire</i> ..	26.3.63	L. H. Sheldrake ..	W. A. Raiton, K. Gowsell, C. J. Willard ..	P. Jones ..	Bibby Line
<i>Shuna</i> ..	25.2.63	T. Henry ..	J. D. MacIntosh, A. MacIntyre ..	R. Minto ..	Glen & Co., Ltd.
<i>Sidonia</i> ..	27.2.63	A. J. F. Colquhoun, M.B.E. ..	J. Swan, D. Bisset, A. R. Hutcheon ..	J. Gourley ..	Anchor Line
<i>Silvercrag</i> ..	26.7.62	M. Duke ..	J. M. Gower, R. Alford, J. Fogarty, M. Stammer ..	C. Ellison ..	Silver Line
<i>Silverfell</i> ..	14.3.63	W. E. H. Lewis ..	G. Hennell, P. Vanner, D. Charles ..	J. Davey ..	Silver Line
<i>Silverforce</i> ..	10.12.62	H. H. Howey ..	I. D. Bean, C. Green, R. Griffiths ..	J. Walsh ..	Silver Line
<i>Silverlake</i> ..	18.7.62	J. Kennar ..	E. B. Addison, J. B. Wyness, I. McLean ..	H. Wallis ..	Silver Line
<i>Silverpoint</i> ..	19.3.63	I. A. Walker ..	D. Cross, B. Whitehouse, C. Barney ..	P. J. Kilbane ..	Torry Research Station
<i>Sir William Hardy</i> ..	4.2.63	E. A. Whittleton ..	R. Postlethwaite, J. C. W. Beer, C. F. N. M. Swain ..	R. Bennet ..	P. & O.—Orient Lines
<i>Socotra</i> ..	16.2.62	E. G. Joss ..	P. B. Snow, M. J. Charlesworth, H. Crane, W. B. Griffith ..	W. Kay ..	Federal Line
<i>Somerset</i> ..	•	A. C. Davies ..			
<i>Southbank</i> ..	29.11.62	B. L. Carnie ..	D. M. Ward, S. Mallory, A. R. Pugh ..	I. W. Shaw ..	Bank Line
<i>Southern Cross</i> ..	21.2.63	L. J. Hopkins ..	J. B. Fowler, M. J. Sayers, A. Cairns, M. Wilkie ..	G. MacRae ..	Shaw Savill Line
<i>Southern Harvester</i> ..	24.5.62	H. Myhre ..	J. B. Kerr, F. Bekken, A. Lyne-Jensen ..	D. W. Miller ..	Chr. Salvesen & Co., Ltd.
<i>Starling Castle</i> ..	10.8.62	R. A. D. Cambridge, D.S.C. ..	I. McKendrick, H. Pearson, L. Smith, —, Wiles ..	F. H. A. Sharp ..	Union Castle Line
<i>Starlingshire</i> ..	26.10.62	J. A. Baxter ..	N. Broggio, M. Chambers, J. Cumming ..	R. Dolby ..	Turnbull Martin & Co.
<i>Stratheden</i> ..	16.1.63	P. G. Lawrence ..	D. Bayliss, B. Holleyoak, G. G. Lee ..	J. Powell ..	P. & O.—Orient Lines
<i>Strathmore</i> ..	11.3.63	H. V. Williamson, R.D. ..	P. D. Lumb, D. Bradley, J. Cochrane, B. Miles, D. N. R. Morrison ..	N. Fontaine ..	P. & O.—Orient Lines
<i>Suevic</i> ..	29.1.63	R. Frisby ..	J. S. Hines, L. Mounsey, H. Dewsnap ..	H. J. McGivern ..	Shaw Savill Line
<i>Suffolk</i> ..	17.12.62	H. J. D. Sladen ..	D. C. R. Sheppard, C. J. M. Bosworth, P. Hornby, R. F. Quiguan ..	W. B. Aitcheson ..	New Zealand Line
<i>Sunda</i> ..	•				
<i>Surry</i> ..	9.1.63	M. R. Prowse ..	R. M. Eaton, D. R. Peters, J. W. Fisher ..	N. Berry ..	P. & O.—Orient Lines
<i>Sussex</i> ..	24.10.62	J. D. Hellings ..	C. James, B. Thomas, G. Younger, R. Hall ..	I. Rae ..	New Zealand Line
<i>Sussex</i> ..	31.12.62	A. B. Stalker ..	S. Baker, P. Grimes, J. Collins ..	A. Titley ..	Federal Line
<i>Swiftpool</i> ..	15.5.62	J. E. Roddam ..			Sir R. Ropner & Son, Ltd.
<i>Sydney Star</i> ..	22.3.63	C. P. Leighton ..	P. E. Long, R. Moir, R. Fieldsend ..	T. W. Regan ..	Blue Star Line
<i>Sylvania</i> ..	16.10.62	I. C. Dawson, D.S.C. ..	P. B. Watson, C. C. Walker, I. B. McLundie ..	A. F. Creeby ..	Cunard Line
<i>Tabitatan</i> ..	30.7.62	R. B. Arthur ..	D. Foster, A. J. Campbell, K. Gregory ..	N. F. McCorm ..	Strick Line
<i>Tactician</i> ..	28.3.63	W. S. Eustance, O.B.E. ..	O. M. Owen, J. B. Dodds, A. Gattiss ..	F. B. Lawton ..	Harrison Line
<i>Tamele</i> ..	30.7.62	J. A. Cleator ..	P. Northway, P. J. Finn, R. Cartwright ..	T. Ainsworth ..	Elder Dempster Lines
<i>Tantallon Castle</i> ..	11.5.62	W. Anson ..	R. Flint, D. O. Toorell ..	D. White ..	Union Castle Line
<i>Tarkwa</i> ..	13.6.62	E. Kungun ..	M. R. Walker, J. M. Owen, M. Sterry ..	R. Seward ..	Elder Dempster Lines
<i>Tasmania</i> ..	4.3.63	C. R. Horton, D.S.C. ..	J. Suddes, S. J. Bunney, R. Guy ..	F. Huggett ..	Blue Star Line
<i>Thalesborne</i> ..	25.1.63	C. C. Brown ..	C. A. Graham, —, Owen, —, Kearney ..	J. Freeman ..	Allan Black & Co.
<i>Tridcrest</i> ..	10.7.62	E. G. Best ..	P. W. Finnie, L. Richards, D. Sempie ..	J. Collier ..	Ivanovic & Co., Ltd.
<i>Tinto</i> ..	9.8.61	C. Everingham ..	T. Lowery, J. Holmes, B. Blampsey, P. Rotherham ..	E. A. Morgans ..	Ellerman's Wilson Line
<i>Torr Head</i> ..	14.3.63	E. G. Davey ..	E. R. Dunwoody, R. Maxwell, P. C. Dobbs, G. Clint, T. Sellers ..	M. J. P. Hannan ..	Head Line
<i>Transvaal Castle</i> ..	24.12.62	A. G. V. Patey ..	B. Watt, R. Flemington, E. Glibbery, P. Nind ..	R. Brew ..	Union Castle Line
<i>Trebartha</i> ..	•	W. Phillips ..	T. Hallatt, G. Smith, J. Darby ..		Hain S.S. Co., Ltd.
<i>Trecaerne</i> ..	17.1.63	I. M. Price ..	M. J. Ball, J. F. Ashbridge, R. T. Lindsey, P. V. A. Underwood ..	T. Ellison ..	Hain S.S. Co., Ltd.

<i>Trecarrell</i>	..	G. Joslin	..	J. C. Perkin, I. Smith, P. Sadler	..	G. H. Sutherland	..	Hain S.S. Co., Ltd.
<i>Trelissick</i>	..	I. M. Downard	..	R. G. Whistler, F. M. Marchant, G. W. Rayner	..	V. Cronien	..	Hain S.S. Co., Ltd.
<i>Tremadoc</i>	..	W. Phillips	..	D. J. Hunkin, J. Ashbridge, G. Quick	..	A. Watt	..	Hain S.S. Co., Ltd.
<i>Tremorvah</i>	..	W. Dodson	..	A. J. Washbourne, A. D. Garner, J. Spall	..	F. A. Ryan	..	Hain S.S. Co., Ltd.
<i>Trevalgan</i>	..	G. A. McKay	..	M. Paterson, J. O. Spence, K. Curry, G. B. Baxter	..	D. K. Byrne	..	Hain S.S. Co., Ltd.
<i>Trevaylor</i>	..	W. F. Denyer	..	D. C. Penberthy, D. A. Field, A. J. Ardley	..	P. H. Leigh	..	Hain S.S. Co., Ltd.
<i>Turakina</i>	..	H. A. Owen	..	R. Bayliss, H. Hawkins, E. Fawcett, P. Milburn	..	H. Hall	..	New Zealand Line
<i>Turkistan</i>	..	R. Owen	..	R. Bayliss, C. Miller, D. Watson, K. Mills	..	F. Cooper	..	Strick Line
<i>Tyrone</i>	..	M. R. Foster	..	I. W. Williams, D. M. C. Murray, T. E. Graham	..	D. R. Uglow	..	Trinder Anderson & Co., Ltd.
<i>Velletia</i>	..	A. R. Spearman	..	M. J. Hollywell, B. Wilkinson, L. Moon	..	T. F. Pearson	..	Shell Tankers, Ltd.
<i>Venassa</i>	..	R. C. Swainston	..	J. E. Maguire, A. M. Tennant, H. J. Bozier	..	S. J. Taylor	..	Shell Tankers, Ltd.
<i>Volatella</i>	..	R. R. Potter	..	V. A. Hubbard, N. Coull, J. P. Cleveland	..	P. W. Peers	..	Shaw Savill Line
<i>Wairangi</i>	..	J. Gunning	..	D. A. Arnoll, T. M. F. Williams, W. A. Anderson	..	J. Downie	..	Shaw Savill Line
<i>Wangara</i>	..	E. E. Snath	..	R. G. Griffin, I. Condie, A. W. Jackson, J. Mansell	..	S. G. Morris	..	R. S. Dalgliesh, Ltd.
<i>Warkworth</i>	..	N. Thompson	..	D. Stewart, C. Harron, W. A. Vaughan	..	G. G. Whitmore	..	Sir Wm. Reardon Smith & Sons
<i>Welsh City</i>	..	S. Leebetter	..	I. B. Roberts, M. T. Davies, R. M. Gidden	..	J. Parry	..	Watts, Watts & Co., Ltd.
<i>Wendover</i>	..	D. N. Allan	..	M. Leyshon, A. Cameron, D. Bradley	..	R. A. Straine	..	Prince Line
<i>Western Prince</i>	..	J. R. Stephens	..	P. J. Goodwin, — Gray, M. Bowen	..	D. K. Parkinson	..	Watts, Watts & Co., Ltd.
<i>Windsor</i>	..	J. A. Tully	..	D. N. Richardson, D. Affleck, N. McLean	..	E. Pitt	..	Union Castle Line
<i>Windsor Castle</i>	..	J. F. Oakley	..	S. W. Dacombe, R. Whythe, G. Watt, D. S. Haynes	..	P. Hawkins	..	Watts, Watts & Co., Ltd.
<i>Wokingham</i>	..	H. G. King	..	N. A. H. Funston, P. Marshall, M. J. Flanagan	..	J. Jardine	..	Watts, Watts & Co., Ltd.
<i>Woodford</i>	..	A. I. Cox	..	J. L. P. Harty, M. J. Ross, I. R. Timms	..	R. A. Waller	..	Henderson Line
<i>Yona</i>	..	J. Walker Brown	..	I. M. Boyd, R. H. S. Gray, R. Sopwith	..	C. Wilkin	..	Bibby Line
<i>Yorkshire</i>	..	R. L. Hagley	..	P. J. MacDermott, J. W. Waldie, K. Gowsell	..		..	Glen & Co., Ltd.
<i>Zena</i>	..	L. W. Loose	..	J. Smith, A. M. Livingstone, J. Hamilton	..		..

Supplementary Ships

NAME OF VESSEL	LAST RETURN RECEIVED	CAPTAIN	OBSERVING OFFICERS	RADIO OFFICER	OWNER/MANAGER
<i>Aaro</i>	11.10.62	W. C. Gill	D. M. Cornes, G. Mitchell, F. Johnson	F. H. Nicoll	Ellerman's Wilson Line
<i>Angularity</i>	27.2.63	R. H. Golding	E. I. Parker		F. T. Everard & Sons, Ltd.
<i>Anno</i>	26.4.61	J. C. Cowie	R. Watt, D. Cowie		Mitchell & Rae, Ltd.
<i>Apollo</i>	27.11.62	G. V. Barnes	S. Church, R. Cox, P. Abbott		Bristol S.N. Co., Ltd.
<i>Aristo</i>	..	G. C. Gill	J. Turley, G. D. Atkinson, I. Watts		Ellerman's Wilson Line
<i>Benattina</i>	22.2.63	C. V. Wyatt	J. L. Young, R. C. Bairnsfather	R. Balfe	Ben Line
<i>Benlanners</i>	..	J. L. Forsythe	J. B. Lyall, I. F. MacKay, K. W. Soulsby	A. M. MacGillivray	Ben Line
<i>Benmacdhus</i>	..	W. C. Watson	J. Shaw, J. MacIntosh, B. Smith, A. Wilson	P. McMeeking	Ben Line
<i>Benvorlich</i>	23.1.63	R. McPhee	R. D. Jones, J. MacIntosh, A. Smith, I. Watts	W. Dughid	Ben Line
<i>Borodino</i>	24.10.62	A. T. Jardine	A. A. MacKenzie, F. Lambert, J. T. Smith	F. E. Smith	Ellerman's Wilson Line
<i>British Oak</i>	..	J. I. Walters	A. H. Camblin, A. A. Wenham, J. L. Gillan, P. Goddard	— Howell	B.P. Tanker Co., Ltd.
<i>British Reliance</i>	13.2.63	J. Picken		P. Jennings	B.P. Tanker Co., Ltd.
<i>Byland Abbey</i>	5.12.62	F. W. Wooler	E. J. Robinson, F. Cooper		Associated Humber Lines, Ltd.
<i>Camellia</i>	12.12.61	G. W. Mortimer	S. Hyland, A. Collins, E. Hutchinson, W. Keough	R. T. Hewitt	J. Robinson & Son
<i>Carlo</i>	17.5.62	E. R. Corp	J. G. Jones, M. W. Salsbury, E. P. Metham, J. Ayers	M. Powell	Ellerman's Wilson Line

Supplementary Ships (contd.)

NAME OF VESSEL	LAST RETURN RECEIVED	CAPTAIN	OBSERVING OFFICERS	RADIO OFFICER	OWNER/MANAGER
<i>Catford</i>	5.4.62	E. Clarke	L. Thompson, G. Beattie, S. Sharp	A. Corkhill	South Eastern Gas Board
<i>Cato</i>	20.3.63	E. Jones	B. Burcher, K. Krutinis	R. A. Newton	Bristol S.N. Co., Ltd.
<i>Cuero</i>	18.10.62	E. Tyler	H. Forrester, J. Wray, D. Ellerby	W. Long	Ellerman's Wilson Line
<i>Circassia</i>	16.10.62	W. S. Thomson	D. K. McArthur, I. McNiel, W. Southworth	M. Lebbon	Anchor Line
<i>Dartwood</i>	19.12.62	W. Wolfe	B. L. Bass, B. Taylor, G. Maw, A. B. Abbas	J. Clark	Wm. France, Fenwick & Co., Ltd.
<i>Echo</i>	24.8.62	J. L. Jenkins	J. Campbell, J. F. Tremlett, M. R. Goodwin	T. J. Quinn	Bristol S.N. Co., Ltd.
<i>Exo Lancashire</i>	26.2.63	A. Canner	J. Bean, P. Box, D. Ledingham	A. Hogg	Esso Petroleum Co., Ltd.
<i>Ethel Everard</i>	15.5.62	W. G. Hunt	N. J. Golding, R. Matthews, N. Goddard	R. P. Tingay	F. T. Everard & Sons, Ltd.
<i>Gardemia</i>	5.6.62	J. H. Gray	J. W. Spence, F. Bowden, L. J. Pearson		J. Robinson & Co.
<i>Glitra</i>	30.12.60	G. Reid	W. N. H. Anderson, J. V. Walgate, R. D. McGlashan		Chr. Salvesen & Co., Ltd.
<i>Greathope</i>	12.2.63	R. Cook, M.B.E.	J. G. Craig		E. R. Newbigin, Ltd.
<i>Hudson Deep</i>	5.3.63	J. Gibbons, D.S.C.	J. W. Melia, L. J. Stevens, A. A. Brown		Hudson S.S. Co., Ltd.
<i>Kirkham Abbey</i>	6.12.62	F. W. Wooler	A. Robinson, B. Wooler, A. Stockdale		Associated Humber Lines, Ltd.
<i>Lord Codrington</i>		T. J. Williamson			Ships Finance & Management Co., Ltd.
<i>Malmö</i>	21.2.63	F. Firth	R. Lawson, J. Randell	M. R. Plaw	Ellerman's Wilson Line
<i>Mangla</i>	14.12.62	J. B. Newman	P. F. Blackburn, A. A. Pittendright, P. A. Gunson, R. Bartley	K. G. Fawcett	Brocklebank Line
<i>Maskelyia</i>	*	A. F. Evans	K. J. G. Bell, W. G. M. Coles, J. A. Fraser	B. Beecham	Brocklebank Line
<i>Mawana</i>	*	L. E. Jeans	J. J. Redden, D. Wilde, A. Lloyd	D. Butterworth	Bristol S.N. Co., Ltd.
<i>Milo</i>	9.11.62	W. Kays	R. Mudway, H. Hancock, K. Skeats, J. M. Gower	J. Kinson	Cable & Wireless, Ltd.
<i>Mirror</i>	3.2.61	G. Garrett	R. M. D. Wright, P. J. Duff, G. J. Ayton		F. T. Everard & Sons, Ltd.
<i>Sanguity</i>	9.7.62	M. M. B. Elsey	J. London, R. Latham		Chr. Salvesen & Co., Ltd.
<i>Sautra</i>		W. Sinclair	A. Nicolson, C. F. Irvine, S. Allan		Bank Line
<i>Streambank</i>		Williamson	I. Morrison, S. Mallory		Chr. Salvesen & Co., Ltd.
<i>Tana</i>	26.1.62	J. Clark	J. V. Walgate, W. Ross		Chr. Salvesen & Co., Ltd.
<i>Tolsta</i>	24.2.61	M. Polson	J. Phinister, W. N. H. Anderson, C. J. Nicolson		Chr. Salvesen & Co., Ltd.
<i>Truro</i>	22.2.63	J. R. Atkinson	P. Ramsay, P. Blud, B. Hatfield	G. Evans	Ellerman's Wilson Line
<i>Tynemouth</i>	7.6.62	H. Kent	C. Robbins, B. Ditchburn, P. Miller	M. Whitworth	Prince Line
<i>Uganda</i>	15.1.63	J. Barras	D. Cone, J. Konton, G. Wood	E. Rossiter	Burnett S.S. Co., Ltd.
<i>Volo</i>	29.11.62	J. D. Hamilton	A. Simpson, N. E. Sealey, D. Mason	R. Berry	British India Line
<i>Waroonga</i>	21.2.63	W. K. Tadmam	G. R. Davidson, J. Well, J. Edwards	E. Priddle	Ellerman's Wilson Line
<i>Winga</i>	7.1.63	D. J. Bardsley	H. Thomson, A. Clark	W. C. Doyle	Shaw Savill Line
<i>York</i>	13.6.62	R. J. McNinch	B. C. Boot, J. Marr, R. Periam, H. Garner, B. Gollifer		Glen & Co., Ltd.
<i>Zinnia</i>	14.1.63	J. W. Laverack	S. D. Hayland, W. Selkirk, W. Fallon	P. McMeeking	Associated Humber Lines, Ltd.
	1.3.63	W. R. Hunter			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>	C. A. Hopkins	Coast Lines, Ltd.
* <i>Alderney Coast</i>	J. Healy	Coast Lines, Ltd.
* <i>Amsterdam</i>	A. W. Greeham	British Transport Commission
* <i>Arnhem</i>	F. B. Allen	British Transport Commission
<i>Ballylagan</i>	A. Barron	John Kelly, 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>B.P. Manager</i>	F. M. Cain	Shell Mex & B.P., Ltd.
* <i>B.P. Marketer</i>	J. MacIntyre	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	Caledonian Steam Packet Co.
<i>Cambria</i>	W. J. Roberts	British Transport Commission
<i>Cerdic Ferry</i>	C. E. Tanner	Atlantic S.N. Co., Ltd.
<i>Cheshire Coast</i>	H. J. Cowan	Coast Lines, Ltd.
<i>Claymore</i>	J. C. McKinnon	D. MacBrayne & Co.
* <i>Clupea</i>	J. Jappy	Dept. of Agric. & Fisheries for Scotland
* <i>Corfen</i>	G. E. Ashton	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>	W. Hoar	British Transport Commission
<i>Devon Coast</i>	D. Campbell	Coast Lines, Ltd.
<i>Doric Ferry</i>	J. W. Cowie	Atlantic S.N. Co., Ltd.
<i>Drake</i>	A. Guest	General S.N. Co., Ltd.
* <i>Dryburgh</i>	J. Johnstone	G. Gibson & Co., Ltd.
* <i>Duke of Argyll</i>	— Ashton	British Transport Commission
* <i>Duke of Lancaster</i>	J. Irwin, R.D.	British Transport Commission
* <i>Duke of Rothesay</i>	J. B. Williams	British Transport Commission
* <i>Duke of York</i>	R. Good	British Transport Commission
<i>Elswick Bay</i>	W. G. Dennison	Elwick Shipping Co.
<i>Falaise</i>	C. E. Hatchley	British Transport Commission
<i>Fauvic</i>	H. S. Shugar	Channel Shipping Co.
* <i>Fernhurst</i>	E. C. Ford	Stephenson Clarke, Ltd.
<i>Ferryhill</i>	J. Innes	Aberdeen Coal & Shipping Co., Ltd.
* <i>Friston Coast</i>	D. K. Wright	Tyne-Tees S.S. Co., Ltd.
<i>Fruin</i>	L. Lamont	W. Sloan & Co., Ltd.
* <i>Fulham X</i>	D. Battle	Stephenson Clarke, Ltd.
<i>Goldfinch</i>	J. A. Furrett	General S.N. Co., Ltd.
<i>Guernsey Coast</i>	P. Meras	Coast Lines, Ltd.
<i>Hadrian Coast</i>	H. G. Keilit	British Channel Is. Shipping Co., Ltd.
* <i>Helmsdale</i>	A. Ross	Northern Trading Co., Ltd.
* <i>Heron</i>	A. Guest	General S.N. Co., Ltd.
<i>Hesperus</i>	R. A. McEachorn	Northern Lighthouse Board
<i>Hibernia</i>	E. A. Horspool	British Transport Commission
* <i>Hibernian Coast</i>	T. Mearns	Coast Lines, Ltd.
* <i>Iberian Coast</i>	G. G. 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>	D. McCormack	Coast Lines, Ltd.
<i>Jade</i>	A. Fletcher	Wm. Robertson, Ltd.
<i>Jersey Coast</i>	J. G. Casey	Coast Lines, Ltd.
<i>Karri</i>	D. Hill	W. N. Lindsay, Ltd.
<i>Kingsgate</i>	F. G. Norton	Hull Gates Shipping Co.
<i>Lairds Crest</i>	L. Stewart	Burns Laird Line, Ltd.
<i>Lairds Glen</i>	D. Campbell	Burns Laird Line, Ltd.
<i>Lairds Loch</i>	D. McCormack	Burns Laird Line, Ltd.
* <i>Lancashire Coast</i>	R. E. Holt	Coast Lines, Ltd.
* <i>Leinster</i>	W. P. Baylan	Coast Lines, Ltd.
<i>Loch Ard</i>	J. Maclean	D. MacBrayne & Co.
<i>Loch Broom</i>	D. Gunn	D. MacBrayne & Co.
* <i>Loch Carron</i>	A. Matheson	D. MacBrayne & Co.
<i>Loch Linnhe</i>	H. McArtney	J. Rainey, Ltd.
<i>Loch Mor</i>	D. McLeod	D. MacBrayne & Co.
* <i>Loch Seaforth</i>	J. Smith	D. MacBrayne & Co.
<i>May</i>	R. Williamson	Northern Lighthouse Board
<i>Mayfair Sapphire</i>	W. Donald	A. S. Davidson, Ltd.
* <i>Melrose Abbey</i>	J. Blackburn	Associated Humber Lines, Ltd.
<i>Mitcham</i>	H. G. N. D’Fuelin	South Eastern Gas Board
<i>Mountstewart</i>	H. A. Matheson	Coast Lines, Ltd.
* <i>Munster</i>	J. Williams	Coast Lines, Ltd.
* <i>Mytongate</i>	F. Williams	Hull Gates Shipping Co., Ltd.
* <i>Netherlands Coast</i>	E. Fisher	Tyne-Tees Shipping Co., Ltd.
<i>Ocean Coast</i>	R. H. Beech	Coast Lines, Ltd.
<i>Olivian Coast</i>	D. Collins	Tyne-Tees Shipping Co., Ltd.
<i>Orelia</i>	T. Dean	Houlder Bros., Ltd.
* <i>Pearl</i>	W. Campbell	Gem Line, Ltd.
* <i>Pentland</i>	J. Drever	Currie Line, Ltd.

* These ships report wind and weather.

'Marid' Ships (contd.)

NAME OF VESSEL	CAPTAIN	OWNER/MANAGER
<i>Pharos</i>	C. Campbell	Northern Lighthouse Board
<i>Pluto</i>	J. Thatcher	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., R.N.	Outward Bound Moray Sea Sch.
<i>Princess Maud</i>	R. Roberts	British Transport Commission
<i>Ringdove</i>	J. W. Klemm	General S.N. Co., Ltd.
* <i>Rollo</i>	C. Williams	Ellerman's Wilson Line
<i>St. Andrew/St. David</i>	H. 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>St. Rognvald</i>	J. Bisset	North of Scotland Shipping Co., Ltd.
* <i>Sappho</i>	C. Knight	Bristol S.N. Co., Ltd.
<i>Sarnia</i>	G. 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>	C. Johnston	General S.N. Co., Ltd.
<i>Silvio</i>	E. Whitfield	Ellerman's Wilson Line, Ltd.
<i>Slieve Bawn</i>	G. R. Gill	British Transport Commission
<i>Slieve Bearnagh</i>	—, Mills	British Transport Commission
<i>Slieve Bloom</i>	J. R. Rowlands	British Transport Commission
<i>Slieve League</i>	—, Evans	British Transport Commission
<i>Slieve More</i>	G. J. Butterworth	British Transport Commission
* <i>Spray</i>	J. Andrews	Ellis & McHardy
<i>Stanstead</i>	E. Reed	Stevenson Clarke, Ltd.
<i>Southern Coast</i>	M. B. Leasit	Coast Lines, Ltd.
<i>Suffolk Coast</i>	H. Maxwell	Tyne-Tees Shipping Co., Ltd.
* <i>Superiority</i>	W. Jones	F. T. Everard & Sons, Ltd.
<i>Tay</i>	W. McIver	W. Sloan & Co., Ltd.
* <i>Teano</i>	—, Firth	Ellerman's Wilson Line
<i>The President</i>	A. Turner	J. Hay & Sons
* <i>Torquay</i>	G. Youngson	J. & A. Davidson, Ltd.
* <i>Whitby Abbey</i>	—, Wooler	Associated Humber Lines, Ltd.
* <i>Woodlark</i>	W. Conway	General S.N. Co., Ltd.
* <i>Woodwren</i>	C. Reynolds	General S.N. Co., Ltd.
<i>Yewarch</i>	J. W. Russell	J. Stewart & Co. Shipping, Ltd.

* These ships report wind and weather.

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. D. Abbey	J. H. Large	Thomas Hamling & Co., Ltd.
A. Clarkson	F. Scott	Kingston Steam Trawling Co., Ltd.
P. Craven	D. L. Verity	St. Andrew's Steam Fishing Co., Ltd.
J. E. Dobson	K. H. Massey	Thomas Hamling & Co., Ltd.
P. Gay	E. Smith	Charleson-Smith Trawlers, Ltd.
J. A. Kersey	E. Smith	Charleson-Smith Trawlers, Ltd.
N. E. Longthorp	G. W. Taylor	Hellyer Bros., Ltd.
W. March	R. Murphy	Hellyer Bros., Ltd.
C. A. Nielsen	W. B. Sayer	Kingston Steam Trawling Co., Ltd.
H. Parker	F. Scott	Kingston Steam Trawling Co., Ltd.
D. P. Pougher	K. C. Stone	Thomas Hamling & Co., Ltd.
S. Sparks	G. Brocklesby	Thomas Hamling & 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 VESSEL	MASTERS
<i>Bar</i>	E. E. Abbott, N. S. Burns
<i>Dowsing</i>	T. W. Dodds, W. R. Nobbs
<i>East Goodwin</i>	G. A. Alp, W. E. Harvey
<i>Galloper</i>	S. M. Loader, W. G. Burroughs
<i>Humber</i>	D. W. Bird, D. A. Bacon
<i>Longstone</i>	R. D. Ewens, W. C. Mortimer
<i>Newarp</i>	G. A. Harris, W. E. Fenn
<i>Royal Sovereign</i>	G. Davies, B. J. Key
<i>St. Gowan</i>	R. G. Jones, T. Reville
<i>Seven Stones</i>	W. E. Harvey, D. J. Harries
<i>Shambles</i>	A. C. Edwards
<i>Shipwash</i>	B. J. Simpson, J. Goldsmith
<i>Skulmartin</i>	J. O'Neill
<i>Smith's Knoll</i>	B. E. Cunham, R. E. C. Lay

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
Conway, 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.
Worcester, H.M.S.	L. W. Argles, C.B.E., D.S.C., Capt. R.N. (Retd.)

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 1.5.63)

NAME OF VESSEL	OWNER
Selected Ships:	
<i>Arafura</i>	E. & A. S.S. Co.
<i>Aros</i>	Wilhelmsen Agency Pty. Ltd.
<i>Bamora</i>	B.I.S.N. Co.
<i>Barossa</i>	McIlwraith McEacharn Ltd.
<i>Barpeta</i>	P. & O. Orient Line of Australia
<i>Bass Trader</i>	Australian National Line
<i>Bermuda Trader</i>	Br. Phosphate Commissioners
<i>Bulolo</i>	Burns Philp & Co.
<i>Carpentaria</i>	B.I.S.N. Co.
<i>Chakrata</i>	B.I.S.N. Co.
<i>Charon</i>	Dalgaty & New Zealand Loan
<i>Delos</i>	Wilhelmsen Agency Pty. Ltd.
<i>Eastern</i>	E. & A. S.S. Co.
<i>Fremantle Star</i>	Blue Star Line
<i>Gorgon</i>	Dalgaty & New Zealand Loan
<i>Hobart Star</i>	Blue Star Line
<i>Kangaroo</i>	W. A. State Shipping Service
<i>Koojarra</i>	W. A. State Shipping Service
<i>Koorawatha</i>	McIlwraith McEacharn Ltd.
<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>Mandowei</i>	Blue Star Line
<i>Milos</i>	Wilhelmsen Agency Pty. Ltd.
<i>Montoro</i>	Burns Philp & Co.
<i>Nankin</i>	E. & A. S.S. Co.
<i>Nellore</i>	E. & A. S.S. Co.
<i>Nuddea</i>	B.I.S.N. Co.
<i>Orestes</i>	Dalgaty & New Zealand Loan
<i>Port Melbourne</i>	Gibbs, Bright & Co.
<i>Port New Plymouth</i>	Gibbs, Bright & Co.
<i>Rhexenor</i>	Dalgaty & New Zealand Loan
<i>Rona</i>	Colonial Sugar Refining Co.
<i>Samos</i>	Wilhelmsen Agency Pty. Ltd.
<i>Shansi</i>	Swire & Yuill
<i>Soochow</i>	John Sanderson & Co.
<i>Tientsin</i>	John Sanderson & Co.
<i>Townsville Star</i>	Blue Star Line
<i>Triadic</i>	Br. Phosphate Commissioners
<i>Triellis</i>	Br. Phosphate Commissioners
<i>Trienza</i>	Br. Phosphate Commissioners
<i>Tsingtao</i>	John Sanderson & Co.
<i>Tulagi</i>	Burns Philp & Co.
<i>Wangara</i>	James Patrick & Co.
<i>Wharanui</i>	Birt Elder Pty. Ltd.
<i>Windarra</i>	James Patrick & Co.
Supplemenatry Ships:	
<i>Delamere</i>	W. A. State Shipping Service
<i>Dorrigo</i>	W. A. State Shipping Service
<i>Dulverton</i>	W. A. State Shipping Service
<i>Kabbarli</i>	W. A. State Shipping Service
<i>Koolama</i>	W. A. State Shipping Service
<i>Wongala</i>	F. H. Stephens Pty. Ltd.

CANADA (Information dated 9.5.63)

NAME OF VESSEL	OWNER
Selected Ships:	
<i>A. T. Cameron</i>	Govt. of Canada
<i>Athelduke</i>	Athel Line Ltd., Liverpool
<i>Baffin</i>	Govt. of Canada
<i>Beaverfir</i>	Canadian Pacific Steamships
<i>Bluenose</i>	Govt. of Canada
<i>Camsel</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 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>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>Octavia</i>	Herman Daulsberg, Bremen
<i>Oriana</i>	Union S.S. Co., of New Zealand
<i>Port Dauphine</i>	Govt. of Canada
<i>Saldura</i>	Chr. Salvesen & Co., Leith
<i>Sir Humphrey Gilbert</i>	Govt. of Canada
<i>Sir William Alexander</i>	Govt. of Canada
<i>Thor I</i>	A. S. Thor Dahl, Sandefjord, Norway
<i>Thorshope</i>	A. S. Thor Dahl, Sandefjord, Norway
<i>Waihemu</i>	Union S.S. Co. of New Zealand
<i>Wolfe</i>	Govt. of Canada
Supplementary Ships:	
<i>Abegweit</i>	Govt. of Canada
<i>Acadia</i>	Govt. of Canada
<i>Anna Bakke</i>	Knutsen Line, Norway
<i>Arcadia</i>	Union S.S. Co., of New Zealand
<i>Banksland</i>	Hudson's Bay Co.
<i>Bougainville</i>	A. F. Klaveness & Co., Oslo
<i>Bronxville</i>	A. F. Klaveness & Co., Oslo
<i>Emerillon</i>	Shell Canadian Tankers
<i>Imperial Halifax</i>	Imperial Oil Company
<i>Imperial Quebec</i>	Imperial Oil Company
<i>Maxwell</i>	Govt. of Canada
<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>Thorstream</i>	A. S. Thor Dahl, Sandefjord, Norway
<i>William Carson</i>	Canadian National Railways

Auxiliary Ships:

Canada has 18 ocean-going Auxiliary Ships, and 26 Auxiliary Ships operating on the Great Lakes.

INDIA (Information dated 16.4.63)

NAME OF VESSEL	OWNER
Selected Ships:	
s.s. <i>Amra</i>	British India S.N. Co., Ltd.
m.v. <i>Andamans</i>	Shipping Corporation of India, Ltd.
s.s. <i>Bahadur</i>	Asiatic S.N. Co., Ltd.
s.s. <i>Bharatmitra</i>	Bharat Line, Ltd.
s.s. <i>Bharatratna</i>	Bharat Line, Ltd.
m.v. <i>Daressa</i>	British India S.N. Co., Ltd.
m.v. <i>Dumra</i>	British India S.N. Co., Ltd.
m.v. <i>Dwarka</i>	British India S.N. Co., Ltd.
s.s. <i>Indian Exporter</i>	India S.S. Co., Ltd.
s.s. <i>Indian Merchant</i>	India S.S. Co., Ltd.
s.s. <i>Indian Pioneer</i>	India S.S. Co., Ltd.
s.s. <i>Indian Reliance</i>	India S.S. Co., Ltd.
s.s. <i>Indian Shipper</i>	India S.S. Co., Ltd.
s.s. <i>Indian Trader</i>	India S.S. Co., Ltd.
s.s. <i>Islami</i>	Mogul Line, Ltd.
m.v. <i>Jalazad</i>	Scindia S.N. Co., Ltd.
m.v. <i>Jaladharma</i>	Scindia S.N. Co., Ltd.
m.v. <i>Jaladhruv</i>	Scindia S.N. Co., Ltd.
s.s. <i>Jalaketu</i>	Scindia S.N. Co., Ltd.
m.v. <i>Jalakrishna</i>	Scindia S.N. Co., Ltd.
s.s. <i>Jalapadma</i>	Scindia S.N. Co., Ltd.
s.s. <i>Jalaparakash</i>	Scindia S.N. Co., Ltd.
s.s. <i>Jalaputra</i>	Scindia S.N. Co., Ltd.
s.s. <i>Jalausha</i>	Scindia S.N. Co., Ltd.

INDIA (contd.)

NAME OF VESSEL	OWNER
m.v. <i>Jalavihar</i>	Scindia S.N. Co., Ltd.
m.v. <i>Jal Jawahar</i>	Scindia S.N. Co., Ltd.
s.s. <i>Kampala</i>	British India S.N. Co., Ltd.
s.s. <i>Karanja</i>	British India S.N. Co., Ltd.
s.s. <i>Mohammedi</i>	Mogul Line, Ltd.
s.s. <i>Mozaffari</i>	Mogul Line, Ltd.
s.s. <i>Nalanda</i>	Shipping Corporation of India, Ltd.
m.v. <i>Nicobar</i>	Shipping Corporation of India, Ltd.
m.s. <i>Pradeep</i>	Dept. of Light-Houses and Light Ships; Govt. of India
s.s. <i>Rajula</i>	British India S.N. Co., Ltd.
m.v. <i>Santhia</i>	British India S.N. Co., Ltd.
s.s. <i>Saudi</i>	Mogul Line, Ltd.
m.v. <i>Sirdhana</i>	British India S.N. Co., Ltd.
s.s. <i>State of Bombay</i>	Shipping Corporation of India, Ltd.
m.v. <i>State of Kutch</i>	Shipping Corporation of India, Ltd.
s.s. <i>State of Madras</i>	Shipping Corporation of India, Ltd.
m.v. <i>State of Orissa</i>	Shipping Corporation of India, Ltd.
m.v. <i>State of Travancore Cochin</i>	Shipping Corporation of India, Ltd.
s.s. <i>Sudabar</i>	Asiatic S.N. Co., Ltd.
s.s. <i>Umaria</i>	British India S.N. Co., Ltd.
Supplementary Ships:	
s.s. <i>Ajanta</i>	Shipping Corporation of India, Ltd.
s.s. <i>Bharatbhushan</i>	Bharat Line, Ltd.
m.v. <i>Bharatkesari</i>	Bharat Line, Ltd.
s.s. <i>Bharatveera</i>	Bharat Line, Ltd.
s.s. <i>Bharatvijaya</i>	Bharat Line, Ltd.
s.s. <i>Indian Commerce</i>	India S.S. Co., Ltd.
s.s. <i>Indian Endeavour</i>	India S.S. Co., Ltd.
m.v. <i>Indian Industry</i>	India S.S. Co., Ltd.
s.s. <i>Indian Renown</i>	India S.S. Co., Ltd.
s.s. <i>Indian Resolve</i>	India S.S. Co., Ltd.
s.s. <i>Indian Resource</i>	India S.S. Co., Ltd.
m.v. <i>Indian Security</i>	India S.S. Co., Ltd.
m.v. <i>Indian Splendour</i>	India S.S. Co., Ltd.
s.s. <i>Indian Strength</i>	India S.S. Co., Ltd.
s.s. <i>Indian Success</i>	India S.S. Co., Ltd.
m.v. <i>Indian Tradition</i>	India S.S. Co., Ltd.
m.v. <i>Indian Triumph</i>	India S.S. Co., Ltd.
m.v. <i>Indian Trust</i>	India S.S. Co., Ltd.
s.s. <i>Jag Ganga</i>	Great Eastern Shipping Co., Ltd.
m.v. <i>Jag Jivan</i>	Great Eastern Shipping Co., Ltd.
m.v. <i>Jag Laxmi</i>	Great Eastern Shipping Co., Ltd.
m.v. <i>Jag Mitra</i>	Great Eastern Shipping Co., Ltd.
s.s. <i>Jag Rani</i>	Great Eastern Shipping Co., Ltd.
s.s. <i>Jag Shanti</i>	Great Eastern Shipping Co., Ltd.
s.s. <i>Jag Tara</i>	Great Eastern Shipping Co., Ltd.
m.v. <i>Jag Vijay</i>	Great Eastern Shipping Co., Ltd.
m.v. <i>Jaladhana</i>	Scindia S.N. Co., Ltd.
m.v. <i>Jaladharti</i>	Scindia S.N. Co., Ltd.
m.v. <i>Jaladhanya</i>	Scindia S.N. Co., Ltd.
m.v. <i>Jaladhir</i>	Scindia S.N. Co., Ltd.
m.v. <i>Jaladuhita</i>	Scindia S.N. Co., Ltd.
m.v. <i>Jaladurga</i>	Scindia S.N. Co., Ltd.
m.v. <i>Jalagovind</i>	Scindia S.N. Co., Ltd.
m.v. <i>Jalagopal</i>	Scindia S.N. Co., Ltd.
s.s. <i>Jalakanta</i>	Scindia S.N. Co., Ltd.
m.v. <i>Jalakirti</i>	Scindia S.N. Co., Ltd.
m.v. <i>Jalamani</i>	Scindia S.N. Co., Ltd.
s.s. <i>Jalamayur</i>	Scindia S.N. Co., Ltd.
m.v. <i>Jalamudra</i>	Scindia S.N. Co., Ltd.
s.s. <i>Jalaprabha</i>	Scindia S.N. Co., Ltd.
s.s. <i>Jalapratap</i>	Scindia S.N. Co., Ltd.
s.s. <i>Jalapushpa</i>	Scindia S.N. Co., Ltd.
s.s. <i>Jalrajendra</i>	Scindia S.N. Co., Ltd.
s.s. <i>Jalvallabha</i>	Scindia S.N. Co., Ltd.
m.v. <i>Jalaveer</i>	Scindia S.N. Co., Ltd.
m.v. <i>Jalavijaya</i>	Scindia S.N. Co., Ltd.
m.v. <i>Jalavishnu</i>	Scindia S.N. Co., Ltd.
m.v. <i>Jalavikram</i>	Scindia S.N. Co., Ltd.
m.v. <i>Vishva Sudha</i>	Shipping Corporation of India, Ltd.
m.v. <i>Vishva Jyoti</i>	Shipping Corporation of India, Ltd.
m.v. <i>Vishva Nidhi</i>	Shipping Corporation of India, Ltd.
s.s. <i>Rajah</i>	Asiatic S.N. Co., Ltd.
s.s. <i>Rani</i>	Asiatic S.N. Co., Ltd.
s.s. <i>State of Andhra</i>	Shipping Corporation of India, Ltd.
m.v. <i>State of Assam</i>	Shipping Corporation of India, Ltd.
m.v. <i>State of Bihar</i>	Shipping Corporation of India, Ltd.
m.v. <i>State of Maharashtra</i>	Shipping Corporation of India, Ltd.
m.v. <i>State of Kerala</i>	Shipping Corporation of India, Ltd.
m.v. <i>State of Uttar Pradesh</i>	Shipping Corporation of India, Ltd.
m.v. <i>State of Rajasthan</i>	Shipping Corporation of India, Ltd.
m.v. <i>State of Gujrat</i>	Shipping Corporation of India, Ltd.
m.v. <i>State of Punjab</i>	Shipping Corporation of India, Ltd.
m.v. <i>Vishva Kirti</i>	Shipping Corporation of India, Ltd.
m.v. <i>Vishva Parbha</i>	Shipping Corporation of India, Ltd.
m.v. <i>Vishva Usha</i>	Shipping Corporation of India, Ltd.

HONG KONG (Information dated 11.4.63)

NAME OF VESSEL	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
Anking	R. C. W. Gorman	R. F. D. Pook, J. H. Gomersall, J. B. P. Blamey	Lum A. Gwan Ying	The China Navigation Co., Ltd.
Anshun	A. J. Keddle	B. A. Owen, W. R. Smith, L. Kane	Ho Po Lam	The China Navigation Co., Ltd.
Changsha	J. M. Parker	G. Chell, B. C. Maloney, A. Young	Ling Shiu Ming	The China Navigation Co., Ltd.
Chefoo	M. D. Burbidge	J. M. Wigham, J. L. MacInnes, C. E. Royle	Loo Wing Kwong	The China Navigation Co., Ltd.
Chekiang	J. R. Kidd	M. Irish, G. H. Belassey-Smith, T. Collom	Tsin Kwong Loi	The China Navigation Co., Ltd.
Chengtu	J. A. McDonald	B. J. Williams, C. J. R. Metcalf, A. J. Mill Irving	Wai Pun Un	The China Navigation Co., Ltd.
Chungking	A. V. Harrison	J. Lough, J. H. Gunn, B. Stook	Kong Shi Wei	The China Navigation Co., Ltd.
Clara Jeben	R. A. D. Nielsen	S. H. Nielsen, K. Paarup, N. L. Thomsen	Ong Sze Chin	Jebsen & Co.
Dana	J. Johnsen	A. Johannessen, H. Bjordal, M. Viken	Hung Siu Kie	T. H. Nordboe, Haugesund
Eastern Argosy	F. H. Main	G. W. S. Ison, R. G. Sanderson, R. C. Porteous	A. P. Burns	The Indo-China S.N. Co., Ltd.
Eastern Glory	T. C. W. Marr	D. M. Cauvin, D. R. Cole, P. S. Lipsett	T. A. O'Donnell	The Indo-China S.N. Co., Ltd.
Eastern Maid	P. J. Sullivan	D. Smith, B. T. Scarbrough, I. H. F. Lowe	T. J. O'Driscoll	The Indo-China S.N. Co., Ltd.
Eastern Muse	J. H. Thomas	E. Dunbar, D. N. Greenhalgh, G. T. Norton	L. E. Elworthy	The Indo-China S.N. Co., Ltd.
Eastern Queen	D. G. R. Kinnear	J. A. C. Hunter, R. J. W. Raudon, P. R. Hay	R. G. Brennan	The Indo-China S.N. Co., Ltd.
Eastern Ranger	J. M. Marshall	K. Millar, E. G. Edmondson, M. L. Olesen	J. F. Fitzgerald	The Indo-China S.N. Co., Ltd.
Eastern Rover	R. K. Learoyd	R. W. Gibson, J. Hawthorne, M. Price	R. O. Smith	The Indo-China S.N. Co., Ltd.
Eastern Saga	C. Preston	B. O. Jensen, J. C. Jones, M. J. Miller	E. A. Dunford	The Indo-China S.N. Co., Ltd.
Eastern Star	M. I. Groundwater	J. D. McNeill, R. E. Jones, K. A. Ashworth	H. E. Brookfield	The Indo-China S.N. Co., Ltd.
Eastern Trader	M. J. K. Crichton	J. D. R. Witschi, P. Ferrar, M. G. Thompson	D. H. Holvey	The Indo-China S.N. Co., Ltd.
Elbeth	J. Pettitt	Shi Wan-Leong, Woo Ting-Po	Wong Kam Bui	Shun Cheong S.N. Co., Ltd.
Fengting	M. T. Anderson	C. D. Nisbet, P. Ellis, Y. Y. Chan	Tsang Pui Leung	The China Navigation Co., Ltd.
Foochow	M. R. M. Searle	P. Matthews, M. C. Sherman, D. Lee	Yue Shiu Ming	The China Navigation Co., Ltd.
Fukien	J. Keates	M. J. Tiddy, H. J. Stagg, W. K. Li	Cheng Yui Man	The China Navigation Co., Ltd.
Funing	N. C. Pearson	R. C. Willey, H. Davis, S. M. Ho	Choi Pong Cheung	The China Navigation Co., Ltd.
Hai Hing	J. M. K. Kelly	C. G. Cockedge, M. Bufton, W. Lee	Chin Fook On	The China Navigation Co., Ltd.
Hai Lee	H. Andersen	K. Jakobsen, O. Andersen, T. Monsen	Cheung Yeuk	Norwegian Asia Line
Hai Meng	O. Schibsted	N. Klokke, B. Varhaug, J. Roland	Chan Wuie lu	Norwegian Asia Line
Hallidor	T. Thorkildsen	A. Gronvik, K. G. Pedersen, K. Haug	Chan Kam Tsun	Norwegian Asia Line
Hallvard	E. Nordendal	Ian Roald Pedersen, T. Breivik, J. Riverud	J. E. Dahl	Norwegian Asia Line
Hang Sang	L. C. Cox	M. G. Bishop, W. J. M. Attrill, Lo Ting Yan	A. Antonsen	Norwegian Asia Line
Hanyang	R. E. Brooks	J. Paisley, T. J. Wilson, C. M. Cheng	W. Dobbie	Norwegian Asia Line
Heinrich Jessen	H. P. Fallesen	J. Truelsen, J. E. Thomas, J. E. Jensen	Tsim Tung Hang	The Indo-China S.N. Co., Ltd.
Helios	J. Mikkelsen	O. Skaugstad, R. Farstad, N. Kaaber	Fok Cho Cheuk	The China Navigation Co., Ltd.
Henrik	A. Sjoberg	G. Forde, K. M. Knutzen, H. Saeteroy	Ip Yuk Fai	Jebsen & Co.
Hermid	O. J. Apold	O. Andreassen, L. Moen, T. Egeland	Chiu Tze Kong	Norwegian Asia Line
Hervar	O. Saltrold	A. Solbaek, O. Stromsness, K. Digerness	Poon Chee Pooi	Norwegian Asia Line
Heta Sang	T. H. Nichols	N. J. M. Wilson, M. G. Lever, T. soi Cheong Ming	Lai Kwong Yin	Norwegian Asia Line
Hin Sang	W. G. White	B. G. Cox, J. B. Skerritt, T. Y. Yuan	A. M. Bailey	The Indo-China S.N. Co., Ltd.
Ho Sang	J. R. Simpson	I. F. Kite, G. Mitchell, Sin Yiu Kai	J. S. Mathers	The Indo-China S.N. Co., Ltd.
Hot Wong	J. Bjerkenes	R. Okland, T. Ofredal, P. Helland	K. D. Cullen	The Indo-China S.N. Co., Ltd.
Jacob Jeben	E. Andersen	W. Fabricius, J. E. Soerensen	H. Fastingsen	H. M. Wrangell & Co., Ltd.
Johore Bahru	C. Clayton	S. K. Nandi, R. J. Kerravalla, Lee Kwai Fong	Chan Fo Soo	Jebsen & Co.
Kota Bahru	Sih Hsiang	E. F. Rainbow, Yeung Hei Chit, Liu Cheung Ki	N. S. Sane	Pedder Industrial Co., Ltd.
Kuala Lumpur	A. Watson	M. H. A. Swift, W. F. Jeffrey, M. de G. Waymouth	Ho Tak Pong	Great Southern S.S. Co., Ltd.
Kwangsi	M. W. Lewis	L. A. McGowan, J. M. Bolton, C. E. M. Graham	Mak Yau	The China Navigation Co., Ltd.
Kwangtung	J. F. Follett	R. Kennett, I. R. C. Hanman, M. R. Coyne	Shiu Ping Fan	The China Navigation Co., Ltd.
Kweichow	A. Atkin	R. I. Shipp, D. H. Hulme, J. A. Derrick	Li Hon Wah	The China Navigation Co., Ltd.
Kwelin	A. Harper	G. W. P. George, C. A. Flavell, I. D. Goddard	Tsui See Man	The China Navigation Co., Ltd.
			Wong Woon Man	The China Navigation Co., Ltd.

NEW ZEALAND (Information dated 1.4.63)

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>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>Kuroto</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 Government
<i>Ngakuta</i>	Union S.S. Co. of New Zealand, Ltd.
<i>Ngatoro</i>	Union S.S. Co. of New Zealand, Ltd.
<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 & Company
<i>Tanea</i>	Shell & Co. (N.Z.), Ltd.
<i>Taranui</i>	South Pacific Shipping Co. (Suva)

Auxiliary Ships:
New Zealand has 11 Auxiliary Ships.

PAKISTAN (Information dated 1.1.63)

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>Kareem</i>	AQVE
<i>Maulabaksh</i>	AQBP
<i>Mustali</i>	AQLY
<i>Ocean Endurance</i>	AQBW
<i>Pakistan Prosperity</i>	AQAZ
<i>Safina-e-Arab</i>	AQVA
<i>Safina-e-Nusrat</i>	AQLM
<i>Safina-e-Hujjaj</i>	AQLW
<i>Shams</i>	

Auxiliary Ships:
Pakistan has 20 Auxiliary Ships.

MUFAX IN SHIPS

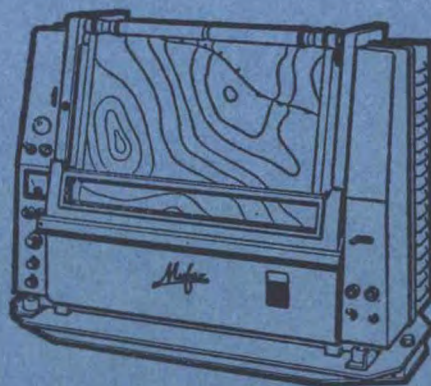


M.S. MEXICAN REEFER

Among the first fleet operators in the world to realize the potentialities of "Weatherfax" was the J. Lauritzen shipping line of Denmark.

A Mufax Weather Chart Recorder is fitted in the M.S. Mexican Reefer, a modern refrigerated vessel that plies the Ecuador-Antwerp route. This enables the Captain to steer a course through the most favourable weather and so keep a tight schedule whilst protecting the delicate cargo.

"Weather Chart Radio Transmissions"
— indispensable to all interested in
facsimile weather charts.
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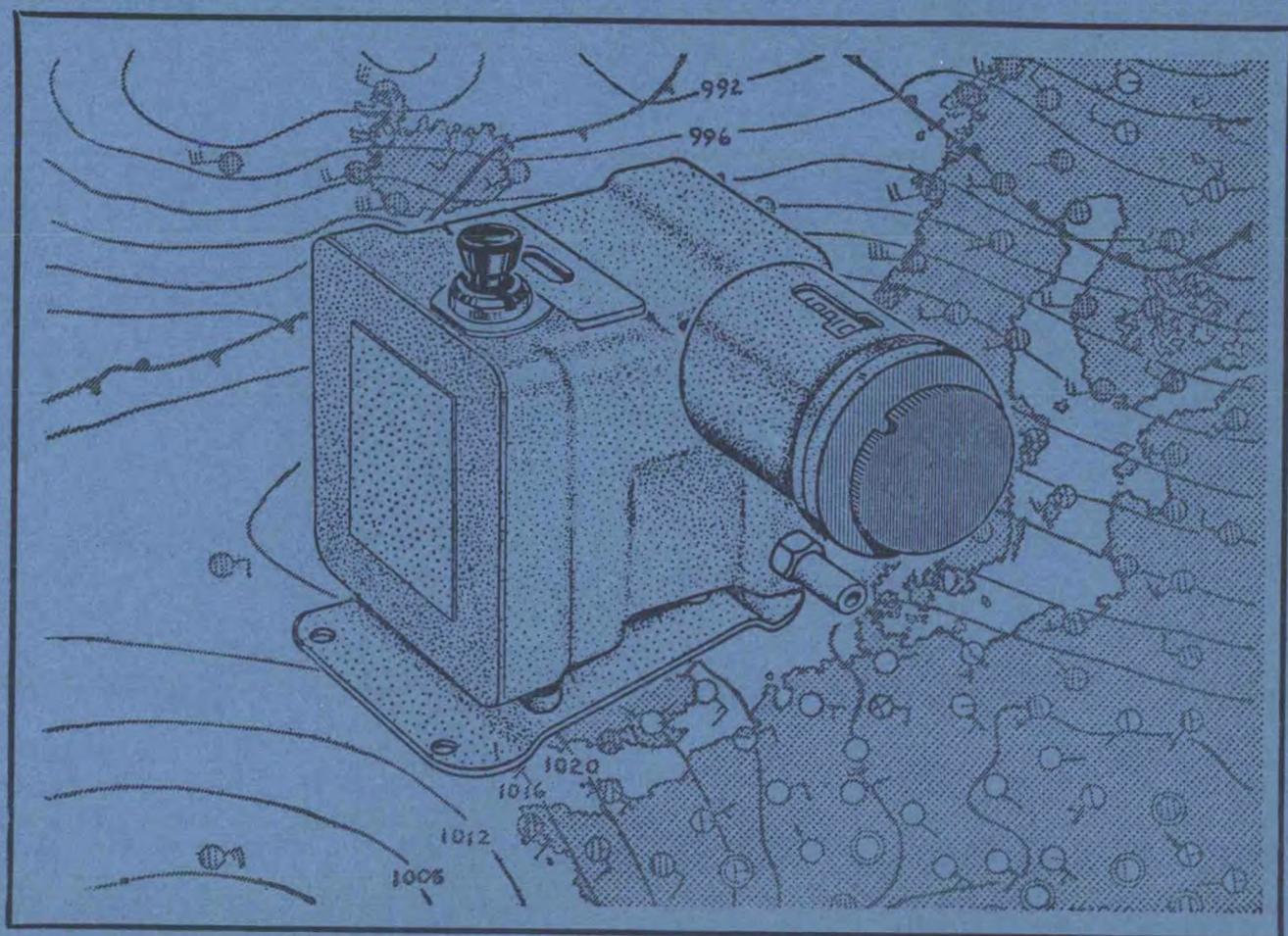
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