M.O. 749

The Marine Observer

A quarterly journal of Maritime Meteorology

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THE MARINE OBSERVER

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

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Editorial

One of the more difficult administrative problems of a meteorological service is that of keeping its 'customers' up-to-date as to anticipated changing weather developments during a 24-hour period. Alternatively, one could say that one of the chief difficulties of the user is that of keeping himself up-to-date in this respect.

The meteorologists do their best, within the budgetary limits that they are allowed, and the problems are nearly always communication ones associated with the length of time it takes to plot hundreds of observations on to a synoptic map. Before the forecaster can have a weather map on which to base his deductions, a large number of observations need to be received at the Central Forecast Office from observing stations ashore and from ships at sea, covering half a hemisphere, and all these have to be plotted by hand on the weather maps. Observations pour into the Forecast Office, by teleprinter and radio, but obviously there is a limit to the number of teleprinter and radio circuits that are economically feasible to operate. (Quite big money is involved; for instance the total cost of the British Meteorological Office for 1962 was about £5,800,000.) And when the messages get to the office they need to be edited, there are further unavoidable minor delays before they reach the plotters and finally there is the laborious business of plotting each observation on the chart. As far as ship reports are concerned, the problems include 'single operator' watches and congestion on available frequencies leading to delays in clearing messages to the shore and then, when the message has been received ashore it has to be retransmitted by teleprinter to the Central Forecast Office, and this tends to cause further delays.

In the United Kingdom, the midnight and 0600 GMT charts are always rather sparse of ship reports, because both these hours fall outside the 'single operator' watch periods in the eastern Atlantic. Recently the 0600 chart has much improved in this respect, because more ships are now transmitting the 0600 observation as soon as the radio officer comes on watch at 0800. Even midnight observations if transmitted then, may still serve a useful purpose on occasions when oceanic weather conditions are a bit complicated.

Finally the forecaster can get to the chart himself—in fact he often starts drawing up his isobars while the plotter is still plotting some of the 'late' reports to come in. Before doing this, he has, of course, been studying the earlier charts that have been prepared (both surface and upper air) so as to familiarise himself with the general synoptic position. Upper air maps to a height of about 50,000 ft. are prepared every 6 hours, wide range surface maps every 3 hours and more local surface maps every hour. (Surface observations from the ocean weather ships are received every hour.) Having made his detailed study he is in a position to draw up his analysis map—which is merely an isobaric 'picture' of the present weather situation—and his prebaratic map which gives an isobaric picture of what he estimates the weather situation will be in 24 hours' time. These maps contain nothing but isobars; the direction and force of the wind needs to be deduced from the type of weather system and the spacing of the isobars. If, for example, they are based upon the 0600 observations, the prognosis would be broadcast by facsimile at 1035 and the analysis at 1113 and finally, as and when necessary, the written synopsis and forecast would be issued, for broadcast by the B.B.C. and G.P.O.

In the United Kingdom, as a general rule, it is thus about 5 hours from the time of the observation to the time that a sea-level prognosis and analysis can be issued. It is even later than this before a forecast, based upon those observations, can be issued by radio. Thus the B.B.C. coastal bulletin which is issued at 0645 is based on the midnight chart. Similarly the G.P.O. coastal bulletins issued by R/T and W/T between 0803 and 0848 are based upon the midnight chart, but these are brought up to date, as far as possible, on the basis of the 'intermediate' 0300 observations. The best chart of the day, for density of ship observations, is the one based upon the 1200 GMT (midday) observations. The prognosis and analysis map derived from

these observations is ready about 1700 and the B.B.C. coastal bulletin broadcast at 1800 and the G.P.O. bulletins broadcast by R/T and W/T between 2003 and 2048 and the North Atlantic bulletin broadcast at 2130 are all derived from this.

Although, for example, the 0930 North Atlantic bulletin is based upon midnight observations and derived from an analysis prepared at about 0500, the forecaster would take into consideration information on the 0300 (intermediate) chart and any available hourly charts before issuing this bulletin. Similar arguments apply in the case of other bulletins.

The sea-level analysis and sea-level prognosis maps represent the official appreciation of the Central Forecast Office concerning the present and anticipated weather situation and are broadcast by facsimile, by landline or by radio for the information and guidance of professional meteorologists in the United Kingdom and elsewhere. The radio frequencies under which facsimile maps are transmitted are such that they are receivable in any part of the world. These maps, all of which are, as previously stated, ready for issue about five hours after the observation time, are issued at regular intervals throughout the day. Although intended primarily for professional meteorologists, they are readily understandable by the average deck officer aboard a merchant ship—particularly when they are studied against the background of a written bulletin.

One of the problems of the forecaster is how to present, in a few words, an accurate and coherent picture of the future weather as well as a brief synopsis of the actual synoptic situation over a large area of land or sea. The number of words he can use are governed by financial considerations and by the patience and understanding of the user. The sea areas are, fortunately, the less complicated, because, except in coastal areas, they are unaffected by topographical considerations.

The World Meteorological Organisation prescribes that location in weather bulletins should be with reference to well-known landmarks or in terms of latitude and longitude. The sub-division of coastal areas in this way is relatively simple, but in oceanic areas, unless there are suitable islands or named banks, it is much more difficult. The method used by the U.K. authorities whereby the eastern North Atlantic is divided into six more or less equal sections seems to satisfy the requirement and to give the forecaster a reasonable chance of describing and forecasting the weather with economy of words. The U.S. Weather Bureau, responsible for the western part of the ocean, use no routine sub-division and may consequently need to use many more words in their bulletins. But whatever the method, the forecasters' problem of describing the weather over such a large area remains very difficult. The user is assisted to some extent by the coded analysis which follows the synopsis and forecast—but to fit in with national broadcasting arrangements, this may often have to be sent at a different time to that of the rest of the bulletins. And it takes time to code it up ashore and to receive, decode and plot it aboard the ship—all rather laborious tasks. In the eastern Atlantic this analysis in only issued once a day, because it is felt rather unlikely that ships' officers would find the time to plot more than one analysis a day.

One difficulty which officers aboard merchant ships often complain about is that the analysis issued by the U.K. authorities only extends to about 50°W and that it is difficult to 'marry it' to the analysis issued by the U.S. Weather Bureau, in order to get a complete picture of North Atlantic weather. Also having to receive, decode and plot two radio analysis messages involves a lot of work for the officers concerned.

The problem for the authorities ashore is an economical and practical one. Under a world-wide scheme, organised by the World Meteorological Organisation in 1948, certain countries agreed to be responsible for the issue of radio weather bulletins for shipping in specific oceanic areas. In this way practically all the oceanic areas of the world are covered by radio weather bulletins for shipping, in one way or another. Thus, the U.S. and U.K. have an official responsibility respectively for the western and eastern North Atlantic and other countries similarly have assumed responsibilities for specific areas in the other oceans. The choice of an area is

largely governed by the competence of the country concerned to forecast for that area—and the nearer to 'home' it is the more accurate the forecast is likely to be. It would not be economical or sensible, for example, if both the U.K. and U.S.A. issued a bulletin and analysis for the whole ocean. Not only would this involve much more work for the forecasters in each country, concerning areas upon which they have limited information—but it would involve inordinately long radio messages which would not only be expensive but would further crowd the already busy maritime radio channel. Sub-division, roughly in the middle of the ocean, seems to be the rational answer. There is, however, a certain amount of overlapping of the areas, which is desirable for various practical reasons.

Nowadays, a rather unusual form of automation in the form of the radio facsimile map provides a simple and ready system whereby the shipmaster can have before him a more or less constant picture of the weather situation, in most oceanic areas—independent of 'single operator watch periods' and without causing any additional work for the deck officers. All that is needed is a suitable radio receiver and the facsimile receiver itself—which can probably be located in the chart room. The analysis and prebaratic maps which are broadcast by facsimile contain similar information to that of the radio analyses broadcast in morse, with the omission of the actual reports from ships and shore stations, and they cover similar areas. But these facsimile maps are prepared by a professional meteorologist who has before him all the necessary detail and they present a far more accurate story than could be portrayed by a ship's officer from the relatively small amount of detail that it is practicable to include in a radio analysis issued in morse. In most cases it is therefore easier to 'marry' the facsimile maps from the eastern part of the ocean with its western counterpart than to do this with the maps plotted aboard the ship. If desired, it would be quite simple to plot, on the facsimile map, any available ship and shore station reports that are contained in the radio bulletin. If studied in conjunction with the synopsis and forecast issued by morse, it seems that facsimile maps can be of real practical value to the shipmaster in keeping him up to date about the weather situation and may assist him materially in weather-routeing his ship. As suggested in earlier editions of *The Marine Observer* weather-routeing is nothing new; it merely implies the shipmaster making seamanlike decisions as to when it is prudent to change his course or speed in order to avoid a particular weather situation, for safety or economical reasons. In this connection, it seems that the facsimile wave analysis and prebaratic maps broadcast twice a day by the U.S. authorities from Washington might prove very useful. If in doubt, the shipmaster can, after all, always consult any meteorological service ashore by radio and obtain advice or confirmation of an opinion about existing or anticipated weather developments. Surface analysis and prebaratic maps for other oceanic areas are also broadcast by facsimile nowadays by certain other meteorological services.

C. E. N. F.

Report of Work for the Year ended 31st December 1963

(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*) 480 Selected Ships which are supplied on loan with a full set of meteorological instruments and which make observations in code form F.M.21C every six hours and transmit them to the appropriate coastal radio station wherever their voyages take them.

(*b*) 48 Supplementary Ships which make less detailed observations than Selected Ships and are supplied on loan with only a barometer, air thermometer and screen. They use abbreviated code form F.M.22C for their messages.

(*c*) 132 coasting ('Marid') vessels, and one lightship, which make sea surface temperature observations in U.K. 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 lightships which make observations of wind, waves, visibility, 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* lightships report barometric pressure using the new precision aneroid and their reports are included in the B.B.C. five-minute weather bulletins for shipping. The *Galloper* also reports barometric tendency. The time limit imposed on B.B.C. weather bulletins does not permit the inclusion of the barometric tendencies of the other two lightships.

(*e*) 14 trawlers which make non-instrumental observations only and transmit them by W/T or R/T, using the first four groups of F.M.21C, 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*) 101 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 775 ships represents nearly 19% of the world's total of about 4,000 voluntary observing ships.

The Port Meteorological Officers at London, Liverpool, Southampton, Glasgow and Cardiff and the Merchant Navy Agents at Newcastle, Hull and Leith whose job it is to recruit ships for the work, equip them with the necessary instruments and to instruct the voluntary observers in their duties, have between them visited each British observing ship every three months where possible. During these visits, instruments are inspected and renewed as necessary, the work is discussed with observing officers and radio officer and newly joined officers are instructed in their observing duties. Useful observations have been received during the year from H.M. Survey Ships; by arrangement with the Hydrographer and the Director of the Naval Weather Service these ships which tend to operate in areas where shipping is sparse keep the same meteorological logbook as our Selected Ships but use their own tested instruments.

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:

Average Numbers of British Selected and Supplementary Ships on main trade routes to and from the U.K.

Australasia	102	S. America	39
Far East	86	Pacific Coast of N. America	12
Persian Gulf	21	Europe	43
S. Africa	36	Falkland Islands and Antarctic	2
N. Atlantic	80	World-wide 'tramping'	83
W. Indies	21		

The map opposite shows the position of British Selected Ships in various parts of the world on 28th May 1963 (a date picked at random).

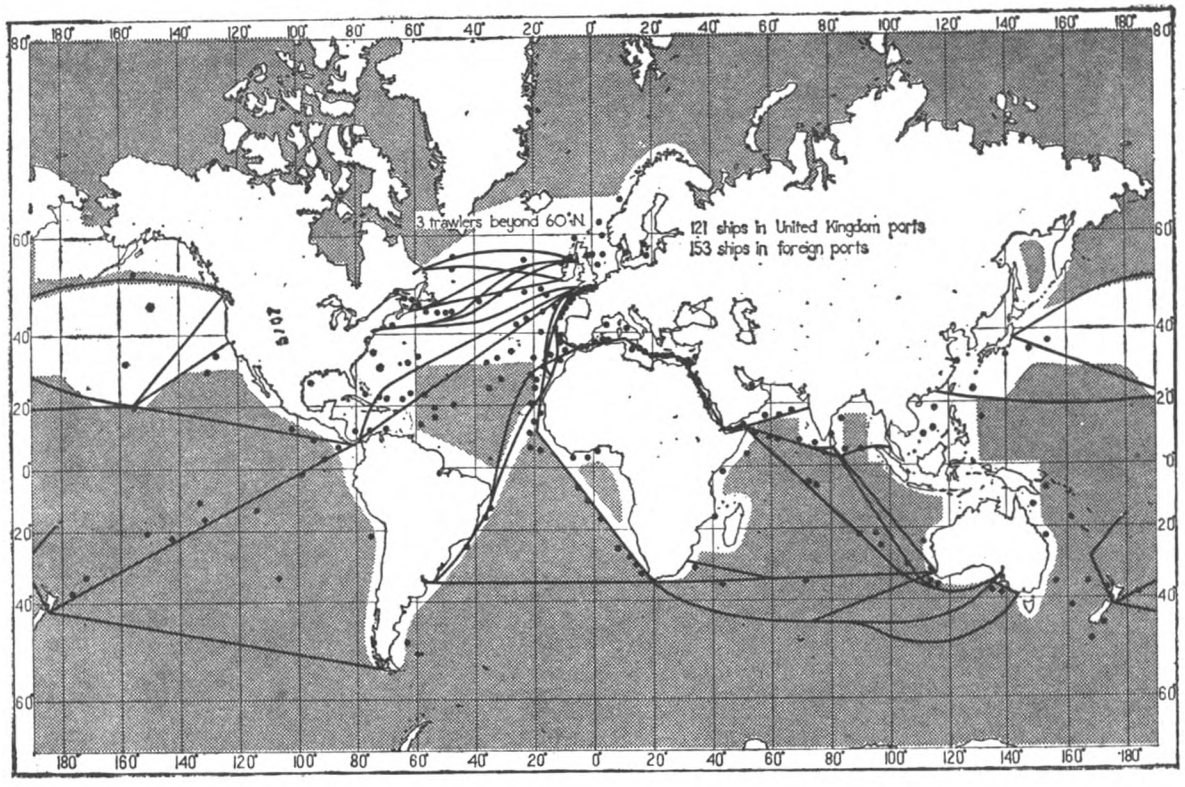
The following table gives the average daily number of radio weather messages received at the Meteorological Communications Centre at Bracknell via G.P.O. coastal stations during the year from merchant ships.

Daily average number of reports received from ships.

(*a*) North Atlantic (east of 40°W and north of 35°N)	
U.K. Selected and Supplementary Ships	86
'Marid' ships (coasting vessels)	12
Foreign ships	17
Trawlers	8
Total	123
(*b*) North Sea (51° 30'N to 61°N and 4°W to 7° 30'E)	
U.K. Selected and Supplementary Ships	7
'Marid' ships (coasting vessels)	7
Trawlers	3
Total	17
(*c*) Light-vessels	34

During two typical days, one in June and one in December, the number of reports from ships received in the Central Forecasting Office at Bracknell were as follows:

		June	Dec.
Direct Reception From	British ships in Eastern North Atlantic	74	100
	Foreign ships in ,, ,, ,,	39	25
	British trawlers in North Sea	6	4
	British merchant ships in North Sea	16	6
Total (direct reception)		135	135
Via other European countries	Ships in Eastern North Atlantic	231	260
	Ships in Mediterranean	48	65
	Ships in North Sea	78	31
	Ships off North Russia	9	13
	Ships in other European waters	41	102
Grand Total (Eastern North Atlantic and European waters)		542	606
Via U.S.A.	Ships in Western N. Atlantic	342	268
	Ships in N. Pacific	468	444



The positions of U.K. Selected and Supplementary Ships on the 28th May 1963 (a day picked at random). The shaded areas are those in which shipping is sparse and in which Auxiliary Ships make reports.

These figures for the Eastern North Atlantic and European waters—averaging about 570 reports a day—look very impressive, but they cover a very large oceanic area, and need to be divided by four to present a true picture for any single synoptic hour. Also it must be remembered that in this area the midnight GMT chart is always very sparse. But these figures (studied in conjunction with the map on page 107) indicate that the network in the Eastern Atlantic is quite reasonable—apart from the inevitable gaps where shipping is always rather sparse.

More reports from ships in the North Sea would be very useful—particularly from ships on passage across that sea. We realise that in this area, ships' officers are kept pretty busy with navigational duties—but all voluntary observing ships are asked to send radio weather messages there whenever possible, particularly when out of sight of land.

British trawlers have provided useful observations during the year but many more are required to satisfy the requirements of forecasters for information from all the areas in which these vessels operate, in all of which shipping is generally sparse. The average number of trawler reports received at U.K. radio stations was 307 a month, while the total number of reports they sent to foreign stations was 328 per month.

We have no detailed record of the number of radio weather messages received from British ships in other parts of the world, but against every observation in the meteorological logbook is recorded the radio station to which the message was sent. Scrutiny of the logbooks shows that our ships regularly transmit their observations to the appropriate radio stations and the table at page 106 shows how widespread the resulting network is.

947 meteorological logbooks were received during the year from ships of the voluntary observing fleet the scrutiny of which shows that a generally high standard of observing has been maintained.

288 completed forms have been received during the year from Auxiliary Ships. The majority of the observations recorded on these forms are from the Indian Ocean and will make a valuable contribution to the data being collected from this area during the period of the International Indian Ocean Expedition.

The number of Selected and Supplementary Ships remains about the same as last year but we are pleased to record the increase in the number of Auxiliary Ships.

The variety of the Aurorae and other meteorological and oceanographical phenomena which have been reported by the voluntary observing fleet during the year is shown in the Marine Observers' Log; a unique record of some of the marvels of nature.

The increasing number of shipmasters and officers who visit the Meteorological Office at Bracknell during their leave is an encouraging sign of their awareness of the practical value of meteorology to mariners.

About 10 British ships are now known to be fitted with facsimile receiving apparatus. The Masters of some of these ships have used to advantage the resulting surface analysis and prognostic maps in association with available radio weather bulletins, for weather routeing of their ships. Facsimile maps of ice distribution also seem to have been found very useful.

2. Ocean Weather Ships

British weather ships have now been operating in the North Atlantic for sixteen years and *Weather Reporter*, the first of the 'Castle' class vessels, has completed her fifth year on this duty. These 'Castle' class ships continue to give good service and are proving to be as good sea boats and almost as economical to operate as the 'Flower' class vessels—taking into consideration the present inflationary trend of costs. These ships have regularly operated at four ocean stations in the North Atlantic, in rotation with French, Norwegian and Netherlands weather ships.

Hourly surface observations and six-hourly upper air observations have been

made whenever the ships have been 'on station' and three-hourly surface observations when 'on passage'.

Radiation observations (using a solarimeter for solar radiation and 'fluxplates' on a boom either side of the ship for total radiation) have continued and these observations are now being made also aboard Admiralty Survey ships and aboard RRS *Discovery*. All the weather ships have been making special rain observations for isotope survey. Special observations have been made to determine the accuracy of the relation of the measured wind with the Beaufort force as estimated from 'State of Sea' criteria, and aboard one ship some experiments with an anemometer on a dan buoy have been carried out for the same purpose.

The new balloons which have been used for upper air observations since 1962 have resulted in radar wind observations attaining an average height, during the year, of about 69,600 feet (maximum 79,800 feet). This compares with an average height of only about 60,000 feet in previous years.

It is worthy of note that aboard *Weather Adviser*, while on duty at ocean station 'India' in November, winds of 70–90 knots were experienced for several hours and yet the meteorologists managed, after several attempts, to get successful upper air soundings. Launching a 9 foot diameter balloon in such weather conditions was a very good effort.

Oceanographical work has included soundings with oceanographic thermometers and sampling bottles to a depth of about 1,500 fathoms, four soundings being made each voyage; bathythermograph observations twice a day, to a maximum depth of about 900 feet; collection of plankton samples; and fishing for red fish when on duty at station Alfa.

All four weather ships are now fitted with precision aneroid barometers; these are easier to read in heavy weather aboard a small ship than a mercurial instrument and more accurate results should ensue.

During the year the average number of aircraft to which navigational aid (including radar fixes) and other information was given by British ships at the various stations during a 24-day period was:

Station A—249	Station J—1267
Station I—515	Station K—374

This traffic has steadily increased year after year, particularly at Station J.

Individual weather ships were alerted by radio on several occasions during the year, when ships or aircraft in the vicinity were in danger—but no actual rescue was required as in each case the alert was either cancelled before the weather ship reached the scene or other ships were nearer and provided any assistance required. The ships carried out frequent air-sea rescue exercises—and Coastal Command aircraft participated in these exercises when their other duties permitted. Opportunity is taken during these exercises for the aircraft to drop mail, newspapers or any urgently required spare parts or stores in watertight containers close along-side the ship.

The Flight Safety Foundation Award, for distinguished service to aviation, was made during the year to the personnel manning all the ocean weather ships in the North Atlantic. The Flight Safety Foundation, with headquarters in New York, is a world-wide organisation dedicated to the furtherance and improvement of air safety in all forms of flight. The Award, which takes the form of a plaque, will be permanently exhibited at the headquarters of the International Civil Aviation Organisation at Montreal and a certificate has been awarded to each individual ship.

3. Ice

The Marine Division continues to publish its ice maps of the North Polar Basin and areas adjacent to the North Atlantic. Since November 1963 at the request of the United States Weather Bureau and of our own long range forecasting unit these ice maps have been published at ten-day intervals in dyeline on a map about 30 inches square for operational purposes. We are grateful for the information we get

from the U.S.A., Canada, all the countries of the Baltic and from the Norwegian Polar Institute and Fisheries Research Organisation. Much of this information comes from ships and aircraft reports. Russia supplies data from the Barents Sea and the Tromso Meteorological Office information from Spitzbergen and Bear Island. For the benefit of scientists and other users of the data a comprehensive map in colour is issued once a month. The information on this map at the time of issue is about 2 months old. An analysis is made of the period of sustained frost over the whole of the area mapped, and the 10-day averages of sea surface temperature computed for the sea areas where ice is reported. We are provided by the Long Range Forecasting Branch with isobaric and upper air thickness data averaged over the 10 days corresponding to our ice maps and these in conjunction with data computed in this Branch have made it possible to provide the shipping press and shipping companies with warnings of possible danger likely to arise from ice. We are glad to acknowledge the useful information provided by merchant ships direct, and from pilots of aircraft flying over the polar regions, on a special reporting form produced for this purpose.

4. Surface Ocean Currents

Over 300,000 surface current observations have now been extracted on to punched cards and much work on their analysis completed by means of the electronic computer with the primary aim of bringing up to date the Current Atlas of the Indian Ocean. The four ocean weather ships and H.M. Survey Ship H.M.S. *Vidal* continue to make special detailed observations to provide data for the improvement of the method of measuring surface currents.

5. Marine Climatology and Enquiries

Work continued with the analysis and tabulation of records of total solar 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 completed and published in the quarterly journal of the Royal Meteorological Society (January 1964). In co-operation with the Ship Division of the National Physical Laboratory good progress was made with the tabulations of wave observations (punched on cards) made by British voluntary observing ships along the main shipping routes during the years 1953 to 1961. The tables give, for each 30° range of wave direction, the number of observations for any combination of wave height and period. An investigation into the relation between wind speed as measured by the anemometer and Beaufort Force as estimated from the appearance of the sea was completed using data supplied by the ocean weather ships. This confirmed the Netherlands investigations which inferred that the present scale of Beaufort equivalents gives values of wind speed which are rather too low for Beaufort forces 6 and less, and too high for forces 8 and above. This investigation was carried out at the request of the W.M.O. Commission for Marine Climatology and the findings will be discussed at the next meeting of the Commission. Information was supplied to the Admiralty during the year for preparing the routeing charts for both the North and South Atlantic.

The number of enquiries handled during the year was substantially greater than the previous year. As in past years the majority were from solicitors, brokers and insurance companies, at home and abroad, requiring reports of past weather and sea conditions in connection with shipping casualties. Information was provided for regions as far apart as Hudson Strait and South Georgia. The Ministry of Transport was supplied on several occasions with reports of weather and sea conditions to be presented at Formal Enquiries into shipping casualties where loss of life was involved. A representative from the Marine Division attended an enquiry in Glasgow and also gave evidence in two civil actions heard in London.

A considerable number of requests for wave data were received from engineers planning operations in the North Sea, Mediterranean, Red Sea, Persian Gulf and

other areas. The reports of sea and swell received for many years from voluntary observing ships have recently been worked up and frequency tables compiled. These have proved to be of great use in dealing with such enquiries. Hovercraft interests have also required similar information. Many enquiries are received from yachtsmen and holidaymakers about the normal weather conditions to be expected at home and abroad. Ocean current and sea ice data for six volumes of Admiralty Sailing Directions were revised during the year.

6. Publications

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

(*b*) A new edition of the *Marine Observer's Handbook* (Met. O. 522) was issued.

(*c*) A new edition of *Ships' Code and Decode Book* (Met. O. 509) was prepared and will be issued during the year.

(*d*) The new edition of M.O. 435 (new title Met. O. 435) (Ocean Currents of the South Pacific) is with the printer and it is hoped to publish it during 1964.

7. Awards to Voluntary Observing Ships

As customary, awards were made to the master, principal observing officer and senior radio officer of the one hundred Selected and Supplementary Ships which had sent in the most careful and painstaking meteorological logbooks during the year; to the same three officers of four ships in the coastwise and short sea trades ('Marid' ships) for the consistency of their radioed sea temperature observations and to the four trawler skippers and wireless operators whose voluntary work for us in high latitudes was considered as deserving special recognition (see page 116 of this number). The books selected as awards this year were *The Merchant Navy, a Social History*, by Captain A. G. Course, and *The University Atlas*. Barographs were awarded to four shipmasters for their long and zealous voluntary meteorological work at sea (see *The Marine Observer*, October 1963, page 216). Certificates of Recognition were received from the United States Weather Bureau for 23 British Voluntary Observing Ships and 41 British ships not on the voluntary observing fleet list, which had, during the previous hurricane seasons in the North Atlantic and Eastern North Pacific, rendered special service to the Bureau by sending radio weather messages. These certificates were forwarded to the masters of the ships concerned (see *The Marine Observer*, October 1963, page 215).

EXCELLENT AWARDS, 1963–1964

Forty years ago, in 1924, the July number of *The Marine Observer* contained the first list of Excellent Awards and the list has since become one of the permanent features of the July number. The list for the year ending 31st March 1964 appears on pages 113 to 116 of this issue.

It is once again our pleasure to congratulate the Captains, Deck and Radio Officers whose names appear in the list. They will be individually notified of the award by letter and asked for an address to which they would like us to send it. If, however, any captain or officer sees his name in the list before he receives the official letter, we would be very glad if he would write to us, claiming the award and giving us his home address, or any other address to which he would like the award sent. Letters have a habit of following officers from port to port, sometimes not catching up with them for many months, and by claiming the award direct from the pages of *The Marine Observer* much time and many repeated letters may be saved.

For many years past it has been the invariable rule for all meteorological logbooks received from ships to be scrutinised by a nautical officer on the staff of the Marine Division. A system of marking has been devised whereby logbooks can be assessed, not only as to the quality of the observations themselves, but also as to the care and attention which has been paid to their accuracy, bearing in mind that the voluntary observing fleet comprises many types of ships, from the two-mate ship carrying

only R/T worked by a deck officer to the passenger liner carrying enough deck officers to double up each watch and with a 24-hour watch being kept in the radio room. A wide variety of trades are engaged in, from the short sea and north Atlantic run with their permanent hazards of speed, discomfort, ice and variable visibility, to the Mediterranean and Indian runs with numerous ports of call in a short time, and to the comparative peace of the long run to Australia or New Zealand. Thus, comparison between meteorological logbooks of such a diverse number of ships with such variable opportunities of observing is not easy but the yardstick for the Excellent Awards is the amount of effort and willingness to help which has gone into the compiling of the logbooks.

In the year ended the 31st March 1964 the best books were received from the following 13 ships:

1. *Cairngowan* (Cairn Line of Steam Ships), Captain J. Lobban
   Dukesgarth (Wm. Cory & Son Ltd.), Captain N. Richardson
   Dartwood (Wm. France, Fenwick & Co. Ltd.), Captain J. Elliott
2. *Cairndhu* (Cairn Line of Steam Ships), Captain G. H. Percy
   Amoria (Tanker Finance Ltd.), Captain R. F. Garrod
3. *Zena* (Glen & Co. Ltd.), Captain L. W. Loose
4. *Sussex* (Federal S.N. Co. Ltd.), Captain J. Ramsay
   Laurentia (Donaldson Line Ltd.), Captain T. S. Graham
   Explorer (Scottish Home Department), Captain E. A. Bruce, O.B.E.
   Apollo (Bristol S.N. Co. Ltd.), Captain G. V. Barnes
   Zinnia (Stag Line Ltd.), Captain W. R. Hunter
   Cannanore (P. & O.-Orient Line), Captain R. Bullock-Webster
   Crofter (T. & J. Harrison Ltd.), Captain W. E. Hinde

This is the tenth year in which we have published a 'short list' of the best observers and we must congratulate *Cairndhu* and *Sussex* on their second appearance whilst *Explorer* and *Zinnia* are appearing for the third time and *Apollo* and *Laurentia* have now appeared in no fewer than four short lists. The customary photographs of the best three ships of the year appear opposite page 141.

The year's awards are shared by ships belonging to fifty-two shipping companies and this seems to be a good measure of the uniform quality of the voluntary observing of all officers in all types of ships and in all trades.

During the year, 1010 meteorological logbooks were received from selected and supplementary ships of which 332 were assessed as 'excellent'. As the number of awards to Selected and Supplementary Ships is fixed at 100, there will thus be 232 captains, 232 deck officers and 232 radio officers who, whilst having the notation 'excellent' placed on their personal record card, may be disappointed at not finding their names in the list. On the other hand there are many names in the list which appear for the first time and undoubtedly some of these will have suffered such a disappointment in the past. This is the encouragement for those who have to wait another year.

A century ago, meteorological logbooks from ships do not seem to have been regularly assessed but in one of our oldest registers we note that during the year ending 31st March 1864, 149 meteorological logbooks were received and against 14 of these appears the word 'excellent'. It is perhaps interesting to note that a hundred years ago about 10% of books were assessed excellent, today the percentage is about 33%.

The list on pages 113 to 116 also contains, as customary, the awards which are being given to MARID ships and trawlers. The comparative quality of the unspectacular but valuable voluntary work of these ships is hard to assess, because they are not asked to keep any logbook and their opportunities of observing vary even more than do those of the selected and supplementary ships. These awards are calculated mainly on the basis of the greatest number of radio messages sent in during the year.

L. B. P.

EXCELLENT AWARDS (Year ended 31st March 1964)

Ship	Captain	Principal Observing Officer	Senior Radio Officer	Owner/Manager
Aden	I. M. Adie	P. D. Curtis	R. J. E. Chapman	P. and O. Orient Line
Afric	R. J. Welch	J. D. Allen	D. Bray	Shaw Savill and Albion Co. Ltd.
Amalric	C. Beck	A. W. Lavey	P. N. Baker	Shaw Savill and Albion Co. Ltd.
Amoria	R. F. Garrod	J. A. Marshall	E. C. Mackenzie	Tanker Finance Ltd.
Apapa	P. M. Ralston	A. G. Maxwell	G. Giling	Elder Dempster Lines
Apollo	G. V. Barnes	S. C. Church	P. Abbott*	Bristol S.N. Co. Ltd.
Araluen	H. G. Chafer	C. Shuttleworth	P. M. Dawson	Trinder Anderson and Co. Ltd.
Aramaic	B. Hammond	D. M. Cole	F. Kirk	Shaw Savill and Albion Co. Ltd.
Arthur Albright	S. J. Bristow	G. B. Goldsmith	R. Reid	James Fisher and Son Ltd.
Asphalion	J. T. Knox	J. A. C. MacGregor	T. Williamson	A. Holt and Co.
Athenic	G. Heywood	M. C. L. Wilkie	H. Knight	Shaw Savill and Albion Co. Ltd.
Ayrshire	P. MacMillan	T. M. Johns	T. Macindoe	Scottish Shire Line Ltd.
Beaverbank	W. Allarby	W. H. Martin	J. J. G. Noone	Bank Line
Benmacdhui	W. G. Watson	J. B. Lyall	W. Duguid	Ben Line
Birmingham City	W. H. Stoodley	B. M. Leek	J. C. Gear	Bristol City Line
Black Prince	E. A. Kemp	J. M. D. Smethurst	S. Marchant	Prince Line
Bristol City	J. N. Ramsay	D. G. H. Smith	T. M. Jenkins, M.B.E.	Bristol City Line
Byland Abbey	T. W. Westerdale	M. Walker	A. Stockdale*	British Railways Board
Cairndhu	G. H. Percy	P. Wallace	W. Greaves	Cairn Line
Cairngowan	J. Lobban	H. W. Robson	E. Johnson	Cairn Line
Cannanore	R. Bullock-Webster	J. S. Hanna	D. I. McLean	P. and O. Orient Line
Carmania	H. J. Law, R.D.	C. C. Walker	C. H. Pennington	Cunard Line
Catford	E. Clarke	L. Thompson	A. Corkhill	South Eastern Gas Board
Chindwara	F. A. J. Downer	B. R. Sanderson	J. Cooper	British India S.N. Co. Ltd.
Cicero	E. Tyler	R. A. Blencoe	R. A. Newton	Ellerman's Wilson Line
Cilicia	D. Barclay	D. K. G. MacArthur	S. J. D. Taylor	Anchor Line Ltd.
Clan McNab	J. G. Smith	M. C. Banbury	R. W. Moore	Clan Line
Clan Mactavish	C. A. Thomas	M. B. Whiteford	P. Entwisle	Clan Line
Cornwall	J. A. North	P. G. Davis	A. McInnes	Federal S.N. Co. Ltd.
Crinan	R. J. Buckley	T. K. Whyte	P. M. Hodgson	J. and J. Denholm Ltd.
Crofter	W. E. Hinde	H. Traynor	J. A. L. MacDonald	T. and J. Harrison Ltd.
Cumberland	S. W. Lambrick	M. J. Hann	D. R. Lake	Federal S.N. Co. Ltd.
Dartwood	J. Elliott	B. L. Bass	M. Lebbon	Wm. France, Fenwick and Co. Ltd.
Debrett	D. S. Leicester	J. J. Barrowcliff	W. Thomson	Lamport and Holt Line

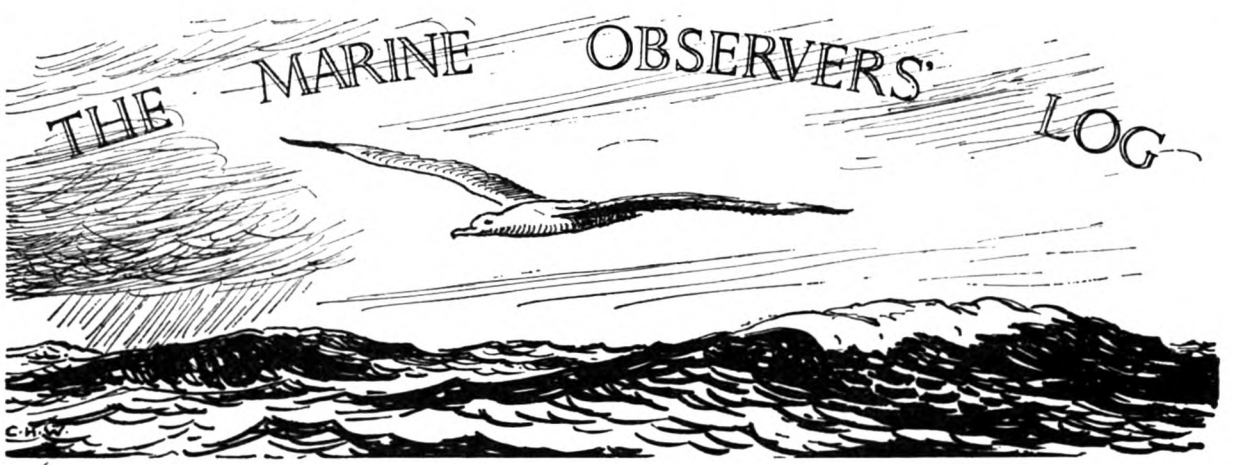
Ship	Captain	Principal Observing Officer	Senior Radio Officer	Owner/Manager
Delphic	T. de M. Ogier	D. M. Tyler	F. Sellers	Shaw Savill and Albion Co. Ltd.
Denbighshire	C. B. R. Goodman	P. D. Crouch	D. Storar	Glen Line Ltd.
Devonia	B. A. Rogers, O.B.E., D.S.C., R.D.	M. F. Davison	R. H. C. Berry	British India S.N. Co. Ltd.
Dorset	J. S. Laidlaw	A. P. I. McGuigan	A. Hirst	Federal S.N. Co. Ltd.
Dukesgarth	N. Richardson	D. V. Wood	P. A. Dunne	Wm. Cory and Son Ltd.
Durango	R. D. Jones	P. J. Smith	A. Chalmers	Royal Mail Lines
Echo	J. L. Jenkins	H. Grant	J. Corbett*	Bristol S.N. Co.
Esso Pembrokeshire	S. R. Dance	M. Birchmore	F. Devlin	Esso Petroleum Co. Ltd.
Ethel Everard	W. G. Hunt	N. J. Golding	A. Bromby*	F. T. Everard and Sons Limited
Explorer (F.R.S.)	E. A. Bruce, O.B.E.	A. A. Baxter	J. Steven	Scottish Home Department
Explorer (m.v.)	A. Sutherland	A. J. Watkins	D. Holden	T. and J. Harrison Ltd.
Farsistan	R. Connacher	W. J. S. Burr	H. A. Buck	F. C. Strick and Co. Ltd.
Glenearn	A. Millard	A. E. J. Cotes	H. F. Murray	Glen Line Ltd.
Glenfalloch	T. R. Walker	D. J. Metcalf	W. Britton	Glen Line Ltd.
Glenogle	W. J. Moore, D.S.C., R.D.	D. J. Gallagher	J. M. Watson	Glen Line Ltd.
Glenroy	I. R. Atkinson	A. M. Kirkland	—. Brunthwaite	Glen Line Ltd.
Hertford	H. C. R. Dell	A. J. Champion	S. J. Braithwaite	Federal S.N. Co. Ltd.
Hororata	C. P. Robinson	P. B. Snow	F. E. Watts	New Zealand Shipping Co. Ltd.
Huntingdon	J. D. Guyler	D. R. J. Plimsaul	D. L. Byne	Federal S.N. Co. Ltd.
Hurunui	S. W. Andrews	C. J. Roberts	M. Holdroyd	New Zealand Shipping Co. Ltd.
Iron Age	D. Brady	E. Cowell	D. Smith	Common Bros. Ltd.
Ixion	F. N. Fisher	R. S. Grono	S. R. MacQuire	A. Holt and Co.
John Biscoe	W. Johnston	R. N. Cumbers	J. A. Quinn	British Antarctic Survey
Laksa	T. W. Lawrence	R. S. Oakes	J. Taylor*	Chr. Salvesen and Co. Ltd.
Laurentia	T. S. Graham	T. Angus	D. Murray	Donaldson Line Ltd.
Lismoria	J. L. Downie	R. Muir	T. S. Service	Donaldson Line Ltd.
Malmo	L. R. Stilwell	J. B. Drinkall	G. Anderson	Ellerman's Wilson Line
Maron	A. R. Davidson	B. K. Micklam	G. T. Pearce	A. Holt and Co.
Mawana	L. E. Jeans	A. K. Lloyd	P. T. Wright	Thos. and Jno. Brocklebank Ltd.
Middlesex	R. E. Baker	P. J. Leally	R. G. Heath	Federal S.N. Co. Ltd.
Northern Star	L. H. Edmeads	I. P. Carr	C. L. Carpenter	Shaw Savill and Albion Co.
Northumberland	M. J. Heron	E. M. Smith	B. Cullimore	Federal S.N. Co. Ltd.
Otaio	F. G. Bevis	M. H. Weston	L. H. Sutton	New Zealand Shipping Co. Ltd.
Otaki	I. Y. Bateley	R. A. Laycock	C. L. Lambe	New Zealand Shipping Co. Ltd.
Pacific Envoy	A. H. Cooke	M. G. East	O. Riches	Furness, Withy and Co. Ltd.
Pegu	K. S. Marsh	J. R. Pearson	J. H. Brown	P. Henderson and Co.
Port Auckland	C. R. Townshend	A. G. Williamson	H. Horrocks	Port Line
Port Brisbane	E. E. Roswell	D. S. Hellier	S. Maguire	Port Line

Port Hobart	L. W. Cady	J. W. Fisher	J. MacDonald	Port Line
Port Launceston	E. E. Chapman	R. H. Mitchell	J. F. Halford	Port Line
Port Lincoln	V. A. Hunt	J. E. Crowsley	G. Foers	Port Line
Port Phillip	P. E. Packwood	P. M. P. Muirhead	R. Stopford	Port Line
Port Pirie	L. J. Skailes	E. C. Harrison	J. S. McPherson	Port Line
Queen of Bermuda	M. E. Musson	S. Vass	R. Stennett	Furness, Withy and Co. Ltd.
Queensland Star	R. White, D.S.C.	A. Carrier	L. Price	Blue Star Line
Regent Falcon	J. D. Pedersen	I. E. McVicar	T. B. Ellis	John I. Jacobs and Co. Ltd.
Ruahine	A. Hocken	C. S. Baugh	W. F. Shepherd	New Zealand Shipping Co. Ltd.
St. John	T. Roberts	K. B. Whitting	R. Harris	South American Saint Line
Sidonia	A. J. F. Colquhoun, M.B.E.	J. Swan	J. Gourlay	Anchor Line Ltd.
Southern Cross	L. J. Hopkins	M. G. Hairsine	D. MacRae	Shaw Savill and Albion Co.
Suffolk	H. J. D. Sladen	G. I. McL. Martin	P. Leigh	Federal S.N. Co. Ltd.
Sussex	J. Ramsay	P. H. King	D. Hinds	Federal S.N. Co. Ltd.
Sylvania	J. Crosbie Dawson	P. B. Watson	A. N. Henderson	Cunard Line
Trebartha	W. F. Denyer	J. M. F. Barnett	E. Carruthers	Hain S.S. Co. Ltd.
Trefusis	R. B. Oliver	D. P. Mitchell	I. Farren	Hain S.S. Co. Ltd.
Trelissick	W. H. Whitaker	L. E. Quigley	F. A. Tilson	Hain S.S. Co. Ltd.
Treneglos	W. Phillips	G. T. Smith	J. C. Smith	Hain S.S. Co. Ltd.
Truro	J. K. Marrow, M.B.E.	J. M. Jarratt	J. V. Hurley	Ellerman's Wilson Line
Velletia	A. R. Spearman	M. J. Hollywell	M. Alexander	Shell Tankers Ltd.
Volvatella	M. A. Neeves	V. A. Hubbert	S. J. Taylor	Shell Tankers Ltd.
Warkworth	N. Thompson, M.B.E.	C. J. McKeon	S. Cowan	R. S. Dalgliesh Ltd.
Welsh Herald	A. S. Anthony	H. P. Davies	M. A. Shinners	Welsh Ore Carriers Ltd.
Winga	R. J. McNinch	A. MacIntyre	W. C. Doyle	Glen and Co. Ltd.
York	J. W. Laverack	R. Shaw	J. Marr*	Associated Humber Lines
Zena	L. W. Loose	J. M. Bryan	M. McCormack	Glen and Co. Ltd.
Zinnia	W. R. Hunter	S. D. Hyland	J. J. O'Sullivan	Stag Line Ltd.
MARID SHIPS†				
Arnhem	F. B. Allen	J. S. Bowman	A. F. Badham	British Railways Board
Corfen	F. A. S. Martin	L. Y. Smith	A. Millard	Wm. Cory and Son, Ltd.
Munster	J. Williams	W. G. McDonogh	J. Reader	British and Irish Steam Packet Co. Ltd.
Scotia	A. M. Finlayson	J. McBride	W. Laws**	Dept. of Agric. & Fisheries for Scotland

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

TRAWLERS

Skipper	Wireless Operator	Ship	Owner
P. E. Craven	D. L. Verity	*St. Matthew*	North Cape Fishing Co. Ltd.
G. Whur	A. Ramsay	*Stella Orion*	Hudson Bros. Trawlers, Ltd.
P. D. Abbey	—	*St. Amant* ..	Firth Steam Trawling Co. Ltd.
C. A. Nielsen	—	*Kingston Sardius*	Kingston Steam Trawling Co. Ltd.
—	J. H. Large	*St. Amant*	Firth Steam Trawling Co. Ltd.
		St. Giles ..	T. Hamling & Co. Ltd.
—	S. Waterman	*Stella Aquila*	Hudson Bros. Trawlers Ltd.
		D. B. Finn	St. Andrew's Steam Fishing Co. Ltd.



July, August, September

HURRICANE FLORA

Caribbean Sea

m.v. *Hauraki*. Captain E. F. H. Allen. Willemstad to London. Observer, Mr. A. R. Pope, 3rd Officer.

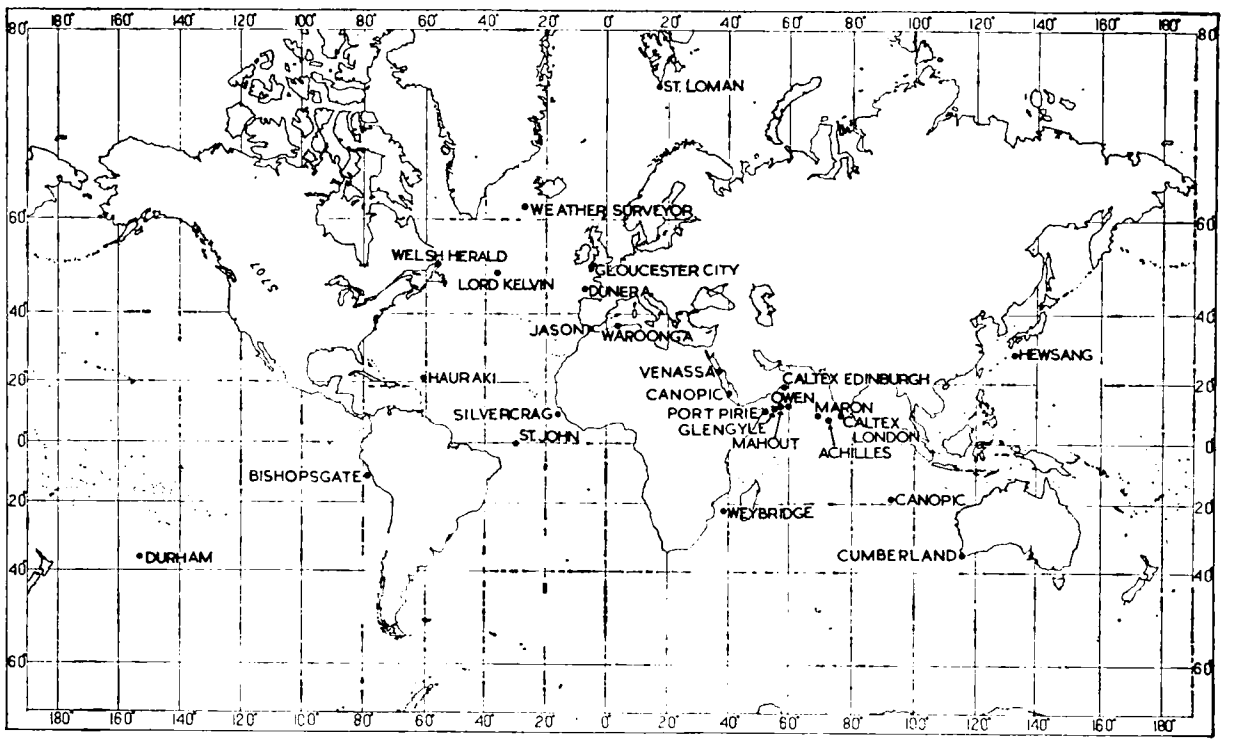
30th September 1963. Prior to our departure from Willemstad, Curaçao, warnings of a hurricane were received, the position of which at 1400 GMT was given as 10° 50′N, 59° 45′W. It was approx. 550 miles from Curaçao, and moving WNW at 15 kt., with winds of 110 kt. at its centre.

At 1600 GMT *Hauraki* was clear of Willemstad and heading on course to Sombrero Island when *Flora* was reported over the eastern end of Tobago Island, moving in the same direction as before, but now at 19 kt. Weather at *Hauraki*: Wind NE′E, force 3. Air temp. 88°F, sea 88°. Weather fair. Visibility excellent. Bar. 1014·2 mb., falling.

1st October. By 2030 GMT *Hauraki* (13° 47′N, 67° 21′W) was in the direct path of the hurricane some 300 miles from its centre (11° 50′N, 62° 25′W). Weather at the ship: Wind NE, force 3. Air temp. 84°, sea 84°. Cloudy with slight shower. Visibility excellent. Bar. 1014·5 mb., falling. During the previous two hours several small squalls had been passed and lightning seen to the E and SE. There was a low NE'ly swell. The hurricane was still moving WNW, and at 17 kt.

At 1000/2, *Hauraki* was in 15° 05′N, 66° 20′W and *Flora* in 12° 24′N, 64° 12′W, moving in the same direction, now at 13 kt. This was the nearest approach of the storm to the ship, approx. 200 miles. Around this time the vessel passed through three violent squalls, lasting in all three hours, with winds of up to force 8 and heavy rain. Lightning was also seen. After the first of the squalls, the wind became force 6 and remained so, blowing from the NE. There was no further precipitation but the sky remained overcast. Air temp. 81°, sea 85°. Bar. 1011·0 mb., rising. Sea very rough, with moderate swell from the E.

2000 GMT. All traces of the storm had been left astern. Air temp. 84°, sea 88°. Bar 1010·4, rising. Wind E, force 3. Low easterly swell.



Positions of ships whose reports appear in "The Marine Observers' Log".

During the time of the observations, pressure had varied between 1010·0 and 1014·5 mb., with no rapid changes. Air and sea temperature changes were gradual and the dew point was around 76°–78°. The main cloud types were C_L2 and C_L8.

Had the hurricane shown any signs of recurving it might have been necessary for the ship to have altered course for safety, even to the extent of returning towards Curaçao.

Position of ship at 1800: 21° 18′N, 61° 12′W.

Note 1. Dr. Robert M. White, Chief of the United States Weather Bureau, comments:

All of the weather messages originated by the *Hauraki* were received promptly and because of their accuracy were of much value to our forecasters in preparing and issuing advice on this storm. You may be interested in learning that we also received on the same dates, special weather observation messages from other ships of British registry as follows:

30th September	*Clymene*
1st October	*Factor*
	Finnamore Valley
	British Lantern
	Stonegate
2nd October	*Stonegate*

The Weather Bureau is very grateful for the excellent co-operation of all of these ships because of the importance of the reports in tracking and issuing warnings on this hurricane during its early history. I shall appreciate it if you will extend to the Masters of the *Hauraki* and all other ships mentioned above my sincere thanks for their valuable assistance on this occasion.

Note 2. Dr. White also sent us a summary of Hurricane *Flora* which forms the basis of the article on page 134.

CLOUD OF SAND

Red Sea

m.v. *Canopic*. Captain T. H. Davies. Aden to Port Said. Observers, Mr. P. Morgan, 3rd Officer, Mr. J. Wilson, Radio Operator and Cadet N. Cook.

16th July 1963. At 1800 GMT when the vessel was proceeding northwards up the Red Sea, a cloud of sand formed from the surface up to a height of about 150 ft. Visibility which had been very good decreased rapidly until 1930 when it was approx. 4½ miles; there was no improvement until 2030 when the cloud of sand

slowly began to dissipate and visibility began to pick up, reaching 10 miles by midnight. Heavy dew began to be deposited around 2300, as the atmosphere cleared. Next morning a film of very fine sandy-yellow dust was seen on exposed surfaces of the ship. At 1800: Air temp. 90·2°F, sea 90·5°. Wind variable, force 1.

Position of ship: 17° 00'N, 40° 37'E.

Note. m.v. *Canopic* experienced a sand storm associated with the northward movement of moist southern hemisphere air associated with the northward movement of the Sudan rainy season. The sand storm is of the haboob type. Strong vertical currents probably extending above 15,000 feet raised the sand and carried it aloft over the sea.

HIGH ELECTRIC STATIC CHARGE

South Pacific Ocean

m.v. *Durham.* Captain R. G. Hollingdale. Wellington to Balboa. Observer, Mr. P. Newman, Chief Radio Officer.

28th July 1963. At 0030 GMT the vessel passed under the edge of a squall cloud carrying a very high electric charge, shown by the fact that as the radio aerials were earthed large arcs occurred. The aerials continued to receive the charge for 20 min. and medium frequency reception was blotted out by static in the form of a loud hiss during this period; high frequency reception was not affected. Air temp. 60°F, wet bulb 55°, sea 58°. Wind NW force 5.

Position of ship: 35° 58'S, 153° 28'W.

Note. m.v. *Durham* appears to have experienced the results of a cold air intrusion from the south and the development of an area of storminess. The location of this occurrence is adjacent to that part of the Pacific (north-west of New Zealand) that experiences tropical storms.

CURRENT RIP

Equatorial Atlantic Ocean

m.v. *St. John.* Captain T. Roberts. Bahia (Salvador) to Las Palmas. Observer, Mr. K. B. Whitting, 3rd Officer.

29th August 1963. At 1630 GMT, the vessel passed across a 500 ft. wide band of agitated water which was darker than the smooth surrounding sea. It stretched from E to W as far as the eye could see. There were white breaking waves all along both edges of the band of disturbed water. The sea temp. was taken and found to be 76°F, as compared with 82° at noon and 81° at 1800. Wind ESE, force 3.

Position of ship: 0° 06'S, 30° 48'W.

Note. This observation was forwarded to Dr. L. H. N. Cooper of the Marine Biological Association of the United Kingdom at Plymouth who sought the opinion of Mr. William G. Metcalf of the Woods Hole Oceanographic Institution, Massachusetts, who had recently been working in the area. Mr. Metcalf comments:

"I have been studying the current system in the equatorial region and am delighted to learn of the very interesting phenomenon described so well.

In the location described, the Equatorial Undercurrent is now known to flow strongly to the east just below the sea surface. The temperatures measured before and after crossing the area of agitation (82°F and 81° respectively) are normal surface temperatures for the region. The 76° temperature measured in the turbulent strip is typical of water generally found at about 35 fathoms in this area. At that depth and temperature, the salinity can be expected to be more than a half of a part per thousand greater than is generally found at the surface. Correspondingly, the density, which increases with a temperature drop and a salinity rise, would be markedly greater than the usual surface density.

It has been my feeling that in the usual case, the surface layer which normally has a westerly drift in this area, will frequently slow down during periods of calm and even move to the east through frictional coupling with the swift flowing undercurrent.

However, in this instance we seem to have a much more violent and spectacular manifestation of the undercurrent whereby the surface layer is actually thrust aside and the undercurrent itself has reached the surface. The magnitude of the turbulent forces required to maintain this phenomenon is difficult to estimate, but it is very impressive that these forces are

apparently able to thrust heavy water up through the light surface layer and maintain this condition along a narrow strip extending from horizon to horizon. It is not surprising that the sea surface in the strip was considerably agitated in view of the powerful force which must have been at work.

I wish to thank Captain Roberts for the clear description of his interesting experience, and Dr. Cooper for calling the matter to my attention."

Barents Sea

s.t. *St. Loman.* Skipper J. E. Dobson.

11th August, 1963. When the vessel was steaming on a 300° course at 14 kt., I suddenly noticed alternate lanes of violently rippled and glassy smooth water. Each lane was about 100 ft. wide and lying in a straight line in a N–S direction as far as the eye could see. In the rippled lanes the small wavelets were moving in all directions and there were numerous 'white horses', giving the appearance of a confused sea. The colour was darker in the disturbed water than in the glassy lanes.

Our position on entering these rips was 76° 15′N, 16° 55′E; we left them in 76° 21′N, 16° 10′E. Outside these positions the sea was normal for a force 2 wind. The radar was distinctly showing blank areas and lanes of clutter on the three-mile range.

Position of ship: South of Spitzbergen.

Note. Dr. A. J. Lee of the Fisheries Laboratory at Lowestoft comments:

"In the Spitzbergen area the water column in summer is often stratified with a shallow layer of cold water of low salinity resting on warm water of much higher salinity. The water temperature measured by Skipper Dobson shows that he was in cold surface water. At the boundary between such water masses of different densities undulating swells known as 'internal waves' occur. These 'waves' create zones with a convergent water circulation at the sea surface and hence a concentration of the surface film in bands parallel to the 'waves'. Under certain conditions of wind and lighting and provided that sufficient organic matter is present in the water, these bands show up as glassy streaks of calm surface water alternating with bands of ruffled water with wavelets."

Australian Waters

m.v. *Cumberland.* Captain S. W. Lambrick. Auckland to Aden. Observers, the Master, Mr. M. J. Mann, 3rd Officer and Mr. S. J. Dobell, Junior 3rd Officer.

25th August 1963. At 0040 GMT, when the vessel was 55 miles SE′S of Cape Leeuwin a strong current rip was encountered, lying along a N–S line. The vessel was deflected 6° to starboard on crossing the rip and the temperature of the sea rose from 59·2°F to 62·8°. The eastern side of the rip was marked by a short choppy sea, whilst the west was quite smooth. Wind SSW, force 3. Swell from SW, 6–7 ft. high.

Position of ship: 35° 09′S, 115° 43′E.

Note. This rip appears to have been associated with the south flowing current close to the Western Australian coast. It appears to have occurred where this current converges with the east going Southern Ocean Current. The choppy and rough eastern edge of the rip was probably due to rapid changes in current direction and speed below the surface.

TIDE RIP OBSERVED ON PPI

Straits of Gibraltar

s.s. *Jason.* Captain E. W. Studley. Malta to Dunkirk. Observers, Mr. J. G. Thorburn, 2nd Officer and Cadet R. A. D. Wright.

8th August 1963. On approaching the straits of Gibraltar at 2315 GMT, in a position with Europa Point Light bearing 295° × 3·6 miles, a line lying 298°–118° was observed right ahead on the radar PPI at 2315 GMT. This line proved to be the tide rip as the vessel sheered violently to port and starboard of the course. The wind was almost calm and the sea smooth. No change occurred in the sea temperature.

Position of ship at 0000: 36° 00′N, 5° 24′W.

Note. Captain F. J. Wylie, Director of the Radio Advisory Service, comments:

"This is the third report of tide rips observed by radar in this area. R.A.S. circular, RDR30

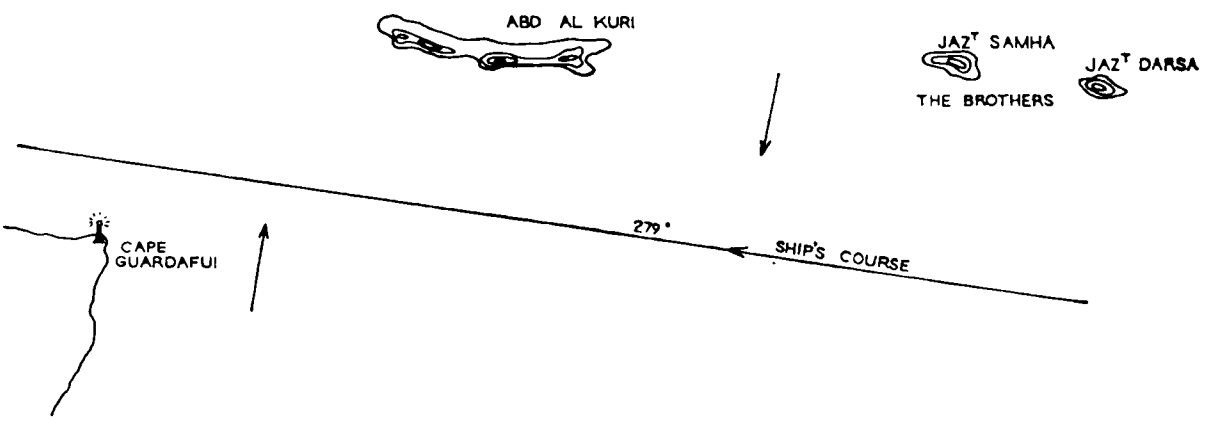
(1st December 1961), contains a summary which includes reference to this phenomenon east of Gibraltar."

SET AND DRIFT

The Brothers to Cape Guardafui

m.v. *Glengyle.* Captain J. Edmonds. Trincomalee to Aden. Observer, Mr. N. G. Simpson, 3rd Officer.

24th September 1963. As the vessel passed abeam of Jazt Samha, about 0500 GMT, a SW'ly set was experienced which put her 2 miles to the south of her course in one hour. Course was altered to counteract the set, but it was found as the ship came abeam of Abd-al-Kuri the set was lost, and she again maintained her course.



Clearing the western end of Abd-al-Kuri, a NE'ly set was experienced carrying the vessel 2½ miles to the north of her course line in 30 min. Wind at this time had increased to force 5 from SSW. Course was altered 8° to port to counteract the set but it was not until the vessel had passed into the lee of Cape Guardafui that the change had any effect in bringing the vessel back to her course line of 279°.

At 1030 GMT a pronounced current rip was encountered in 12° 09'N, 51° 00'E which caused the vessel to swing about 10° to either side of her course.

Position of ship: off Cape Guardafui.

Note. This complex series of observations is associated with the passage of cold up-welled water from off East Africa south of Socotra towards the N and NE into the North Arabian Sea. The south-westerly set and the current rip are associated with the complex phenomena of up-welling. Rapid changes of sea surface temperature and direction of current flow at and below the surface are not unusual in this area.

FALL OF SEA TEMPERATURE

Vicinity of Cape Guardafui

m.v. *Port Pirie.* Captain L. J. Skailes. Aden to Sydney. Observers, the Master and Mr. R. E. D. Clifford, Junior 3rd Officer.

26th July 1963. While the vessel was passing Cape Guardafui at a distance of 1·7 miles at 2150 GMT, the sea temperature was found to be 84·7°F, 3·1° lower than at 1800. At 2300 the reading was 78·2° and at 0000 on the 27th it was down to 68·9°. By 0600 the sea temp. had risen again, the value then being 78·7°. The wind at 1800 was light and variable, but by midnight it was S'E, force 7.

Position of ship at 0000 on 27th: 11° 06'N, 52° 12'E.

Note. The changes in sea temperature observed by m.v. *Port Pirie* are related to the phenomena reported above by m.v. *Glengyle.*

DISCOLOURED WATER

Arabian Sea

s.s. *Caltex Edinburgh.* Captain E. C. Adams. Flushing to Bahrein. Observer, Mr. J. Brewster, 2nd Officer.

12th July 1963. At 1038 GMT, the sea around the ship within the range of vision was seen to have changed colour to a dark maroon, having formerly been the normal blue colour. The discoloration was in wide streaks running in the same direction as the wind, namely 200°–020°, but there were patches roughly circular in shape and about 500 ft. across, scattered among the streaks. After steaming for 6 min. at 16 kt. the vessel passed out of the area of discoloured water. Sea temp. 70°F. Wind SSW, force 5.

Position of ship: 18° 06′N, 57° 11′E.

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

"Most probably a bloom of dinoflagellates such as *Goniaulax sp. Discovery* made detailed observations on a similar occurrence about 100 miles SSW from this position on 3rd August 1963 and this was definitely due to *Goniaulax*, but of course many other micro-organisms can give a similar visual effect."

EXCESSIVE RADAR CLUTTER

Bay of Biscay

m.v. *Dunera.* Captain R. Baker. Lisbon to Cardiff. Observers, the Master, Staff Captain P. Mills, Mr. R. Beeder, Extra 3rd Officer.

22nd August 1963. At about 2100 GMT when the vessel was in the northern part of the Bay of Biscay an excessive amount of clutter was observed on the radar screen (10-mile range) at about 5 miles on the port bow. It was almost circular in shape and appeared as small dots, resembling a large group of small fishing vessels. It passed over the vessel and a short while afterwards a similar echo which also passed over was seen on the starboard bow. There were periods of drizzle with poor visibility, and also fog banks which varied in direction between NW and NE: these were observed both before and after the time of the observations. Neither the drizzle nor the waves appeared to be the cause of the echoes. Decca readings, Chain 1:— Red H 4·7. Green D 41·4. Air temperature 57°F. Sea 62°. Wind light and variable.

Position of ship: 46° 18′N, 7° 54′W.

DEEP SCATTERING LAYER

North Atlantic Ocean

c.s. *Lord Kelvin.* Captain S. J. S. Moore. Stopped for cable repairs. Observer, Mr. P. Petrovitch, 2nd Officer.

12th August 1963. During the night a false sounding was visible on the trace a few fm. below the surface. And with the sounding machine operating continuously for three days, it was noticed that every morning after sunrise the depth of the false sounding would start to increase to a maximum of 200 fm., and then in the late afternoon it would slowly start to shoal to within a few fm. of the surface again.

The true depth was recorded on the trace as 2,400 fm., and the quality of the echo of the false sounding was much weaker than the true sounding at 2,400 fm.

During this three-day period, many jelly fish were seen, and also many schools of Pilot Whales and dolphins at different times. Sea temperature 12·8°C–15·9°C.

Position of ship: 50° 00′N, 36° 30′W.

Note 1. Dr. A. S. Laughton of the National Institute of Oceanography comments:

"The false echo obtained by the *Lord Kelvin* is a phenomenon now known to be world-wide and is called the Deep Scattering Layer. It was first observed during the war while searching for submarines by Asdic and has since been the subject of extensive research by oceanographers and marine biologists. The characteristic rise and fall of the layer at dusk and dawn indicates that it is biological and many types of organism from fish to plankton have been suggested. The vertical migration is due to their desire to seek a layer in which the ambient light is always the same.

Detailed studies of the scattering layer by high resolution echo-sounders show it to consist of many layers, some of which follow the light and others which do not. Furthermore, the echoes are sometimes diffuse as from millions of small organisms and sometimes discrete as from shoals or individual fish.

The fact that this phenomenon was observed on the *Lord Kelvin* is undoubtedly due to the fact that the echo-sounder was on a phase which could observe both the deep bottom echo at 2,400 fm. as well as the shallow echoes of the scattering layer. I suspect the echo-sounder was such that one revolution of the stylus was equivalent to 2,250 fm., so that echoes from the range 0–400 fm. were superimposed on those from 2,250–2,650 fm.

In the new generation of precision echo-sounders in which the scattering layer can be seen on any phase, it will be seen that this layer is present almost everywhere in the oceans."

Note 2. C.S. *Lord Kelvin* is a voluntary observing ship on the Canadian fleet list.

PHOSPHORESCENCE

Bristol Channel

s.s. *Gloucester City*. Captain E. Irish. Swansea to New York. Observers, Mr. A. Johannsen, 2nd Officer and Mr. R. E. Adamson, 3rd Officer.

23rd August 1963. On the night of the 23rd, shortly after leaving Swansea, while on passage between the Helwick and St. Gowan Light-vessels, the sea became extremely phosphorescent. The wind was SW, force 8, in opposition to an ebb tide, causing a rough, breaking sea which emphasised the phosphorescence. A distinct glow was seen to windward over approx. 90° of arc; it disappeared abruptly when the St. Gowan L.V. was abeam to starboard at a distance of 4·3 miles. Sea temperature 57°F. 8/8 low stratus.

Position of ship: 51° 25′N, 5° 00′W.

Indian Ocean

m.v. *Achilles*. Captain R. G. Boyd. Aden to Singapore.

10th September 1963. We had just passed Minicoy Light at 1500 GMT when we were called up by the *City of Peterborough*. Both ships were using Aldis lamps and as each letter was flashed the rays of light which touched the surface of the sea gave rise to phosphorescence. After the exchange of messages was completed, we found that it was possible to cause phosphorescence anywhere one wished, just by directing the Aldis light on the water. This appeared to confirm the theory we had advanced, that the phosphorescence seen the previous night had been caused by the vessel's deck light shining on the sea surface. Sea temp. 84°F. Wind W'ly, force 3. Slight sea; low swell.

Position of ship: 8° 03′N, 73° 05′E.

Arabian Sea

H.M.S. *Owen*. Commander D. W. Haslam, R.N. The Seychelles to Karachi.

23rd April 1963. From 1730 GMT, onwards, considerable phosphorescence was seen around the ship. Occasional brilliant spots of light observed up to 200 yd. ahead of the vessel seemed to burst over the surface of the sea giving the impression of full moon illumination, and then dying down. The apparent speed of travel of the bursts of light was in the region of 80 kt., based upon the approx. time, 4–5 sec., taken for the burst to reach the ship. When the Aldis lamp was flashed over the sea, an afterglow was left on the surface which persisted for up to 5 sec. Reddish spots of light appeared to be darting around on the surface of the water in the light of the Aldis. These phenomena lasted for about half an hour but general phosphorescence was in evidence throughout the hours of darkness. There was no sign of any phosphorescence in a water sample obtained at the condenser intakes at 1900. Sea temp. 85°F. No moon. Good visibility. Wind E'N, force 2. Sea calm. No appreciable swell.

Position of ship: 11° 48′N, 59° 24′E.

Indian Ocean

m.v. *Maron*. Captain A. R. Davidson. Aden to Singapore. Observer, Mr. B. K. Micklam, 3rd Officer.

10th August 1963. At 1730 GMT, for about 10 min. patches of luminosity were observed passing the ship. First, usually just forward of the bridge, the sea would

appear to sparkle as if there were lights immediately beneath the surface of the water. Then as the patch passed aft into the illumination shed from the accommodation, the sparkling effect would increase and suddenly diffuse over about twice the original area, the individual lights going out and leaving a greenish white glow. As the ship drew ahead the glow faded. The largest patches were about 25 ft. across and were visible well clear of the ship's wash. All this was seen on the weather side. There was no moon. Sea temp. 83°F. Wind WSW, force 5.

Position of ship: 9° 18′N, 68° 54′E.

Note. Dr. R. H. Kay of the University Laboratory of Physiology, Oxford, comments:

"The observations from *Achilles*, *Owen*, and *Maron* are all concerned with the influence of ambient light on marine bioluminescence.

In laboratory experiments, light is most often found to inhibit the glowing of luminescent creatures, though *Pyrosoma* is an exception and also, at high light intensities, *Meganyctiphanes Norvegica* is unusual in being stimulated into glowing by light about one minute after switching the light *off*. But at low light intensities this animal's glow is also reduced when ambient light is present.

It would be interesting to have more observations like those above and also to determine whether a dark sea can be made to glow when light is directed upon it, and whether light can make a glowing sea dark again and with what delay. Can, for instance, a bright light focused on a luminescent sea from a moving ship leave a 'wake' of darkness behind its area of contact and if so, for how long?"

off S.W. India

s.s. *Caltex London*. Captain D. Stokoe. Bombay to Bahrein. Observer, Mr. D. J. Read, 2nd Officer.

30th July 1963. At 0300 SMT (2130 GMT/29th) when the wind was W, force 6–7, an almost continuous milky glow was seen right to the horizon, due to phosphorescence in the breaking waves and also in the blown spray. It persisted for about half an hour until the wind decreased to force 4, but some phosphorescence was still visible in the bow wave and wake and in occasional wave crests. The night was dark with continuous moderate rain. Sea temperature 80°F. Depth of water 11–12 fm.

Position of ship: 9° 12′N, 76° 24′E.

Mozambique Channel

m.v. *Weybridge*. Captain E. A. Peirce. Port Louis (Mauritius) to Beira (Mozambique). Observers, Mr. M. W. England, Chief Officer and Mr. J. Coleman, 3rd Officer.

17th September. While lying stopped, at 1800 GMT, the night being dark with no moon, small flashes of brilliant coloured lights appeared on the sea, moving towards the ship; they resembled flashing buoys seen at a distance. One suddenly 'popped up' alongside and we shone the Aldis lamp on the water to see what was happening. A shoal of fish was seen, similar to garfish (approx. 18 to 24 in. in length). The lights seemed to be coming from the top of the fishes' heads, and were bright red, green and white, the main colours being red and white. As the fish swam into the pool of light made by the Aldis lamp, the colours remained visible until they went down below the surface. It was noticed that when two, or more, fish came together, the light given off by each was extinguished. While on the surface, the lights from the fish remained steady and of one colour, but they disappeared when the fish submerged, thus accounting for the flashing action. Wind light and variable. Sea rippled with slight swell.

Position of ship: 22° 18′S, 38° 55′E.

PORPOISES

off Sierra Leone

m.v. *Silvercrag*. Captain D. G. Roberts. Monrovia to Birkenhead. Observer, Mr. J. M. Gower, 2nd Officer.

26th July 1963. At approx. 1000 GMT the vessel was approached by numerous

porpoises, whose antics were watched for some time from the bridge. My interest was so aroused that I went forward to observe them from the fo'c'sle head. About 30 or 40 were moving with the vessel immediately below me and I noticed that about 50 per cent of these, usually the larger ones, had something attached to their sides. As the porpoises leapt high out of the water just ahead of the vessel, I could see clearly the nature of these attachments. They were fish, apparently of the 'sucker' variety and very similar in looks to catfish, having large, wide bony-looking heads, and coloured a distinctive silver-white. They varied in size from about 9 in. to 18 in. in length, though this was rather difficult to judge with accuracy. The majority were of the larger sizes and all wriggled and flopped vigorously about as the porpoises hurled themselves clear of the water. Perhaps the most noteworthy feature, however, was the identical position of attachment on each animal. This was just below the darker top-half of the body, at the side of the belly about two-thirds of the way down from the head. Some porpoises carried only one fish but a good many had two, one on each side.

Upon questioning around, I found that nobody had seen such an occurrence before and could offer no explanation. There was, however, some argument as to whether they were porpoises or dolphins—no one quite knowing the difference. The larger of the animals were from 5 to 7 ft. long, the smaller 3 or 4 ft. They were grey-green on top and creamy-white below, with the characteristic snout nose and blow hole about 1–2 in. in diameter at the rear end of the head, through which their snorting was clearly heard. The vessel's speed was 12 kt. and they had no difficulty in keeping pace and frequently shot ahead at great speed.

It has been suggested that since the dolphins are mammals they might perhaps have been suckling their young. Sea temp. 82°F.

Position of ship: 9° 30'N, 16° 20'W.

Note. This observation was referred to Dr. F. C. Fraser, Keeper of Zoology at the Natural History Museum, whose comment was as follows:

"I referred your letter to Dr. P. H. Greenwood in the Fish Section and he indicates that from the general description he thinks that these animals were definitely *Remora*. In the *Journal of Mammology*, Nov. 1963, p. 587, there is an observation about *Remora* being frequently attached to swimming dolphins. Incidentally, Dr. Greenwood says that the earliest reference seems to be by Aristotle, who called the fishes Dolphin Lice.

I do not think there is any substance in the suggestion that the sucker fish were connected with the fact that Dolphins suckle their young. The mammary glands in cetaceans are low down on the ventral surface of the body and not on the side, which is the position that the sucker fish were described as being attached."

FLYING FISH

Arabian Sea

m.v. *Mahout*. Captain J. B. Newman. Aden to Calcutta.

7th August 1963. In the afternoon, local time, a flying fish was observed passing over the vessel at bridge height (56 ft.) apparently under control. Wind SSW, force 5–6. Sea waves 3 ft. high. Swell 9–10 ft.

Position of ship at 1200 GMT: 12° 00'N, 57° 36'E.

Note. Dr. P. H. Greenwood of the Natural History Museum comments:

"I have checked what reports there are for the height to which flying fish may ascend under calm conditions and I can find no record greater than about 20 feet. However, it seems possible to me that if the weather was at all rough and the ship was in the trough of a wave, then a flying fish suddenly shooting out from the crest of a wave might succeed in passing over the vessel at bridge height. My own experience of flying fish is that they are rarely active, airily, in moderately rough weather.

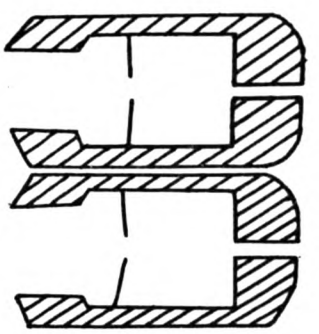
The other possibility may be connected with the aerodynamics of the *Mahout*. If she creates an updraught of some force she could perhaps give a flying fish a lift and carry it over at the height mentioned. I should not like to hazard a guess as to whether under these conditions the fish would be under control."

ABNORMAL REFRACTION

off Cape Bengut, Algeria

s.s. *Waroonga.* Captain H. R. Smith. U.K. to Australia. Observer, Mr. G. R. Davidson, 2nd Officer.

10th July 1963. At 0500 GMT a coaster, on the horizon, appeared inverted twice due to abnormal refraction, as shown in the accompanying sketch. During the night,



lights along the Algerian Coast had been seen at much greater distance than usual. The sea was flat calm, and there was no wind. Air temp. 80°F, sea 76°. 1/8 $C_{M}4$.

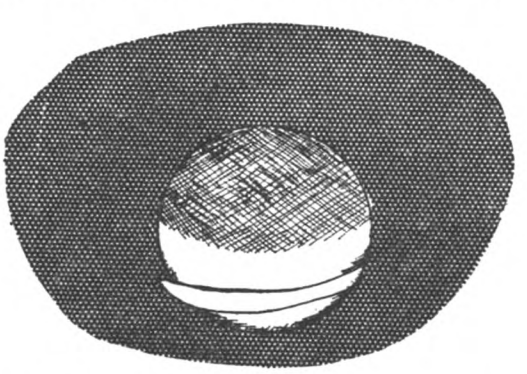
Position of ship: 37° 00′N, 3° 36′E.

Note. This case of abnormal refraction was probably due to the cool sea and also to rapid horizontal changes in sea temperature.

Red Sea

s.s. *Venassa.* Captain D. I. P. Jones. Hamburg to Kharg Island. Observer, Mr. R. G. Brown, 2nd Officer.

16th August 1963. At 0100 GMT when the moon bore 070° at an altitude of 8½°, the two refracted images, shown in the accompanying sketch, were observed. Con-



ditions at 0000: Air temp. 86°F, wet bulb 80°, sea 87°. Calm and cloudless. Visibility very good.

Position of ship: 24° 22′N, 36° 04′E.

Note. This phenomenon is caused by abnormal temperature or humidity variations over a deep layer of the atmosphere.

FOG BOW

Belle Isle Strait

m.v. *Welsh Herald.* Captain A. S. Anthony. Newport to Seven Islands. Observers, the Master, Mr. H. P. Davies, 3rd Officer and Mr. M. A. Shinners, Radio Officer.

22nd July 1963. At 1240 GMT the vessel was proceeding through thick fog, the top of which was estimated to be at about 70 ft. above the sea. The sun penetrated the fog and a faint fog bow could be seen on the starboard side; it showed no colour. Later, at 1250 a fog bow was observed which had on the outside a reddish-yellow

colour, and on the inside a blue-white tinge. The fog thinned out and by 1400 the bow could no longer be seen. Air temperature 47·6°F, sea 46·9°.

Position of ship: 51° 55′N, 55° 40′W.

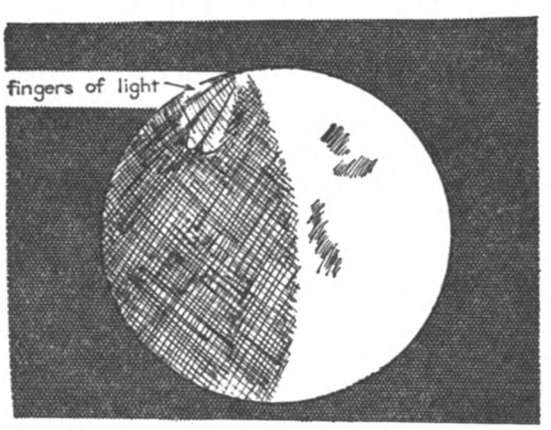
Note. The second bow described was a perfect example of a fog bow but the first bow was incomplete. The production of such a phenomena requires the particle size of the fog to be of the same order as the wave length of light.

PARTIAL LUNAR ECLIPSE

Indian Ocean

m.v. *Canopic*. Captain T. H. Davies. Sydney to Aden. Observers, Mr. K. Newton, 2nd Officer and Mr. R. Pedlow, Jnr. 3rd Officer.

6th July 1963. Between 2035 and 2300 GMT a partial eclipse of the moon was observed. At maximum eclipse when three-quarters of the moon was in shadow, its surface still remained visible, and fingers of light were seen illuminating the



upper section which was in shadow, the appearance being shown in the accompanying sketch.

Only limited observation was possible due to the presence of 7/8–8/8 Sc. The end of the eclipse was not observed due to the sky becoming overcast.

Position of ship: 18° 40′S, 92° 33′E.

Note. Mr. H. B. Ridley of the British Astronomical Association comments:

"I think that the explanation of the 'fingers of light' mentioned in the text and shown in the drawing is fairly straightforward. The earth's atmosphere refracts light from the sun into the shadow-cone, so that a lunar eclipse, although total, is not complete; the moon is still quite plainly visible even when wholly immersed in the earth's shadow. The atmosphere scatters blue light (hence the colour of the sky) but transmits red: therefore the faintly visible eclipsed moon has a coppery hue, though this does not normally appear until the whole disc is immersed. The 'continental' areas of the moon are much brighter than the flatter, darker maria or 'seas', and show up very plainly during eclipse.

It is fairly evident that what the observer saw in this case was the comparatively bright north polar region, partially illuminated even though it was in the earth's shadow.

Although there is nothing exceptional about this observation, the officer concerned was quite justified in remarking on the phenomenon, which might have escaped the notice of a more casual observer."

RAFT UNDER SAIL

Peruvian waters

m.v. *Bishopsgate*. Captain P. Hopkins. San Nicolas to Panama.

6th July 1963. At 1500 GMT passed raft under sail heading NW'ly. It appeared to be almost circular in shape and made of wood. The mast and bowsprit were of tubular steel and the large square sail carried the legend *Age Unlimited*. The raft flew the U.S.A. flag and one person was seen on deck. There must be easier ways of 'getting away from it all'!

Position of ship: 11° 30′S, 78° 20′W.

Note. The arrival of this raft at Faluela, near Apia, in Western Samoa was reported on 12th

November 1963. The person mentioned in the ship's narrative was a 70-year-old U.S. citizen Mr. William Willis who was accompanied only by two cats. The drift was of some 7,540 miles and occupied 130 days. *Age Unlimited* was a raft 32 × 20 ft. rigged with three steel pontoons. She sailed from Callao equipped with rudders but these broke up about 500 miles out.

In 1954 Mr. Willis had made a drift of 6,700 miles from Peru to Samoa in 115 days on a balsa raft.

Both these drifts were, it will doubtless be noticed, on the same lines as those of the Kon-Tiki expedition of 1947.

RADIO FADE-OUT

North Pacific Ocean

s.s. *Hewsang*. Captain T. H. Nicols. Wallace Bay to Tokyo. Observers, Mr. A. M. Bailey, Radio Operator and Mr. P. R. Hammond 2nd Officer.

15th September 1963. Between 0025 and 0105 GMT a complete fade-out of all signals was experienced on frequencies of 4, 6, 8, 12 and 16 Mc/s. but transmissions on the lower wavebands remained as normal. Weak signals, strength 1 to 2, re-appeared on the 12 and 16 Mc/s band at 0105 GMT and by 0200 GMT signals of similar strength reappeared on the lower bands, i.e. 4, 6 and 8 Mc/s. By 0400 GMT reception was back to full strength on all bands.

Position of ship: 22° 16′N, 132° 13′E.

Note 1. s.s. *Hewsang* is a Commonwealth Selected Ship

Note 2. Mr. G. O. Evans of the G.P.O. Radio branch comments:

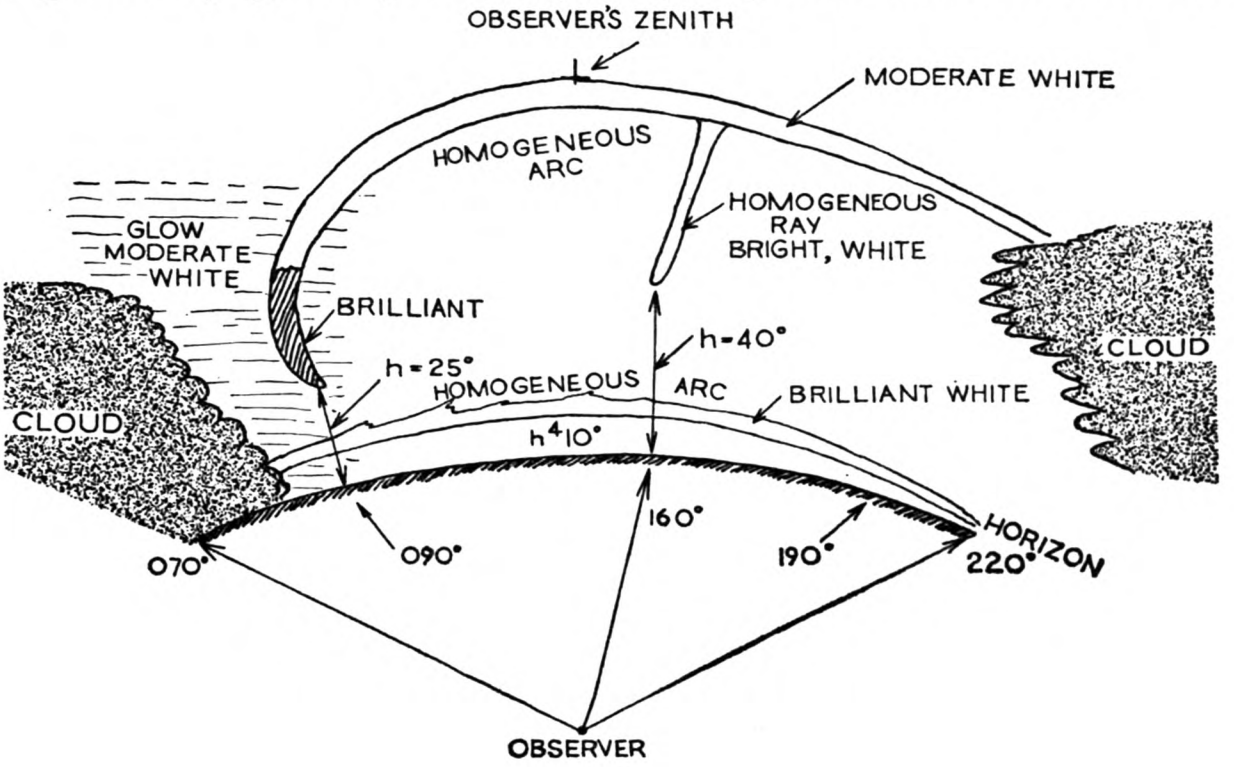
"The complete radio fade-out reported on 15th September coincided with a Dellinger type fade-out which blacked out all incoming transmissions to Hong Kong between 0025 and 0200 GMT. The fade-out was probably associated with a large sun spot that was visible on the sun's disc between 10th and 22nd September. It is unusual for this type of ionospheric disturbance to be in evidence at such a late stage in the declining phase of the sun spot cycle."

AURORA

North Atlantic Ocean

o.w.s. *Weather Surveyor*. On Station Alpha. Observer, Mr. J. Lack.

20th September 1963. At 2345 GMT an aurora display was observed in the southern sky. A brilliant arc low on the horizon was observed first and also the ray shown in the sketch. While the dimensions were being noted, the higher arc shown in the diagram slowly appeared (over about 5 mins.) being first noted at the zenith at the

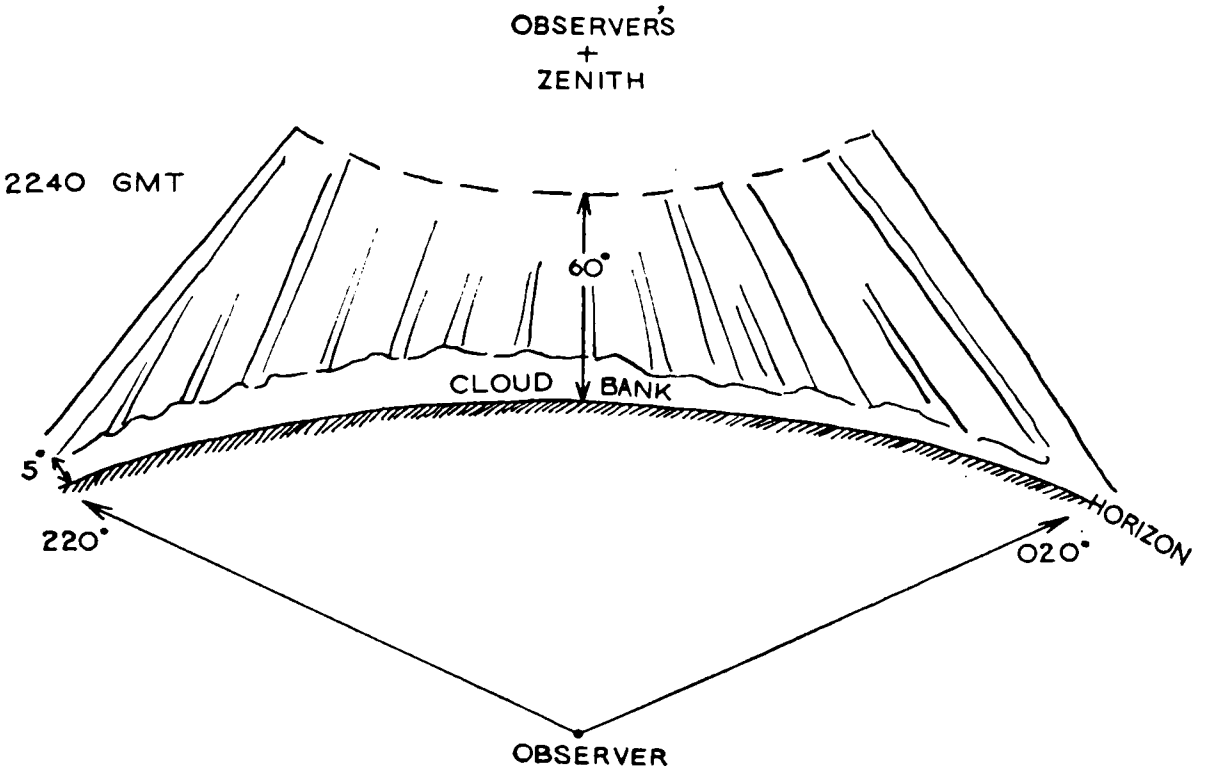


extremity of the ray. The glow in the east intensified to 'moderate' and the suspended extremity of the upper arc became brilliant. The complete display was quiet and well-defined.

Position of ship: 62° 19'N, 32° 30'W.

O.W.S. *Weather Surveyor.* On Station Alpha. Observer, Mr. R. Alan.

22nd September 1963. At 2240 GMT, rays of white light of 'bright' intensity radiated from a source approx. overhead of the observer; the rays started at 60° above the horizon and terminated in a cloud bank near the horizon (max. height 5°). (See sketch below.) At 2242 this was replaced by a corona in the shape of a star of



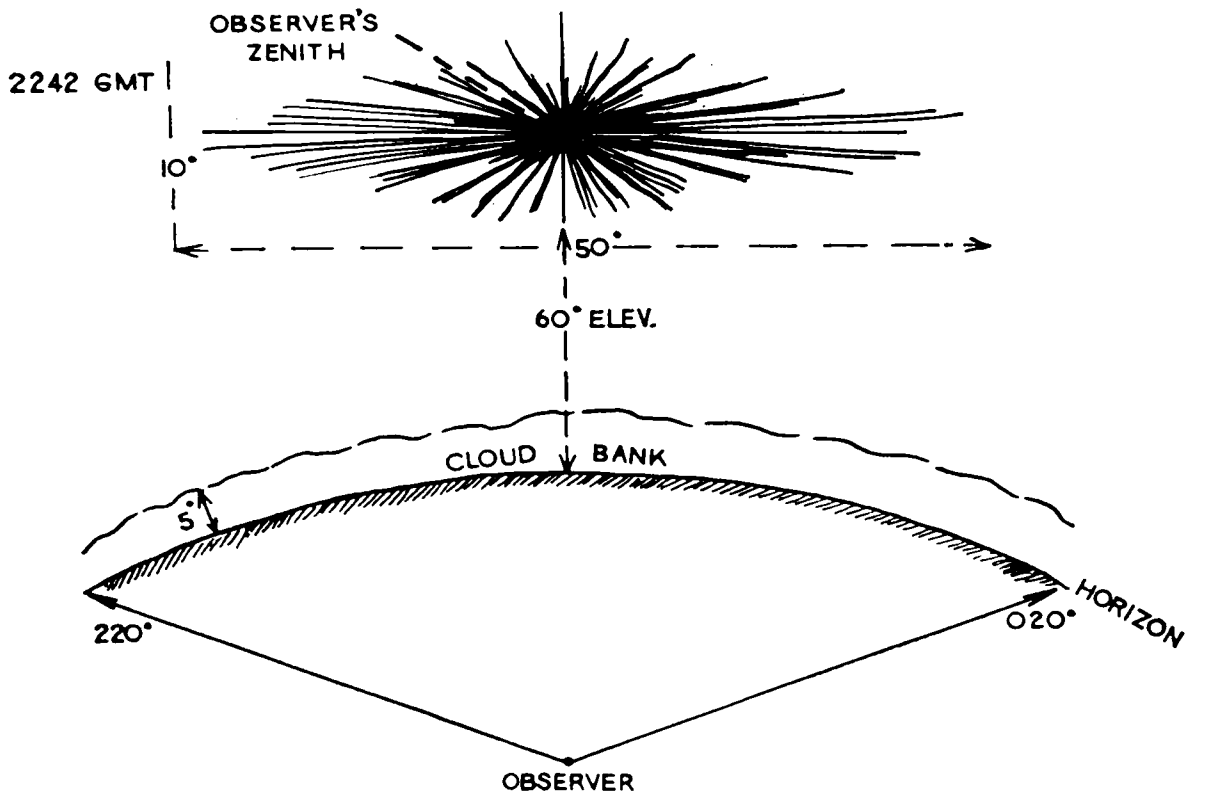
Bethlehem; all other aurora had by this time disappeared. The centre of the star was at the observer's zenith and it was 'bright' intensity but momentarily 'brilliant' fading to nothing some 30 seconds later. (See sketch opposite.)

Reports of aurora received at the Balfour Stewart Auroral Laboratory in the University of Edinburgh for the months July–September 1963 are listed briefly opposite.

We are using in the list abbreviations for the auroral forms in accordance with the new system of classification which came into use on 1st January 1964, the day on which the International Years of the Quiet Sun 1964–65 began. This change in no way affects the narrative method of reporting (with sketches where possible) used in ships selected by the Meteorological Office to report aurora. It merely brings this list in *The Marine Observer* into line with the method of reporting used by the Weather Ships and land-based observers, and others using special reporting forms.

The changes are as follows: G (glow) becomes N (not identifiable), since it is the upper part of a display, the identifiable portion of which is below the horizon. DS (diffuse surface) becomes P (patch) to describe the appearance of cloud-like forms of limited extent, while a new term V (veil) is used to describe uniform luminosity frequently covering a large part of the sky. The forms HA (homogeneous arc), RA (rayed arc), HB (homogeneous band), RB (rayed band) and R (ray or rays) remain as before. F (flaming) and C (corona) are no longer used to describe separate forms, but are recognised as conditions affecting the main existing forms, and will not appear in this brief list. The term DR (drapery or 'curtains') is now covered by RB (rayed band), or RR (ray bundles). We shall gladly send copies of the new observing manual to those who would like to have full particulars of the new classification.

We reminded you in the last issue of *The Marine Observer* that even at this time of minimum sunspot activity, there are likely to be sporadic auroral outbursts, and there were occurrences of this kind during September and October 1963, as those on duty in the Weather Ships in



Date (1963)	Ship	Geographic Position		Λ	Φ	I	Time (GMT)	Forms
1st Aug.	*Dukesgarth*	50°04′N	59°50′W	010	62	+75	0410–0805	HA, HB, RA, R, P, N
20th	*Caslon*	54°45′N	42°30′W	040	64	+73	0100	HA, RA, R
							0600	RA, R, N
	Weather Surveyor	54°04′N	13°12′W	070	60	+70	0203–0330	RB, RR, N
28th	*Marengo*	49°34′N	65°46′W	360	61	+75	0230	HA
	Laksa	58°30′N	00°05′W	090	61	+71	2205–2330	RA, R, N
31st	*Cairngowan*	54°06′N	48°54′W	030	65	+74	0600–dawn	R, N
3rd Sept.	*Crinan*	53°12′N	46°10′W	030	63	+72	0100–0130	HB
9th	*Weather Surveyor*	63°03′N	33°10′W	060	70	+76	2245–0450	HA, RA, R, N
10th	*Weather Surveyor*	61°50′N	32°25′W	060	70	+76	2240–0045	HA, RA, RB, N
14th	*Weather Surveyor*	62°00′N	33°20′W	060	70	+76	0035–0045	P, N
							0435–0445	RB, R, P
15th	*Weather Surveyor*	62°12′N	32°30′W	060	70	+76	0335–0440	HB, N
	Weather Monitor	58°42′N	18°40′W	070	65	+72	2300	RA, R
	Weather Surveyor	62°18′N	32°18′W	060	70	+76	2325	RB
16th	*Weather Monitor*	58°42′N	18°40′W	070	65	+72	0200–0341	RB, N
	Weather Surveyor	62°18′N	32°12′W	060	70	+76	0200–0500	RA, RB, R
	Weather Surveyor	62°00′N	32°50′W	060	70	+76	2245, 2340	R, N
17th	*Weather Monitor*	59°00′N	18°48′W	070	65	+72	0001	RB, R
	Weather Surveyor	62°00′N	32°50′W	060	70	+76	0240, 0545	N
	Weather Surveyor	62°12′N	32°50′W	060	70	+76	2240	R, P
18th	*Weather Surveyor*	62°20′N	32°40′W	060	70	+76	0440	N
	Weather Surveyor	62°25′N	32°25′W	060	70	+76	2240–0545	HA, HB, RB, R, N
19th	*Weather Surveyor*	62°10′N	33°00′W	060	70	+76	2240–0245	HB, RB, R, N
20th	*Weather Surveyor*	62°10′N	32°50′W	060	70	+76	0445	R
	Weather Surveyor	62°20′N	32°30′W	060	70	+76	2240–0540	HA, RB, R, P, N
21st	*Weather Surveyor*	62°20′N	32°12′W	060	70	+76	2140–0440	R, N
22nd	*Weather Monitor*	59°13′N	19°09′W	070	65	+72	0100–0400	N
							0500	RA
	Cairngowan	56°30′N	40°07′W	040	66	−74	0400–dawn	RR
	Weather Surveyor	62°00′N	33°00′W	060	70	+76	0645	R
	Weather Surveyor	62°00′N	32°54′W	060	70	+76	2140–0020	RB, R, P, N
23rd	*Weather Surveyor*	62°03′N	32°56′W	060	70	+76	0144–0545	All forms
	Weather Surveyor	62°00′N	32°40′W	060	70	+76	2235–0500	R, N
24th	*Weather Surveyor*	61°54′N	31°54′W	060	70	+76	2138–0545	HA, RA, RB, R, N
25th	*Weather Monitor*	59°12′N	19°38′W	070	65	+72	0001–0200	N
	Weather Surveyor	62°00′N	33°12′W	060	70	+76	2153–0145	HA, RA, P, N
26th	*Weather Surveyor*	62°00′N	33°18′W	060	70	+76	0345	N
	Weather Surveyor	62°00′N	33°06′W	060	70	+76	2300	N
27th	*Weather Surveyor*	62°12′N	33°06′W	060	70	+76	0440	N
							0506–0508	HB
28th	*Weather Monitor*	58°52′N	19°27′W	070	65	+72	0100, 0200	R, N
30th	*Weather Surveyor*	62°06′N	33°00′W	060	70	+72	2300	N

Note. No reports of aurora were received in July.

KEY: Λ = geomagnetic longitude; Φ = geomagnetic latitude; I = inclination; HA = homogeneous arc; HB = homogeneous band; RA = rayed arc; RB = rayed band; R(R) = ray(s); P = patch; V = veil; N = unidentified auroral form.

higher latitudes are well aware. We reproduce here three of the varied sketches received. According to the accompanying note from the *Weather Surveyor* "we had fun making them, although we didn't discover any Picassos (or did we!)". We are not sufficiently competent in matters artistic to judge, but we can say that they reached the standard of masterpiece on a scientific assessment and we should be glad of more for our gallery! The display in the early hours of the 23rd September was "most impressive and got most of the ship's crew on deck at one time or another". As it was the last trip to higher latitudes of the *Weather Surveyor's* Meteorological Officer i/c, it was an effective farewell display. We received altogether a bumper bundle of detailed reports, and as communications were bad for such a long period, we found most valuable the detailed radio interference reports.

Aurora was reported on more than 20 nights in September, many of which were cloudy over parts of Britain.

Once again we take the opportunity to thank all those helping us in the work of collecting auroral information, and ask that you will please continue to report any auroral appearance, however brief or unspectacular. When you are in Edinburgh, we hope that you will visit the laboratory to meet us and see how we use your observations.

551.506.5(267)

The International Indian Ocean Expedition

PROGRESS IN METEOROLOGY

By C. S. Ramage

(Scientific Director for Meteorology, International Indian Ocean Expedition)

The two-year meteorological observing effort of the International Indian Ocean Expedition (IIOE) is now two-thirds over and most of the special measurement programmes have been completed. Thus the plans outlined in my article which appeared in the April 1963 issue of *The Marine Observer* have been largely fulfilled and investigators are now concentrating on assimilating and using the wealth of novel data at their disposal.

Of fundamental importance has been the continued and increasing help from merchant ships. On an average day the International Meteorological Centre in Bombay receives 200 weather reports by radio from ships in the Indian Ocean. A further 100 are added subsequently by mail. Many oceanographic vessels make radiation measurements and upper air soundings.

Research Aircraft

Five aircraft of the U.S. Weather Bureau and the Woods Hole Oceanographic Institution flew extensive scientific missions from their base in Bombay during May, June and July 1963, probing equatorial circulation systems and the Arabian Sea and Bay of Bengal monsoons. On 22nd May one of the DC-6 aircraft made the first aerial eye penetration of a north Indian Ocean tropical cyclone; on the 24th maximum winds of 104 kt. and an eye sea-level pressure of 947 mb. were recorded by the aircraft.

Three of the research planes returned for six weeks during February and March of this year. This time, besides equatorial flights, they ranged into the southern hemisphere, made many sorties in support of the University of Washington's air-sea interaction study and measured the intensity and extent of the western Indian sea-breeze. During the two visits, 124 scientific missions, totalling 830 hours were flown.

Air-Sea Interaction

In a project timed to coincide with return of the research aircraft to India, meteorologists from the University of Washington shipped a specially instrumented buoy (MENTOR) to Bombay and then with the Dutch tug *Oceaan* acting as tender made, and automatically recorded, continuous measurements of wind, temperature and humidity between 50 and 200 miles west of Bombay. While the fine structure of air-sea interaction was thus being recorded, MENTOR was being 'boxed' by the

research aircraft flying between 1,500 and 14,000 feet collecting data from which the total energy entering and leaving the 80 × 100 × 3 mile box could be evaluated.

Weather Satellites

As part of a grant from the U.S. National Science Foundation to the U.S. Meteorology programme of the expedition, a complete automatic picture taking ground equipment (APT) for weather satellites was installed at the International Meteorological Centre in December 1963. A few days later, the new satellite TIROS 8 was suitably instructed and pictures were received from it as it passed over the station. Immediate cloud information is thus available in Bombay from the North Indian Ocean and adjoining countries. In addition, intensive regular photography by TIROS 7 and TIROS 8 significantly contributes to research.

Meteorological Rockets

During 1964 meteorological rockets are being fired synoptically from Indian Ocean stations in a combined IIOE-International Quiet Sun Year (IQSY) programme. Australia, India, Italy, Pakistan and the United States are participating. The rocket probes will provide wind data, and occasionally temperature, pressure and density information between 20 and 45 miles above the earth.

Data Processing

The IBM 1620 computer installed at the International Meteorological Centre is now rapidly checking expedition data for accuracy and has begun computing ocean/atmosphere heat exchanges using punch card records of ship's weather observations. Data are also being microfilmed and back-plotted on a master synoptic chart file. Progress has been so rapid that specific plans are now being formulated for preparation and publication of detailed IIOE meteorological atlases.

Research

In August 1963 investigators reported preliminary research results at a seminar in Bombay. The proceedings have appeared in pre-published form. Studies have so far largely concentrated on monsoon circulations, upper air climatology, air-sea exchange, sea breezes, and tropical cyclones. Two investigations now in hand illustrate the wealth and variety of data that diligent effort can provide.

INDIAN SEA BREEZE: The sea breeze of the mountain-rimmed coast of western India is among the world's most intense, extending a hundred miles or more inland and to seaward and two miles in depth. During early March the research aircraft flew multi-level day and night missions perpendicular to the coast and traversing *Oceaan* (the Netherlands Research Ship) whose officers were making frequent pilot balloon ascents. Besides continuous onboard electronic and photographic records, observers on the aircraft noted the drift of smoke and the edge of the Bombay 'smog'; autographic records at coastal and inland stations pinpointed wind, temperature and humidity changes and a special programme of one-hourly wind observations by merchant ships provided information on circulation variations along the coast.

DOLDRUMS: A study of doldrum weather over the eastern Indian Ocean is focussing attention on the meteorological events of 5th February 1964. On that day numerous merchant ships traversing the Singapore–Colombo, Singapore–South Africa, Singapore–Fremantle and Fremantle–Aden routes made weather reports. Surface and upper air observations were made at Gan, Diego Garcia and Cocos and at continental coast stations. Two research aircraft flew from Gan to Cocos. One RAF transport aircraft made excellent time-lapse films of clouds between Gan and Singapore and another, equally valuable 35 mm. stereo cloud photographs between Singapore and Gan. The Gan radarscope was photographed for rain echoes while TIROS 7 and 8 recorded clouds over the whole region in a sequence of orbits.

New observing techniques and intensive application of older, well-tried methods are delineating the weather of the Indian Ocean in unprecedented detail. A relatively few scientists, powerfully aided by the computer, are now engaged in the challenging and exciting task of understanding and explaining.

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A Meteorological Study during the International Indian Ocean Expedition

BY J. STEVENSON

(C.S.I.R.O. Division of Meteorological Physics, Melbourne, Australia. Mr. Stevenson was formerly a Merchant Navy Officer; an observation of his, made in the s.s. *Shahjehan* in the Bay of Bengal, was published in the July 1950 number of *The Marine Observer.*)

The article 'Meteorological Research Goes to Sea' in the April 1963 issue of *The Marine Observer* outlines some of the major meteorological projects undertaken by the many nations and individual research establishments co-operating in the International Indian Ocean Expedition.

The contribution to this expedition by the Division of Meteorological Physics, Commonwealth Scientific and Industrial Research Organisation (C.S.I.R.O.), Melbourne, is in the field of ocean-atmosphere exchange, and in particular the measurement of the radiant energy income of the sea.

The Indian Ocean could be compared to a large boiler-room or evaporator as it supplies the motive power for the great atmospheric circulations in this area, and at the same time is the source of the rainfall of some of the most highly populated regions of the world. To obtain a better understanding of the mechanics of monsoons and their variations from year to year it is an obvious first requirement to study the energy budget of the Indian Ocean and its seasonal variations.

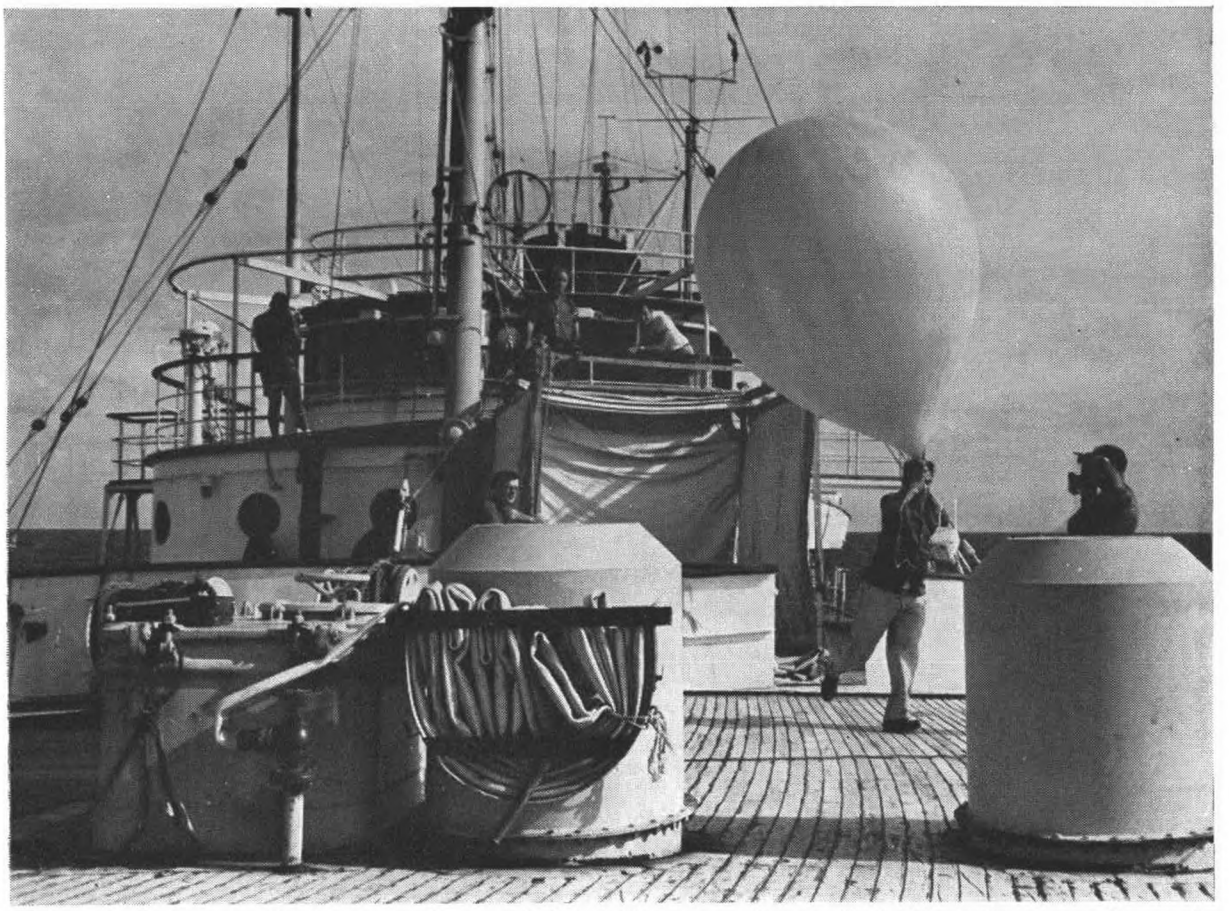
Study of this energy budget is being carried out on two frigates of the Royal Australian Navy—H.M.A.S. *Diamantina* and H.M.A.S. *Gascoyne.* These vessels are actively employed by the Commonwealth of Australia for oceanographic survey (physical and biological), the major part of the scientific personnel and the equipment being provided by the C.S.I.R.O. Division of Fisheries and Oceanography. The ocean-atmosphere experiments have been carried out during these survey cruises, and apart from the direct meteorological value of this study, it is hoped that the information may also be useful in discovering more about the way the water masses become modified in their travels, this having a bearing on the

Opposite page (lower photograph):
The University of Washington's MENTOR buoy being assembled in Bombay harbour. A movable instrumented boom measures wind, temperature and humidity up and down the 30-ft. mast. Similar reference measurements are made from the fixed boom, on the end of which can be seen a sonic anemometer.

Watertight wells in the buoy's pontoons contain electronic equipment. When measurements begin at sea, stability is ensured by filling the cylindrical keel with water and lowering it to a position vertically below the mast. The buoy floats freely 1,000 feet upwind of and attached by electric cables to the tug tender which houses recording equipment. (See page 130.)

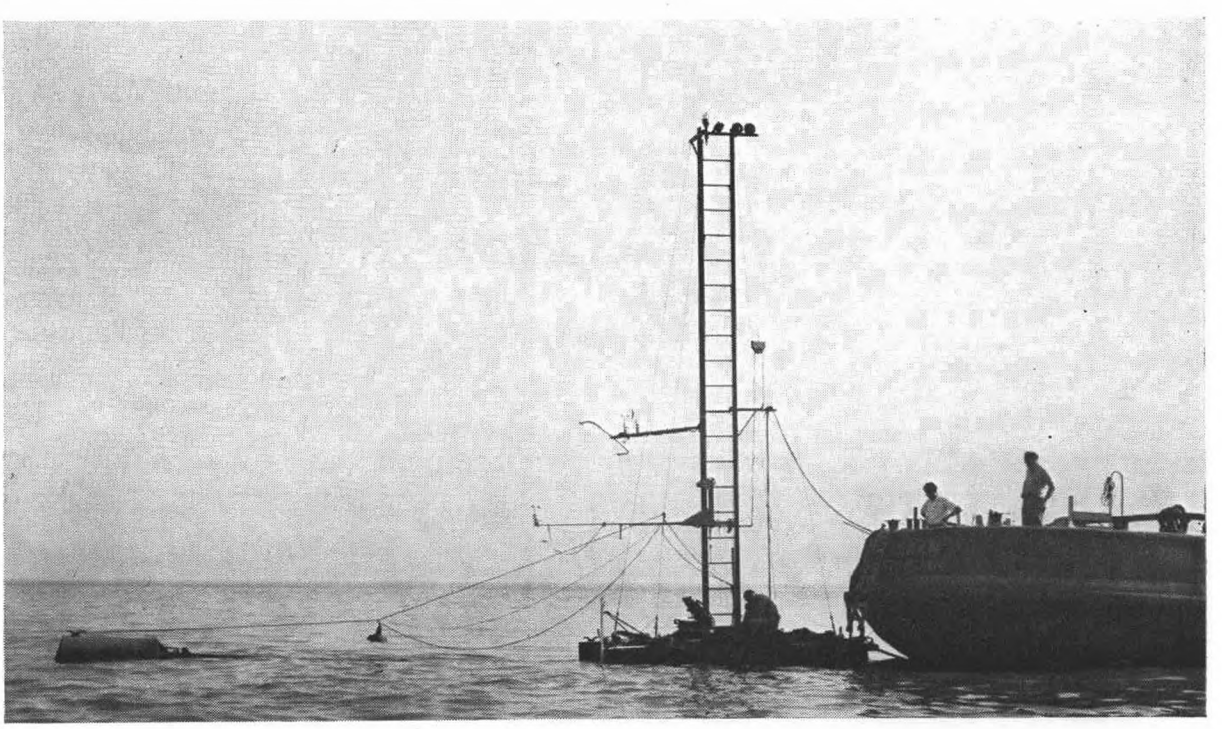
Photo by U.S. Information Service.

(*Opposite page 132*)

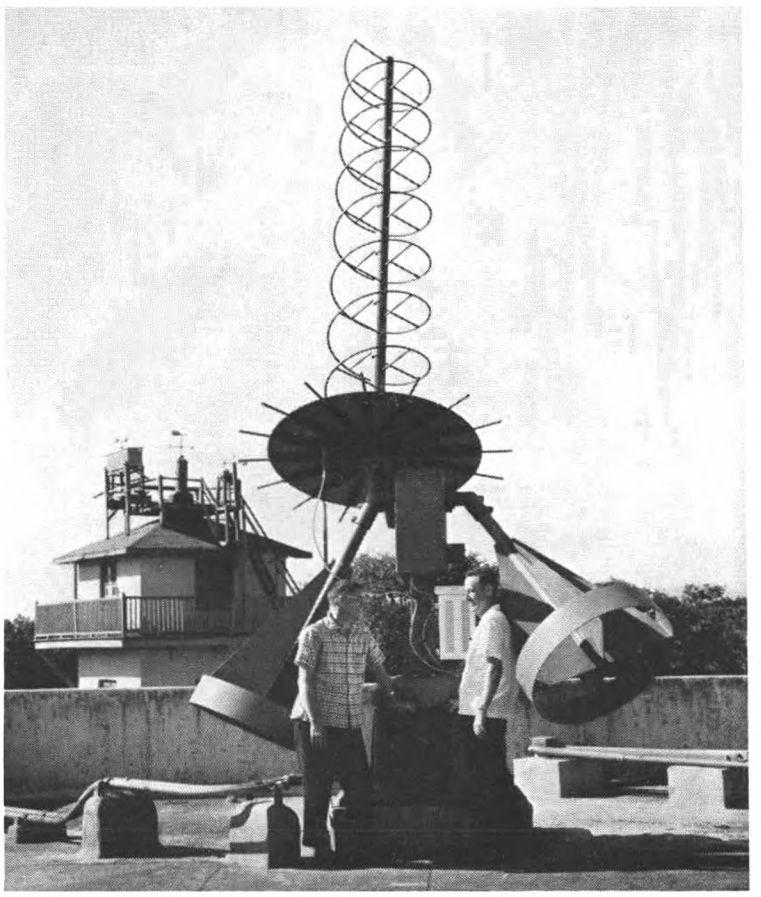


A daily event on the U.S. research vessel *Anton Bruun*—release of a balloon-borne radiosonde. At other times during the day smaller balloons are tracked by theodolite to determine upper winds. The *Anton Bruun*, primarily designed for research into marine biology, has voyaged more extensively over the Indian Ocean than any other IIOE ship. (See page 130.)

Photo by Woods Hole Oceanographic Institution.



(*Opposite page 133*)



A satellite automatic picture taking (APT) antenna installed at the International Meteorological Centre. The antenna, driven by Selsyn motors remote-controlled from the receiving console, tracks the satellite as it orbits from horizon to horizon. (See page 130.)

Photo by U.S. Information Service.

H.M.A.S. *Gascoyne*. (See page 132.)

productivity of the sea and the development of modern fishing methods in the Indian Ocean area.

In these energy budget experiments, the radiation measurements are made using two instruments giving electrical outputs which are continually recorded on a chart-recorder housed in the ship's laboratory. The first of these is a 'Solarimeter' which measures the solar radiation on a horizontal surface and consists of a series of thermocouples attached to the underside of a blackened metal plate and covered with a glass dome, 2 in. in diameter. The thermocouples produce an electrical output proportional to the intensity of the incident radiation from the sun, together with that scattered by the air and clouds. All this radiation has wavelengths within the range 0·3 to 4 microns (the visible range is 0·4 to 0·7 microns) and is short-wave radiation. The second instrument, known as a radiometer, is essentially similar to the solarimeter except that the sensing element is covered by a thin polythene hemisphere maintained distended by air pressure. To measure all the radiant energy falling on the sea surface it is necessary to take account of heat radiated downwards by the atmosphere and the clouds; this is long-wave radiation and is in the range 4 to 100 microns. The polythene on the radiometer is transparent to both long- and short-wave radiation so the total radiant energy may be recorded.

Not all the radiation downward on the sea surface is retained to heat the water and evaporate moisture; part is reflected, but this can be allowed for from existing knowledge of reflection by water surface. There is also an actual loss of radiation from the sea surface itself—this is long-wave radiation emitted at a rate dependent only on the actual temperature of the sea surface. This makes it necessary to measure and continuously record the sea surface temperature and this is done by towing an electrical thermometer element from a boom on the ship's side. The element is known as a 'thermistor', i.e. a semi-conductor material, the electrical resistance of which varies greatly with temperature.

The net radiation income depends greatly on the state of the sky. It is small with a heavy overcast condition, and largest with a clear sky and high sun, amounting, at the latter state, to about 250 watts per square yard. As the state of the sky is so often very variable frequent observations are needed. The arrangement used is a standard 16 mm. cine camera, which is triggered automatically to take one frame every four minutes (daytime only). The camera is mounted inside a box with the lens pointing upwards and forming the centre of a 24 in. round convex steel mirror; some 20 in. above the lens is a small round flat mirror. The sky image on the convex mirror is reflected to the flat mirror, thence to the camera and this system gives a resultant all-round view from some 5° above the horizon. Each time the camera operates, a mark is made on the recorder chart, and this allows us to synchronise the observations and photographs when it comes to analysis.

Due to the fact that the energy income at the sea surface depends so much on the state of sky, application of the results derived on these cruises to the problem of the energy budget of the whole Indian Ocean requires more information on the amounts and types of cloud. Here the observations made by the Selected Ships have proved to be of great value and will continue to be necessary in compiling the needed climatological averages for the various seasons and areas. However, the ships' observations are largely confined to the main shipping routes and many parts of the ocean are only visited at rare intervals. Here the data being gained by TIROS satellites which view the cloud formations from above will be of great value.

All recorded information is supplemented with 2-hourly standard meteorological observations of pressure, wet and dry bulb temperature by Assman psychrometer—thence vapour pressure—wind speed from two anemometers, wind direction, and estimation of wave height.

Measurements along these lines have now been taken on five voyages. The first in February 1961 in the Bass Strait and Great Australian Bight was of a preliminary working-up character. Since then, there have been three on the same track from Fremantle to Singapore up the 110°E meridian and one in the Timor Sea area.

551.515.23:551.515.9

THE STORY OF 'FLORA'

At 0940 GMT on 26th September 1963 the U.S. Weather Satellite TIROS 7 sighted a complex cloud system in approximately 11° 30'N, 38° 00'W, from which was to develop hurricane *Flora*, in the words of the U.S. Monthly Weather Review "The most concentrated and best organised tropical cyclone of the past two years . . . the second most deadly ever to occur in the Atlantic area."

On the following day, 27th September, TIROS 7 again photographed this system which, though it had retained a remarkable resemblance to that of the day before, had moved to 8°N, 40°W. There was as yet no sign that it would develop into anything other than an ordinary depression in the Intertopical Convergence Zone. The satellite was not in a position to photograph the system on either of the two successive days and on 29th September the San Juan Hurricane Centre asked for special reports. British ships which were in the area and who responded were *Hauraki*, a Selected Ship, *British Lantern*, *Clymene*, *Factor*, *Finnamore Valley* and *Stonegate*. (See observation from *Hauraki* in the "Marine Observers' Log" in this issue.) A hurricane research flight was arranged for daybreak on 30th September.

It is not inappropriate to point out in this journal that, though it was a satellite which first gave the warning that trouble might be in the offing, it rested with a ship, as it nearly always will, to indicate the true nature of that trouble and to pinpoint its position. At 0830 on 30th September, a much delayed message was received from the Netherlands *Simon* reporting that at 2230 the previous evening the barometer had fallen to 1000 millibars and that the wind had shifted from NW to SW; unfortunately the message did not give any wind strength nor rate of change of barometer. At 0930 the American *Del Alba* reported a wind of 35 kt. from NE at 0600, a barometric pressure of 1006·8 mb. with a fall of 5 mb. in the past three hours. At 1330 the Norwegian *Varvara* in 10° 40'N, 59° 30'W, reported that the wind had backed from NE, force 4, to SW, force 7, within the past hour and that the glass had fallen from 1011 to 1005 mb. in the past two hours. At 1500 the *Del Alba* sent in a complete report of having located the centre in approximate position 11° 00'N, 57° 30'W, and at 1407 the hurricane reconnaissance plane reached the centre of the storm finding "a circular eye well defined, central pressure 994 mb., surface winds in excess of hurricane force and the wall cloud around the eye 8 miles wide". At 1400 the San Juan Weather Bureau issued a bulletin and the first formal hurricane advisory was sent out at 1600 GMT.

The centre of *Flora* passed over Tobago at 1840 GMT on 30th September with lowest pressure 974 mb. and winds 78–87 kt. Seventeen persons were killed and property damage was estimated to amount to almost £10,000,000. *Lloyd's List* of 11th October reported a spokesman for the cocoa industry as saying that *Flora* had eliminated Tobago completely as a cocoa-producing area. Less damage was suffered in Trinidad due to the protection afforded by the mountain range along the north coast. When, however, the wind shifted to the SW, extensive damage was done to the harbour at Port of Spain, an open roadstead from which larger vessels had prudently put to sea.

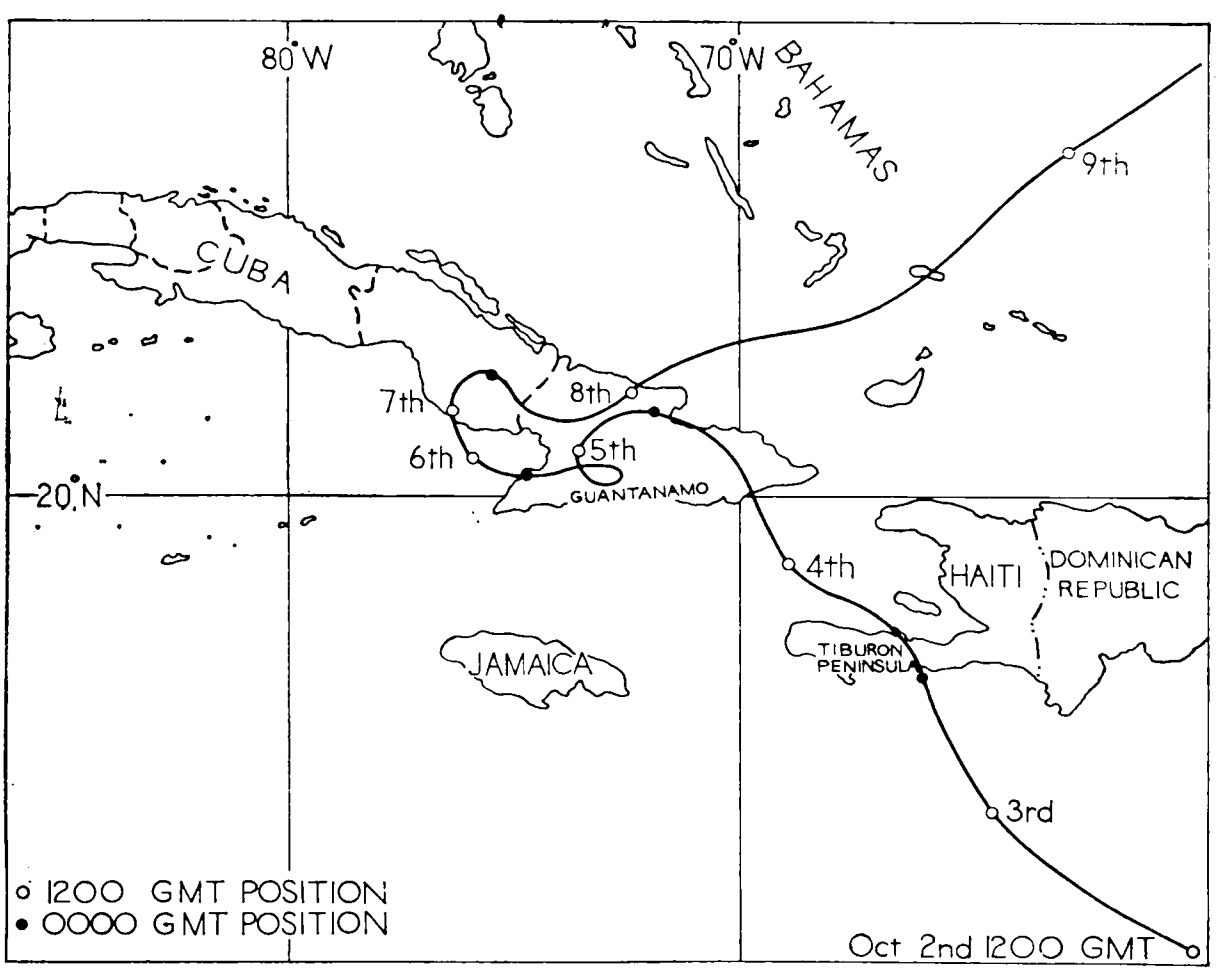
Granada, the most southerly of the Windward Islands, was the next to feel the impact of *Flora*. The centre passed some 60 miles to the south, six persons were drowned on the island and there was extensive damage to cultivation.

After leaving the southern Windwards, *Flora* moved on a fairly smooth and regular track towards the south-western Haitain Peninsula, where it struck at about 2359 GMT on 3rd October with winds of about 90 kt. It swept across the Tiburon Peninsula leaving a widespread trail of death and destruction. The U.S. Monthly Weather Bulletin stated that crops were totally destroyed, that in the mountainous terrain many towns were washed away and others buried by landslides. The height of the storm surge along the south shore was not known but could have been as much as 12 feet. *Lloyd's List* of 7th October quoted from the *Miami News* that the Haitain Minister of Health had said that entire cities had been destroyed and that

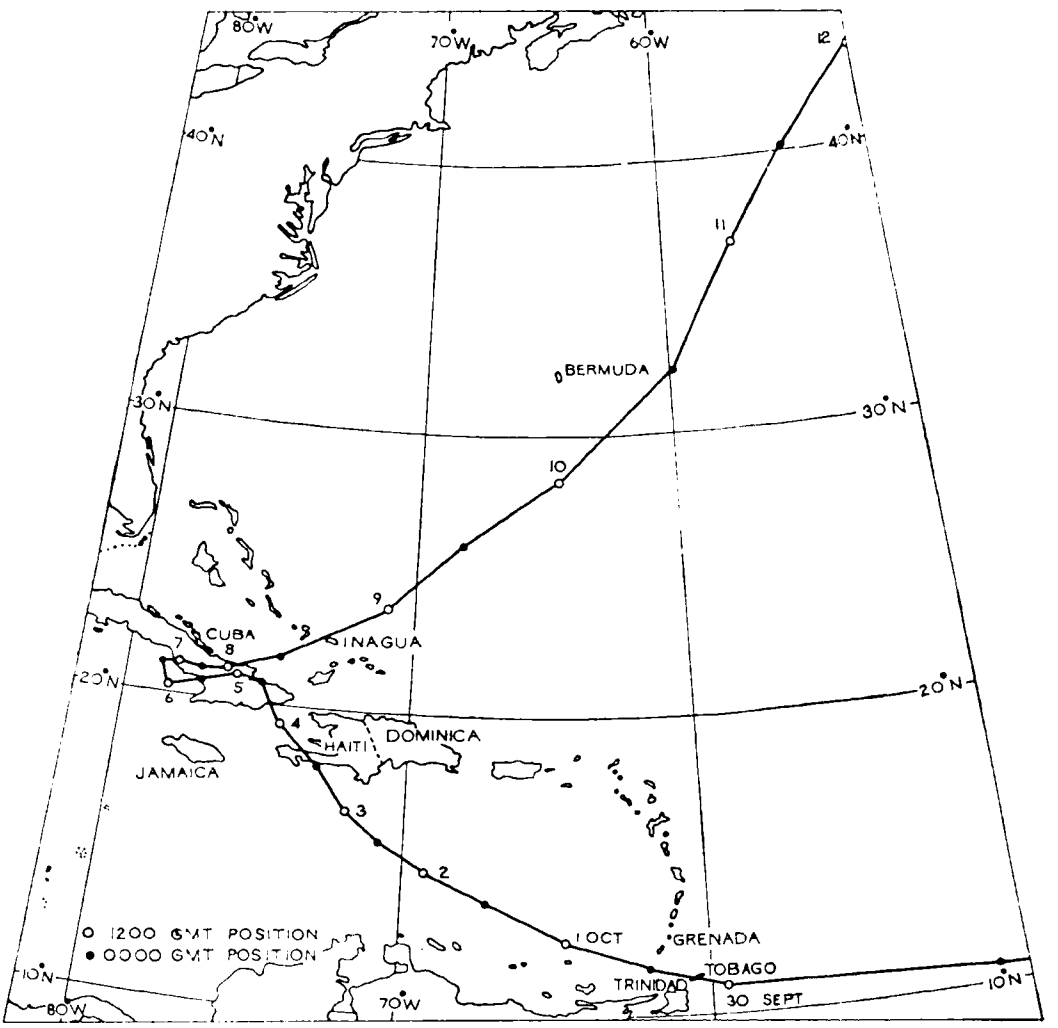
bodies were floating in the streets. The same paper reported, on 8th October, that the Haitain Embassy in Washington had said that a shortage of drinking water and very bad sanitary conditions had created a serious problem. On 10th October an official of the World Health Organisation in Port au Prince issued a new fatality figure of 5,000. During the time that Haiti was under the influence of *Flora*, the rainfall was measured at more than 75 inches. The neighbouring republic of Dominica suffered severe damage to agriculture, livestock, communication, bridges etc. whilst the loss of life was probably more than 400.

Next on *Flora's* visiting list was the island of Cuba. The centre crossed the coast about 30 miles east of Guantanamo Bay late in the forenoon of 4th October and for portions of five days it conformed scarcely at all to the general behaviour of these storms, i.e. a westerly progression, recurving to the NW, to N and finally NE, because it was almost completely boxed in by high pressure areas to the west, to the north and to the east. Instead of this, *Flora* meandered back and forth over eastern Cuba bringing winds of hurricane force and torrential rain. The track was determined by hourly observations made by the National Observatory at Havana, jointly with the National Academy of Sciences (Cuba) and is shown in the figure below. It will be noted that twice during this unusual visitation, *Flora* made short sea passages which, no doubt, renewed her strength and enabled her to maintain her ferocity on her return visits. Rainfall amounts were enormous, radio broadcasts from Cuba at the time mentioned a total of 90 inches near Velasco, whilst at Guantanamo Bay the rainfall from *Flora* greatly exceeded the recorded amount for the entire year of 1962. Cuba's productive valleys and lowlands remained flooded for many days and crop damage was widespread. Deaths were estimated at more than 1,000.

On 8th October, the centre finally left Cuba and began to follow a more normal north-eastward direction at a gradually increasing forward speed, into higher latitudes.



Hurricane *Flora's* track in the vicinity of Cuba.



On the night of 8th October it passed through the south-east Bahamas. On Inagua it was described as the worst hurricane within living memory. Winds were estimated at 70 kt., two wharves were destroyed and there was extensive damage to crops and roads. At about 0600 on 9th October the eye passed over Mayaguana with winds of 75 kt. Here, the sea wall was washed away and crop destruction was total. Exuma, Long, Acklins and Crooked Islands, and Long Cay also suffered during the north-east passage of *Flora*.

From 10th to 12th October *Flora* continued rapidly north-eastward. It passed well to the south and east of Bermuda where, on 10th October, gales were recorded, and across the main shipping lanes on 11th and 12th. Surface pressure at 1200 GMT 11th October in 43° 45′N, 50° 00′W was 963 mb. and winds from 9th to 11th had ranged up to 100 kts. By the afternoon of 12th October *Flora* had lost its tropical characteristics over the cooler waters east of Newfoundland and it proceeded towards the Denmark Strait as an extra-tropical depression.

Although some distance from the hurricane itself Jamaica also had suffered peripheral effects; there were eleven deaths on the island, mostly due to flooding, whilst damage to crops and installations was estimated at almost one million pounds.

Altogether, the U.S. Monthly Weather Review estimated the total deaths due to the hurricane at 7,186 and this takes second place only to the great hurricane which devastated the Windward and Leeward Islands on 10th–12th October 1780 in which more than 20,000 persons are said to have perished, 4,326 on Barbados, 9,000 on Martinique, 4,500 on St. Eustatius whilst several thousand sailors in the British, French, Netherlands and Spanish Fleets were lost with their ships.

Acknowledgement is made to the U.S. Weather Bureau for permission to quote meteorological details from their Monthly Weather Review and to reproduce the maps above and on page 135. Many of the casualty reports have been extracted from issues of *Lloyd's List* of the period. L. B. P.

551.501.8:551.507.2

RADAR REPORTS ON OBSERVED PHENOMENA (EXCLUDING KNOWN METEOROLOGICAL EFFECTS)

(Reprint of a report from the Radio Advisory Service)

From time to time radar observers may perceive peculiar phenomena on their screens which they consider unworthy of a report. Similarly, in particular areas, certain phenomena may have become commonplace to the regular voyager.

If the facts were reported in all such cases and were then carefully analysed this might help to solve problems connected with unexplained echoes or new effects displayed by radar in different parts of the world. Various channels exist for the recording and collection of information of this kind; Meteorological Logbooks, Hydrographic Notes (H102), Radar Log of Targets Part 2, and individual reports by correspondence. Radar observers are asked to make their experiences available by one of these methods.

The subject of meteorological effects on radar propagation including super-refraction, multiple trace echoes, fog, rain, sand and dust storms, etc., are covered in circular RDR 31.

As an indication of the information sought by this circular, a summary of the more unusual phenomena which have been reported up to the present, exclusive of meteorological effects, is given below:

Radar Echo or Phenomena	Area
Dolphins	Cape Villano
Electrical storm interference	Bashee river entrance. S. Africa
Phenomena. High speed echo at close range (unseen visually)	500 miles west of Ireland
Locusts, 30 miles diameter swarm	Persian Gulf
Phosphorescence on sea surface (?)	Bengal Strait. N.W. Sumatra
,, ,,	Goschen Strait. S.E. New Guinea
,, and swell	Las Palmas
Tide rips	Sandakan. N. Borneo
,,	Resolution island. Canada (2)
,,	East of Gibraltar (2)
,,	East London. S. Africa
,,	Cabo Mala. Balboa (4)
,,	Berada. Italian Somaliland
,,	Kattegat
,,	Malacca Strait
,,	100 miles south of Hong Kong
Long range tropospheric reflections, producing sea clutter returns in vicinity of ship in a calm sea	Cape Verde

CHANGES AT HULL AND SOUTHAMPTON

Following the death (reported on page 147) of Lieut.-Cdr. W. H. Carr, Merchant Navy Agent for the Humber area, Lieut.-Cdr. E. R. Pullan, R.D., R.N.R., has taken up duty there as full-time Port Meteorological Officer, a post he formerly occupied at Southampton.

Our representation at Southampton has reverted to an Agency, as it was before 1948, and Commodore D. M. MacLean, D.S.C., R.D., has been appointed Merchant Navy Agent for the area. A biographical note concerning Cdre. MacLean appeared in the October 1962 number of *The Marine Observer* when he retired from the Cunard Line.

The addresses and telephone numbers of both offices remain as published in *The Marine Observers' Guide, Admiralty List of Radio Signals, Vol. 3*, and other publications.

551.326.7(261)

NOTES ON ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FOR JANUARY TO MARCH 1964

JANUARY

Relevant Weather Factors. Pressure was high between Greenland and Europe and an abnormally warm air mass extended over the Arctic from Greenland to the Bering Straits. The atmosphere over northern Canada was cold as was that over northern Europe and Asia.

Canadian Arctic Archipelago, Baffin Bay, Hudson Bay, Davis Strait and Labrador Sea. Conditions appeared to be largely normal in these areas. There was more extensive and thicker fast ice than normal over NE Canada.

Up to a hundred icebergs were observed by individual land stations drifting northwards and westwards away from the coast of Greenland between Cape Farewell and 60°N.

Belle Isle Strait. Early in the month, the Strait was filled with new and nondescript ice which steadily increased to very close winter ice associated with icebergs at the end of the month. These conditions were also in the seaward approaches to the Strait for 100 miles. This is not abnormal. The Strait was reported closed to navigation on 12th January.

The River St. Lawrence and Great Lakes. Ice conditions over the Great Lakes were approximately normal. Towards the end of January, Lake Erie was covered with ice consisting of a great many heavy floes. There were large areas of open water in the remaining lakes. At the end of the month the river above Montreal was largely full of ice. After being icebound 13 miles below Montreal the *Helga Dan* was the season's first ship into the port on 4th January, the earliest date on record. Towards the end of the month it was reported that the steamer *John W. Bordman* was icebound in the Lake St. Claire for about 1½ hours and was released by a coastguard tender.

Gulf of St. Lawrence. It continued to be a relatively light ice year in the Gulf with much open water. These conditions continued on into February and March.

Great Banks and Waters off Eastern Newfoundland. There were few icebergs but extensive light pack ice moved southwards seasonally later than normal. There was much fast ice in the bays and inlets of eastern Newfoundland.

Greenland Sea, Denmark Strait and Icelandic Waters. Conditions were largely normal off north-eastern Greenland except that extensive freezing earlier had caused relatively high amounts of fast ice in bays and inlets. This was also true of Bear Island and Spitzbergen, but the movement of Arctic pack to the SW of Bear Island and W of Spitzbergen was more extensive than usual. South of Scoresby Sound in Denmark Strait there was extensive moderate to light pack-ice extending south-eastwards from the Greenland coast towards NW Iceland. South of this, the area of polar pack against the Greenland coast was less than normal while icebergs tended to accumulate west of Cape Farewell.

Barents Sea and White Sea. Ice conditions were approximately normal. Arkhangelsk was reported closed to navigation on 17th January.

Baltic Sea (see Table 2). This continued to be a very light ice season.

North Sea. Towards the middle and end of the month ice was reported in the estuaries of the Ems, Weser and Elbe.

FEBRUARY

Relevant Weather Factors. High pressure persisted between Greenland and Europe with intensive cyclonic activity S of Greenland and over the Barents Sea. Sea temperatures were above 5°C in the Norwegian and Barents Seas as in the corresponding period of 1963.

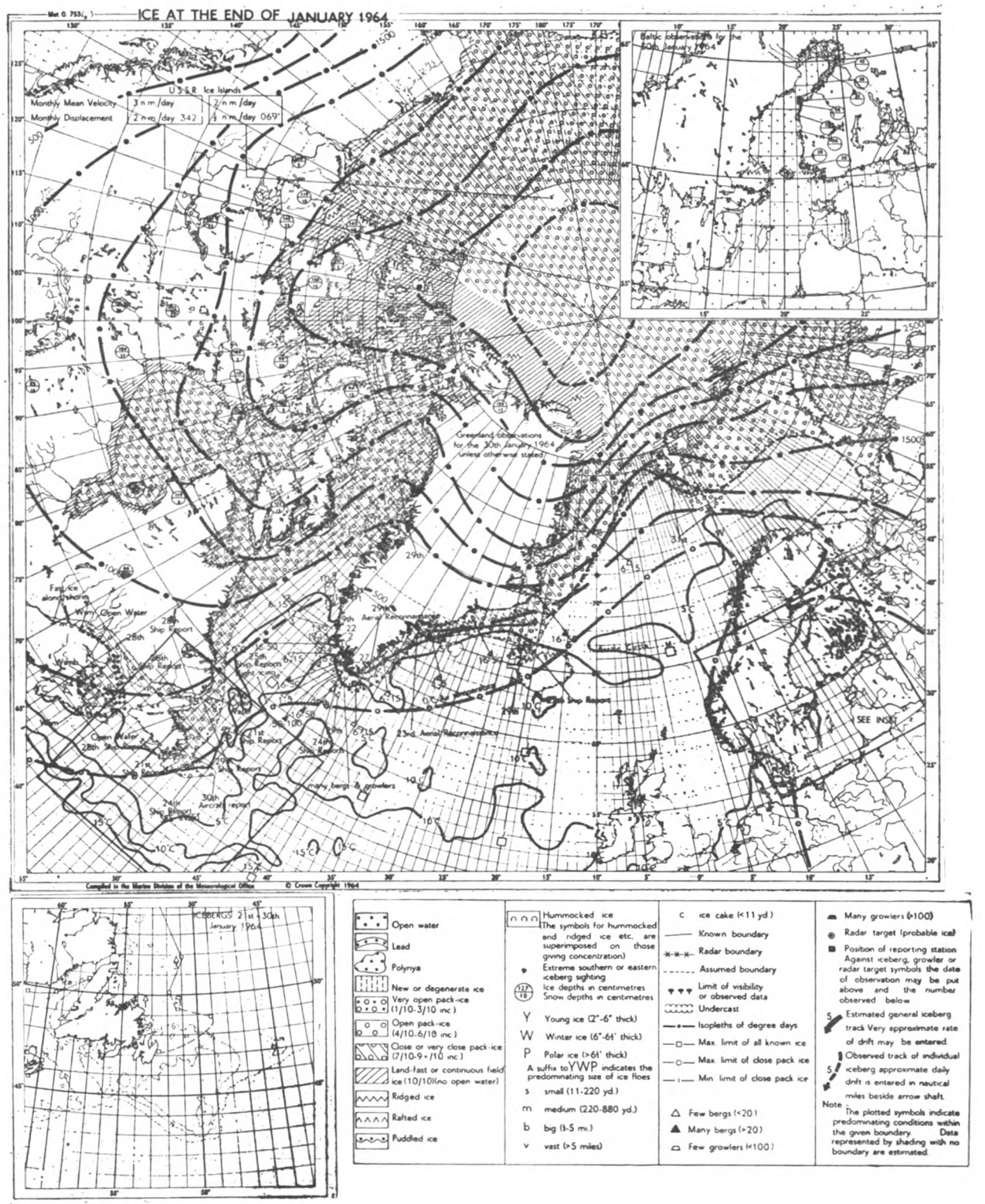
Canadian Arctic Archipelago, Baffin Bay, Hudson Bay, Davis Strait and Labrador Sea. There was very little change from January apart from increasing amounts of very open pack SW of Baffin Island extending towards the middle of the Davis Strait. The extent of fast ice particularly off Baffin Island remained abnormally large and the ice was abnormally thick. The number of icebergs drifting SW off the Labrador coast appeared to be increasing rapidly. Conditions remained largely unaltered on into March except that the number of icebergs accumulating off SW Greenland decreased.

Belle Isle Strait. During this month there was much movement and fluctuation in the character of the ice both in the Strait and in its seaward approaches. There were few icebergs reported but the numbers in the seaward approaches were gradually increasing. These conditions continued on into March.

Gulf of St. Lawrence. This continued to be a light ice year. There was, however, extensive ice locally round Prince Edward Island and pack-ice was moving south-eastwards through the Cabot Strait which became blocked for short periods. These conditions continued on into March but there were increasing areas of open water around Anticosti Island and west of Newfoundland. These finally provided a shipping route through the Gulf.

Great Banks and Waters of Eastern Newfoundland. A southward movement of pack-ice continued but it remained below normal in extent. There was a considerable increase in the number of icebergs drifting southwards. Isolated icebergs penetrated south of 48°N.

Greenland Sea. During February we have received considerable amounts of photographic and of visual observations of the edge of the ice adjacent to the coast of eastern Greenland N of Jan Mayen. The extent of fast and polar pack-ice appeared to be changing slowly and there



—— o —— Air temperature: 0°C isotherm (mean for 18th–27th January).

—— · —— Air temperature: negative degree days, °C.

———— Sea temperature, °C, for 18th–27th January. These isopleths give an indication of the monthly movement of warm and cold water.

— — — Sea temperature, as above, but only estimated values.

Note. The notes in this article are based on information plotted on ice charts each month, similar to the map above, but on a much larger scale (39 in. × 27 in.). They are available at the price of reproduction on application to the Director-General, Meteorological Office (M.O.1), London Road, Bracknell, Berks. Alternatively, they may be seen at any Port Meteorological Office or Merchant Navy Agency.

appeared to be less than normal of the latter but at the edge there were large areas of winter ice that fluctuated rapidly and extensively towards NW Iceland.

The extent of the Arctic pack-ice W of Spitzbergen and SW of Bear Island increased. The Arctic water with its associated ice appeared to have extended about 100 miles westwards. This area had a severe ice season during this period. There were no significant changes in this ice situation on into the end of March.

Denmark Strait and Icelandic Waters. The large area of pack-ice extending south-eastwards towards Iceland decreased and pack-ice spread south-westwards all along the southern Greenland coast. The extent of the pack-ice south of 65°N was, however, about normal. These continued on into March but continued onshore winds tended to consolidate the pack-ice.

Baltic Sea. Ice formed rapidly from the coast in the north of the Gulf of Bothnia (thickness 6 ft.) and the Gulfs of Finland and Riga (thicknesses 4–5 ft.) but the extent of the ice continued well below normal.

MARCH

Relevant Weather Factors. There was very little change during this month in the general weather situation but sea temperatures in the Barents Sea were higher than those of the corresponding period of 1963. This appears to have been the result of persistent southerly winds over the Norwegian Sea and western Barents Sea.

Great Banks and Waters of Eastern Newfoundland. During March extensive pack-ice extended southwards off the Newfoundland coast east of 51°W. Many icebergs were reported south of 48°N (see Table 1). However, all types of ice were degenerating *in situ*. This is a light pack-ice year but there are indications that it will be a moderate or high iceberg year.

River St. Lawrence and Great Lakes. At the end of March the river and lakes were clearing rapidly of ice. The whole area was largely clear of ice except for local 'jams' and over shallow water. The St. Lawrence Seaway was expected to open several days ahead of normal. (It opened on 1st April.)

Barents Sea and White Sea. There was little change from February but sea surface temperatures were increasing in the SE of the area with temperatures above 0°C at the entrance of the White Sea. The Arctic pack of Spitzbergen and Bear Island retreated eastwards and the extent of the Arctic pack in the NE of the Barents Sea appeared to be less than normal.

Baltic Sea. During March fast ice increased generally in the Gulf of Bothnia with lower thicknesses at the end of the month of 3½ ft. approximately. The area of fast ice decreased in the Gulf of Finland with thicknesses at about 3 ft. but there was little change in the Gulf of Riga. By the end of March, however, many leads had begun to form along the Finnish coast. In the open sea in the Gulf of Bothnia there was much pack-ice with open water. All the more important towns of the northern Baltic were kept open continuously by ice breakers.

G. A. T.

Table 1. Iceberg sightings by merchant ships in the North Atlantic

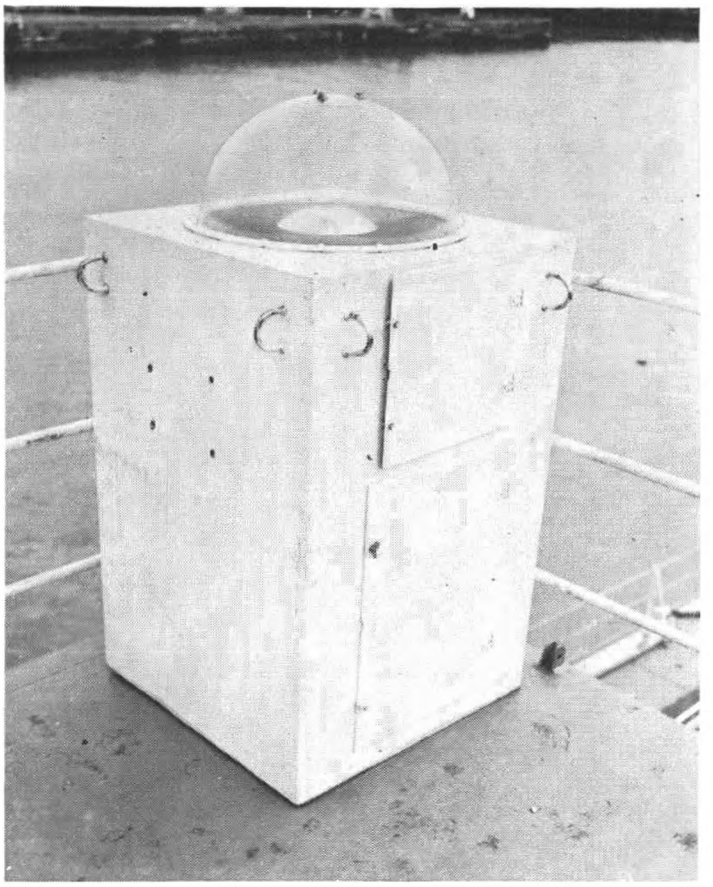
(This does not include growlers or radar targets)

Limits of Latitude and Longitude		Degrees North and West							
		58	56	54	52	50	48	46	44
Number of bergs reported south of limit	January	*	14	14	11	7	0	0	0
	February	*	>298	231	199	21	9	0	0
	March	>406	>403	>403	>403	>397	>153	17	0
	Total	*	>715	>648	>613	>425	>162	17	0
Number of bergs reported east of limit	January	14	12	10	3	0	0	0	0
	February	>298	236	48	18	2	0	0	0
	March	*	>406	>388	71	15	0	0	0
	Total	*	>654	>446	92	17	0	0	0
Extreme southern limit	January	49° 17′N, 53° 18′W on 31.1.64							
	February	46° 55′N, 50° 58′W on 29.2.64							
	March	45° 05′N, 51° 08′W on 28.3.64							
Extreme eastern limit	January	51° 41′N, 51° 05′W on 21.1.64							
	February	47° 57′N, 49° 43′W on 18.2.64							
	March	56° 35′N, 48° 10′W on 31.3.64							

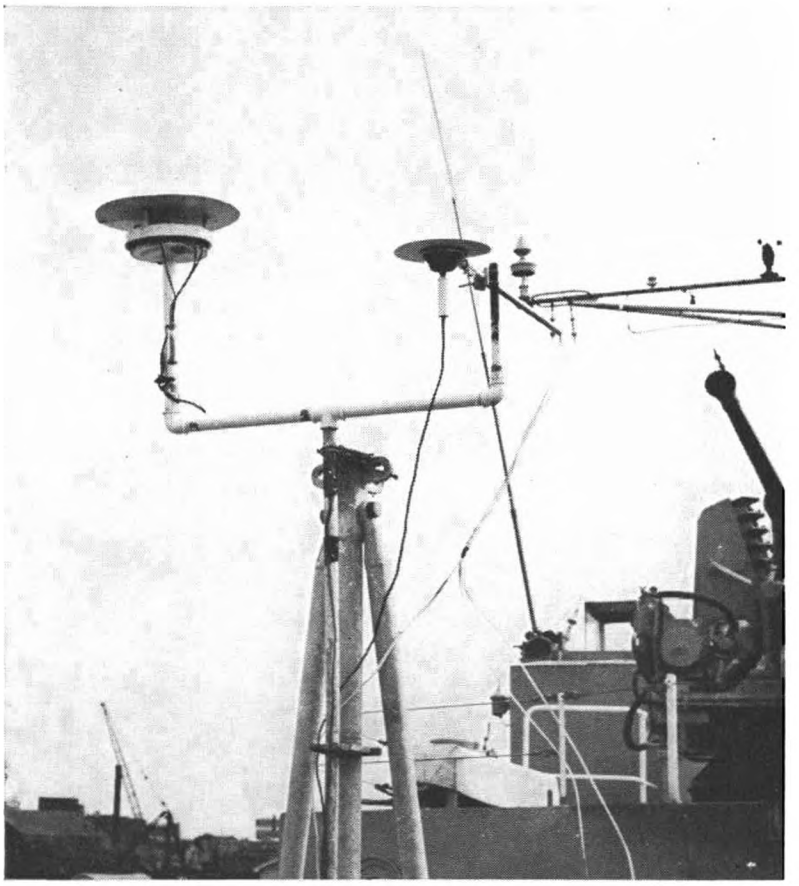
* Probably large numbers, but none sighted in excess of those reported in further south positions or in further east positions.

> ("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.

(*Opposite page 140*)

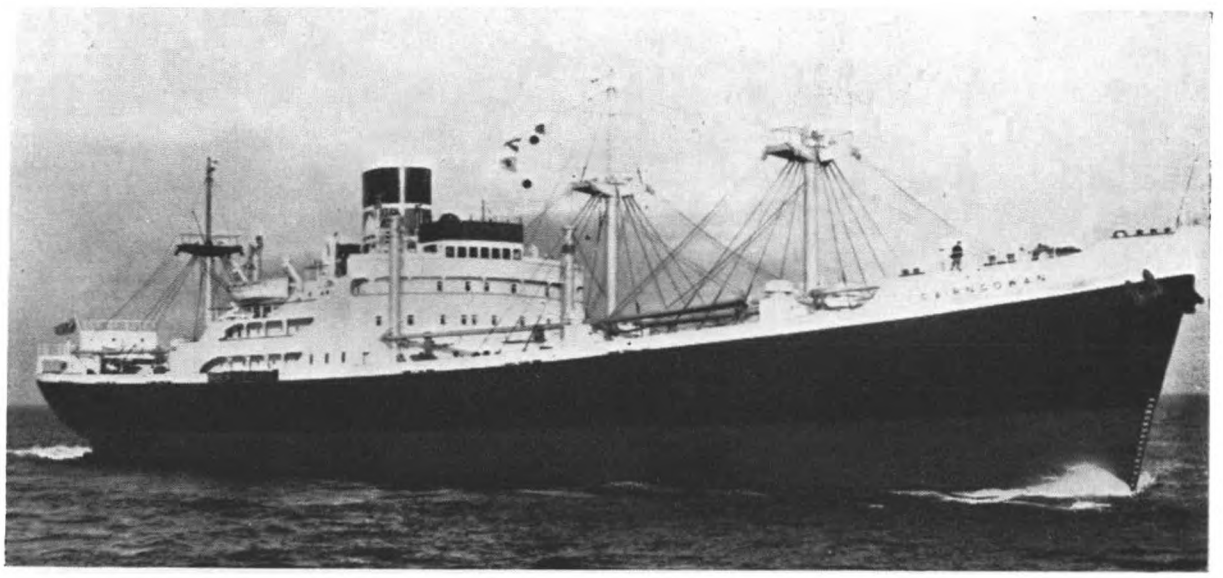


All sky camera unit.



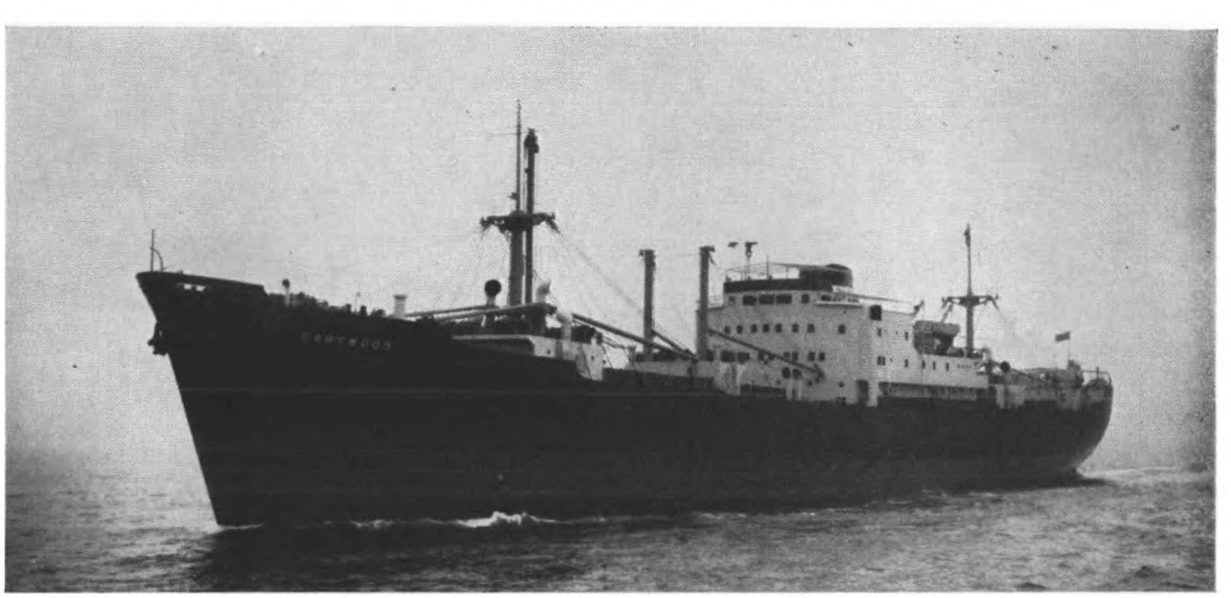
Radiation elements in position on H.M.A.S. *Gascoyne*. (left, Solarimeter; right, Radiometer). (See page 132.)

(*Opposite page 141*)



Cairngowan (Cairn Line of Steam Ships), Captain J. Lobban.

Dukesgarth (Wm. Cory & Son Ltd.), Captain N Richardson.



Dartwood (Wm. France, Fenwick & Co. Ltd.), Captain J. Elliott.

The three ships which gained the highest markings for their meteorological logbooks during the year ended 31st March 1964. (See page 111.)

Table 2. Baltic Ice Summary, January–March 1964

No ice was reported at the following stations during the period: Kiel, Flensberg, Aarhus, Kristiansandfjord.

Station	January 1964									February 1964									March 1964								
	Length of Season		Ice Days			Navigation Conditions			Accumulated Degree-days	Length of Season		Ice Days			Navigation Conditions			Accumulated Degree-days	Length of Season		Ice Days			Navigation Conditions			Accumulated Degree-days
	A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I
Tonning	1	25	19	0	19	16	0	0	—	20	27	8	0	8	8	0	0	—	0	0	0	0	0	0	0	0	0
Husum	1	23	10	0	3	6	0	0	—	20	23	4	0	0	0	0	0	—	0	0	0	0	0	0	0	0	0
Emden	17	26	10	0	10	9	0	0	—	0	0	0	0	0	0	0	0	—	0	0	0	0	0	0	0	0	0
Lubeck	15	15	1	0	0	0	0	0	—	0	0	0	0	0	0	0	0	—	0	0	0	0	0	0	0	0	0
Gluckstadt	1	31	25	0	21	24	0	0	—	1	24	6	0	5	1	0	0	—	0	0	0	0	0	0	0	0	0
Bremerhaven	21	23	3	0	3	2	0	0	—	0	0	0	0	0	0	0	0	—	0	0	0	0	0	0	0	0	0
Riga	8	31	18	9	4	3	0	0	237	1	29	24	20	2	8	13	0	474	1	31	31	31	0	0	31	0	591
Pyarnu	1	31	31	31	0	0	31	0	232	1	29	29	29	0	0	29	0	453	1	31	31	31	0	0	31	0	573
Leningrad	1	31	31	17	14	14	17	0	401	1	29	29	29	0	0	29	0	686	1	31	31	31	0	2	29	0	878
Viborg	1	31	31	31	0	0	31	0	—	1	29	29	29	0	0	29	0	—	1	31	31	31	0	0	31	0	—
Stettin	11	29	18	3	7	5	0	0	145	6	29	17	7	2	13	0	0	190	1	16	16	0	11	13	0	0	218
Gdansk	0	0	0	0	0	0	0	0	93	15	26	12	0	4	7	0	0	176	6	16	5	0	3	1	0	0	242
Klaipeda	8	31	8	0	0	4	0	0	183	1	29	17	0	0	14	0	0	372	1	29	24	3	3	19	0	0	482
Tallin	0	0	0	0	0	0	0	0	—	11	29	19	2	17	3	16	0	—	1	31	31	9	17	3	28	0	—
Ventspils	8	31	19	0	0	3	0	0	—	1	29	29	0	3	15	0	0	—	1	26	26	10	0	9	0	0	—
Helsinki	26	30	5	0	0	2	0	0	249	3	29	27	20	4	8	16	0	518	1	31	31	31	0	1	30	0	676
Mariehamn	0	0	0	0	0	0	0	0	78	12	29	18	15	0	15	0	0	243	1	31	31	31	0	18	0	0	369
W. Norskar	17	27	3	0	0	0	0	0	—	11	29	19	0	19	12	6	0	—	1	28	28	3	25	10	18	0	—
Turku	17	31	10	5	0	5	0	0	210	1	29	29	29	0	14	15	0	454	1	30	30	25	0	14	16	0	602
Vaasa	1	31	31	31	0	0	31	0	220	1	29	29	29	0	0	12	17	482	1	31	31	31	0	0	11	20	642
Mantyluoto	17	31	14	0	3	8	6	0	—	1	29	28	18	4	15	13	0	—	1	31	31	31	0	0	31	0	—
Lulea	1	31	31	31	0	0	30	1	529	1	29	29	29	0	0	10	19	888	1	31	31	31	0	0	0	31	1126
Bredskar	2	31	28	0	0	13	0	0	—	1	29	26	16	0	17	6	0	—	1	31	31	31	0	31	0	0	—
Stockholm	1	31	31	15	0	31	0	0	124	1	29	29	29	0	28	1	0	237	1	31	31	31	0	27	4	0	308
Kalmar	1	31	21	12	3	19	0	0	76	1	29	29	21	3	29	0	0	158	1	31	31	7	20	17	0	0	197
Visby	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	79	0	0	0	0	0	0	0	0	133
Goteborg	0	0	0	0	0	0	0	0	—	0	0	0	0	0	0	0	0	55	0	0	0	0	0	0	0	0	62
Skelleftea	1	31	14	6	0	4	2	0	—	1	29	28	27	0	8	6	13	—	1	31	31	31	0	0	0	31	—
Roytaa	1	31	31	31	0	0	0	31	556	1	29	29	29	0	0	0	29	905	1	31	31	31	0	0	0	31	1159
Copenhagen	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0	0	27
Oslo	0	0	0	0	0	0	0	0	255	0	0	0	0	0	0	0	0	358	0	0	0	0	0	0	0	0	394

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 No. of days of pack-ice.
F No. of days dangerous to navigation, but assistance not required.
G No. of days assistance required.
H No. of days closed to navigation.
I Accumulated degree-days of air temperature (°C) where known.*

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

Book Reviews

'Discovery II' in the Antarctic, by John Coleman-Cooke. $5\frac{3}{4}$ in. × 9 in. pp. 251. *Illus.* Odhams Press Limited, London 1963. 25*s*.

The title of this book seems to imply that it is the story of one ship in one ocean. Perhaps its sub-title *The Story of British Research in the Southern Seas* gives a better idea of its scope, for it begins back in 1917 when thoughts about a post-war Britain were engaging the minds of the home government. One result of these deliberations was to appoint a committee to make "a serious attempt to place the whaling industry on a scientific basis". This was a project which faced enormous pratical difficulties but it was to come to fruition as the most comprehensive scheme of oceanographical research ever undertaken, to which today the National Institute of Oceanography stands witness.

This then is Mr. Coleman-Cooke's story, starting with, as he says, "A body of civil servants and scientists who, with the help of a sailor and an explorer, got down to business, bought a famous ship and appointed a leader."

The ship was the *Discovery*, already well known for her Antarctic work at the turn of the century with Captain Scott's first expedition. Early in 1925 about the time that she was bought, a scientific station was set up at South Georgia with the object of examining whale carcases and carrying out research into the habits of the whale. The overall project was given the name of '*Discovery* Investigations'.

A new, and smaller vessel was built to supplement the work. This was *William Scoresby*, a whale chaser type of vessel but equipped so that a small metal marker button could be shot into a whale's thick covering of blubber.

During the early years of the project, the movements of whales as recorded by the *William Scoresby* and the food resources of the sea itself, as investigated by *Discovery*, began to take on a broad and suggestive shape; this was the beginning of a scheme for the systematic farming of the sea, instead of merely hunting in it.

But the old *Discovery*, admirable as she was as an explorer's ship, capable of withstanding ice pressure for months if need be, was not up to the demands made of a research ship, which needs essentially to be capable of covering thousands of sea miles every year and to be a floating base for teams of scientists with their attendant requirements of bulky apparatus and laboratories. In 1927 therefore she was paid off having laid the foundations of a great enterprise. She was to make two further visits to the Antarctic on other business before she came to an honourable retirement in Kings Reach, River Thames.

She was replaced by *Discovery II*, the titular subject of this book, specially built, embodying the sturdiness of her predecessor with the modernity of the *William Scoresby* and equipped with laboratories, trawling winches and all the paraphernalia of a research ship.

The five commissions which she made in the Antarctic up to the beginning of the Second World War and the seven commissions, mainly whale marking expeditions, made by the *William Scoresby* in the same period form the greater part of Mr. Coleman-Cooke's book. The full story of those years and the enormity of the task accomplished can be found in the 32 volumes of *Discovery* Reports. But these reports have little or nothing to say about the dramas which are inseparable from the organisation and maintenance of ships over such a vast region or of the men who worked the plankton nets, the sea water bottles, or the echo sounder, which in those days was not the instrument that it is today. Nor do they have much to say about the crews that manned the ships. The rescue of two Americans who had made the first airborne crossing of the Antarctic continent and the adventures of a party of six marooned on a sub-Antarctic Island go unrecorded in the official records, as do also many other tales of courage and endurance which the author, from interview, personal diaries, reports and lectures has set down in his book.

The '*Discovery* Investigations' were naturally suspended during the Second World War, though at home the work on the accumulated data, complicated by the need

for evacuation to a safe place primarily for the preservation of valuable specimens (the author mentions that these were contained in no fewer than twenty-five thousand glass jars) went on. The two ships 'went to war' and their movements are, strictly speaking, outside the scope of this book. The author does, however, mention that in March 1940 *Discovery II* rescued 24 people from a torpedoed Danish ship. But, if the war had to be mentioned at all, the reviewer feels that he should have recorded that the ship, in the early morning of 6th June 1944, laid many of the buoys marking the swept channel across to Normandy for the allied invasion forces.

The direct biological research on whales went on after the war. *Discovery II* carried out one more Antarctic commission, in the course of which she made her second winter circumnavigation of the Antarctic continent. *William Scoresby* also carried out one more commission, which included a survey of the Benguela current.

The Antarctic expeditions came to an end in 1951 and the years of Antarctic research were broadened out into a survey of life in all the oceans, under the aegis of the newly formed National Institute of Oceanography. It is perhaps sad to dwell on some of the author's final paragraphs: "The nation which has done most to conserve the stocks of whales has virtually given up the business. . . . In what degree the nations have failed to implement the view of scientists, or how far the sceintists have failed to convince the nations is a subject for the historian of whaling rather than for the writer of this book. . . . How the information is used or disregarded is the responsibility of governments."

William Scoresby was paid off after 28 years of service and *Discovery II* found her work in warmer waters, on such diverse subjects as general oceanography, submarine geology and deep-sea photography. For a time during one of her lay-up periods, she was chartered by the Meteorological Office to replace one of the ocean weather ships.

Throughout their sea-going careers, both *Discovery II* and *William Scoresby* carried Meteorological Office instruments and were Selected Ships, as was the old *Discovery* when she pioneered the '*Discovery* Investigations' and as is the modern *Discovery* (miscalled by the author, *Discovery III*) now doing research work in the Indian Ocean. The Meteorological Office records have been much enriched by the meteorological logbooks of all these ships, in many instances containing unique observations.

Mr. Coleman-Cooke's book will be enjoyed by any seaman with a taste for reading of the sea and its mysteries away from the normal trade routes. His style is vivid and makes for easy reading. There are 24 really first-class photographs and short biographies of many of the seamen and scientists who went down south with the Investigations. Some of the latter will be known to our readers by virtue of their contributions to *The Marine Observer* or for their notes on ships' observations published in the "Marine Observers' Log".

L. B. P.

Mischief in Greenland, by H. W. Tilman. $8\frac{3}{4}$ in. $\times$ $5\frac{3}{4}$ in. pp. 192. *Illus.* Hollis and Carter, London, 1964. 25*s*.

This is Major Tilman's third book concerning his travels in *Mischief*, a one-time Bristol Channel pilot cutter, which for thirteen years from 1906 to 1919 was owned and operated by one William Morgan, who in the picturesque phraseology of those parts, became known as 'Billy the Mischief'. Tilman bought her in 1954 and a preface shows that since then he has, in seven cruises, sailed her a distance of more than a hundred thousand miles, visiting Patagonia, the Crozet and Kerguelen Islands and now Greenland. A previous book of his, *Mischief Among the Penguins*, was reviewed in the April 1962 number of this journal.

Major Tilman is essentially a mountaineer with a distinct leaning towards the unknown and unclimbed peak. "The sole object of the three long voyages I had made in *Mischief*", he says, "had been to combine sailing with climbing, the obvious

solution for a man who likes both and is reluctant to give up either." But "twenty thousand miles is a long way to go for the sake of a month or so spent climbing some obscure mountain. . . . It had seemed to me an intolerable deal of sea to one halfpennyworth of mountain", so in the summers of 1961 and 1962 he took *Mischief* north. *Mischief in Greenland* is the story of these two expeditions.

In 1961 *Mischief* sailed from Lymington on 14th May, eight days had passed before she reached Belfast to pick up the last member of the crew and it took her two further days to clear the north coast of Ireland. Thus did Major Tilman realise that he had sacrificed "fair winds, sunshine, flying fish and all other blessings of tropical seas" in favour of a venture more balanced as between sailing and mountaineering. It was not until 30th May that *Mischief* made a day's run of 120 miles with 94 miles on the following day. Major Tilman writes, "with Cape Farewell less than 1,500 miles away we began making absurd calculations, little thinking that another 30 days would elapse before we rounded that noted Cape". A glance at our climatological atlases will convince any mariner that there is little chance of a favourable sailing breeze on the passage from the North Channel to Cape Farewell and *Mischief* was no more fortunate than she could expect. But the long haul to windward eventually came to an end when the presence of icebergs showed her to have come under the influence of the east Greenland current which sweeps westward round Cape Farewell and, though the wind prevailed obstinately from the westward, on 29th June a landfall was made in dramatic circumstances. "We had little idea how near we were to some unknown part of a rock-bound and probably ice-bound coast towards which we were sailing in fog, surrounded by scattered icebergs. If we went about, as caution advised, we could steer only south. So we carried on and at 4 o'clock that afternoon our boldness or rashness had its unmerited reward. A vast berg looming up ahead obliged us to alter course to clear it and at that moment the fog rolled away. After a month at sea the dullest coast looks exciting, but a more dramatic landfall than the one we now made, both as to its suddenness and its striking appearance, could scarcely be imagined. Two or three miles ahead, stretching away on either hand, lay a rocky coast thickly fringed with stranded icebergs and backed by high barren mountains. Beyond the mountains and over-topping them was the faintly glistening band of the Greenland ice-cap."

On the morning of 4th July, *Mischief* arrived at Gothaab; four days for rest and replenishment and then northwards to Igalorssuit where the mountains called. This was a five-week period, mainly spent in one- or two-day climbs, returning to the ship and sailing round to the foot of another peak. This culminated in a two-night camp, 6,730 ft. up on Upernavik Island, where, the author says, they ought to have come first and established a base "instead of buzzing, as we had done, like elderly bees, from flower to flower."

The run home was made in 29 days, favourable winds making this run much less eventful than the outward passage, though on 15th September *Mischief* did strike the fringe of hurricane *Debbie* which wrought severe damage in Ireland, Wales and Scotland. But at the time, Major Tilman says, "We were out of reach of any shipping forecasts and happily ignorant of any hurricane being at large in the North Atlantic". He has printed the story of *Debbie* as we gave it to him when we subsequently discussed his experiences.

Part II of the book is devoted to *Mischief's* 1962 voyage in which Major Tilman, having found that "The west coast of Greenland can hardly be called remote and desolate, and it is far from being uninhabited" determined to try "the Canadian side of the [Davis] Strait where the Cumberland Peninsula is as desolate as man could wish, more or less uninhabited and besides that, mountainous". This venture, for which *Mischief* sailed from Lymington on 23rd May 1962 followed very much the pattern of the 1961 venture, though, mindful of the calms and northerly winds experienced in the Irish Sea on that occasion, this time she went straight out south of Ireland and the landfall was made in 23 days against the 35 days of the previous year. The year 1962 was a bad ice year, we had warned Major Tilman of this before

he left and he was thus not surprised when he encountered pack ice south of Cape Desolation. *Mischief* had one or two nasty experiences, admirably recounted, which led Major Tilman to have her slipped and her hull examined later on at Holsteinborg. Gothaab was again the first port of call and then up to Evighedsfjord and across to Exeter Sound and the beloved mountains.

The homeward passage was made in 34 days direct from Exeter Sound, almost without incident, though Major Tilman comments that he made the mistake of allowing himself to get to the eastward and thus amongst the ice again, before making sufficient southing; the darker nights, for it was now towards the end of August, made ice a greater hazard.

Mischief had kept a meteorological logbook for us and had rendered us great service by filling in our ice reports. She is not equipped with a radio transmitter and therefore the data which she accumulated could not be used in any forecast, but to her we are indebted for much valuable climatological information which would not otherwise be available, for the Davis Strait sees very little shipping.

Major Tilman has a most pleasing and entertaining literary style; he is not above self-criticism and his many reminiscences, references to other voyages and inexhaustible fund of quotations from other works make this an eminently readable and instructive book. Not without reason does the reviewer feel that *The Times* has called him "One of the most sensitive and entertaining ocean-going writers in the catalogue". The preface to the book states that in December 1963, after *Mischief* had made another voyage, not yet documented, she was surveyed and reported no longer fit for long voyages. The reviewer is happy, however, to have since heard from Major Tilman that the surveyors were too pessimistic and that when *Mischief* was hauled out her timbers below the water line were found to be quite sound. So, though it will be expensive to double the upper frames, she should still be good for a few more deep-sea voyages and we shall look forward to another book from the pen of this intrepid twentieth-century Elizabethan.

L. B. P.

Wind Driven Ocean Circulation, edited by Allan R. Robinson. 9½ in. × 6½ in., pp. 161. Blaisdell Publishing Company, New York, Toronto, London, 1963. 30*s*.

In recent years considerable progress has been made in the understanding of the mechanism of the general oceanic circulation as revealed, for example, in the predominating currents of our Marine Division atlases. The mathematical equations used by oceanographers are very similar to those of the meteorologist and just as difficult to solve. Therefore with the lack of data from the oceans, particularly below the surface, the understanding of phenomena like the equatorial counter current and the strong Gulf Stream appears to have defied the ingenuity of man for generations. However when there is a clear and striking phenomena like the strong predominating Gulf Stream off the United States that has been carefully studied assessments and approximations can be made producing tractable equations which fit in with the known circulations revealing the essential and non-essential physical processes. A small book edited by Allan R. Robinson of Harvard University received in the Marine Division contains in a single volume a great deal of theoretical work carried out mainly in the United States on the dependence of ocean currents upon wind. The title of the book is *Wind Driven Ocean Circulation* and it largely confirms that the large oceanic current circulations are largely wind driven; in particular the Gulf Stream is driven by energy taken up from the North Atlantic wind circulation. Conservation of energy and momentum, including that provided by the earth's rotation, large scale turbulence and advection of vorticity (the inherent rotary motion of water masses) are brought in to explain the main oceanic current systems including the Gulf Stream.

The early work that set these profitable lines of investigation going was carried out by Sverdrup using Pacific data within 25° latitude of the equator. He was able

to give a theoretical explanation of the equatorial counter current. Stommel, assuming a homogeneous ocean affected by an easterly wind in the south and a westerly wind in the north and using equations very similar to those of Sverdrup, showed that the conservation of mass associated with the earth's rotation requires the very strong flow in the Gulf Stream off Florida. Munk and Carrier building on the work of Sverdrup and Stommel with a more detailed analysis give a theory that predicts familiar currents like the Gulf Stream, Labrador and East Greenland currents, the North Atlantic drift and the equatorial counter currents. In addition their analysis suggests double circulations on the western side of the oceans over the subtropical atmospheric anticyclones. However, the magnitudes and current widths experienced are not well predicted by the theory.

J. T. Charney studied terms in the oceanographical flow equation expressing acceleration and deceleration of velocity along the line of current flow and improved the theoretical predictions of the distribution of velocity in the Gulf Stream.

The book contains papers by Fofonoff, Morgan and Carrier and Robinson and a final Editor's note by Robinson developing the ideas basically postulated by Sverdrup, Stommel, Munk and Charney.

This book is essentially mathematical although not impossibly so to those with some mathematical training. For the layman it could be too difficult but for those interested in modern ideas concerning ocean currents this group of papers represents fundamental progress in the understanding of oceanic current circulations. Therefore I cannot recommend the book to the average Merchant Navy Officer but for any officer seriously interested in ocean currents it is desirable that he should understand the arguments and the theories put forward in this book. For oceanographers or meteorologists this is a valuable reference tool. G. A. T.

Keoeeit—the Story of the Aurora Borealis, by W. Petrie. 10 in. × 7½ in. pp. 134. Illus. Pergamon Press, London, 1963. 35*s*.

This is one of the best non-mathematical scientific books the reviewer has read. One feels that a companion publication giving some of the more mathematical parts of the theories described, with references to the most important of the original researches, would give an almost perfect combination for all interested in these 'most spectacular natural phenomena'—the *aurora borealis*.

This is not a large book. The reading material is less than half an inch thick but it gives a concise, flowing, full description of the *aurora borealis* beautifully illustrated with line diagrams, photographs, reproductions of old prints and of paintings in colour by the author's wife.

Chapter 1 describes history associated with the aurora; it is pointed out that the early civilisations of Greece and Rome were not familiar with the displays, although they must have seen them on rare occasions. It is only in the higher latitudes that this phenomenon has become part of the mythology and history of the people. Aurora observations over the ages are listed with early theories. As explorers went further and further north interest in the aurora grew, attracting the attention of great men like Halley, Franklin and Dalton. Captain Cook of course observed the *aurora australis*.

Chapters 2 and 3 give the scientific significance of the aurora and a fascinating description of instruments and methods of observation (mostly American). There is sufficient material here to satisfy even the most enthusiastic reader. We are given descriptions of the all-sky camera, the spectograph, radar equipment, high altitude balloons, rockets and satellites and accounts of observations from large and small observatories.

Chapter 4 is to the reviewer the most interesting in the book. It gives and illustrates the letter code for the standard terminology for describing aurora. Those of us born and bred in the South of England can get from this chapter some idea of the majestic quality of the colour and scale of the displays from the coloured pictures and photographs. Colleagues in the Meteorological Office who have served

at Aberdeen and Lerwick Observatories assure the reviewer that they have experienced displays just as impressive as the photographs and pictures referred to. For example at Aberdeen the whole sky appeared to be covered by a great tent with red seams converging to the zenith which is a type of display not illustrated in the book and presumably not often seen in Canada.

Chapter 5 then follows giving the results of using cameras and systems of lenses to observe the location, movement and distribution of occurrence of aurora over the earth, showing their close association with the earth's magnetic field, and with the electrically charged layers in the upper atmosphere. This careful observation and recording of aurora has apparently gone on since 1726. The atmospheric and cosmic particles producing aurora have been observed at very great heights ranging from about 40 to 200 miles, and at even higher levels from about 400 to 650 miles above the earth's surface. Individual displays may extend over a depth of a 100 miles vertically and horizontally along a distance of 3,000 miles.

Chapter 6 shows how closely the occurrence of aurora is related to the state of the sun's surface and with the astronomical movements of the sun. It is likely that the aurora is influenced by the atmospheric tide which is also influenced by the sun. Although diurnal variation of aurora has been clearly established and variations of this with latitude have been observed the patterns are too complex to be associated with any systems of physical causes.

Chapters 7 to 9 are theoretical but quite lucid and take the reader over a wide range of atmospheric physics all of current interest in these days of satellites and rockets. The early laboratory work of pioneers like Sir J. J. Thompson and Lord Rutherford at Cambridge, using apparatus whose size can be measured in feet and inches, can be applied to phenomena working on a planetary and cosmic scale. Interesting theoretically predicted phenomena confirmed by satellites such as the Van Allen belts of charged particles that encircle the earth are described. The colours of the aurora also provide very interesting points of study for the spectroscopic physicist. An example of this is the intense red and green light produced by excited oxygen atoms in the rarefied atmosphere of the aurora but which are not seen in the light emitted by gas discharge tubes used in laboratory work at the surface.

The processes whereby charged particles are emitted by the sun and transmitted to the earth are also discussed.

This book thus covers in a pleasant way the modern concepts of the processes going on in the higher atmosphere and it is also attractive artistically and historically, particularly to mariners, who probably more than others, experience the splendours of the aurora.

G. A. T.

Personalities

OBITUARY.—We regret to record the death of LIEUTENANT COMMANDER W. H. CARR, R.N.R., our Merchant Navy Agent in the Humber area.

William Henry Carr was born in 1890 at Stockton on Tees and went to sea in 1906 in the barque *Wychwood* belonging to R. H. Gaymer of Sunderland, subsequently transferring to their barque *Windrush* in 1907. His brother was also serving his time in those two ships.

After passing for second mate, Carr went into tramp steamers in order to get his time in quickly for master. He subsequently served in the Clan line and shortly before the First World War he joined the Royal Mail Steam Packet company, the forerunner of the present Royal Mail Lines.

In 1914 he joined the Royal Naval Reserve as a temporary Sub-lieutenant and was first engaged on anti-submarine patrols, later being appointed to command a vessel in the Aegean Sea. One of his assignments during this period was to lay marks for the minelayers during the 1915 assault on the Gallipoli peninsula. After that war, Carr, now in command of a minesweeper, was engaged in clearing those same minefields.

On demobilisation he settled in Scarborough and became Lloyd's agent there: he came to Hull in 1928 and joined an insurance broking firm. In 1936 he became the Marine Division's agent for the Humber area, a post which he held until the outbreak of the Second World War when he again volunteered for Naval service. He was commissioned as a temporary Lieutenant R.N.R. and appointed to the Sea Transport Service. Promoted to Lieutenant Commander R.N.R. in 1940, he saw service in France, Greece, Crete, Turkey and Egypt; he was released in 1948.

His second spell ashore was as branch manager of a well-known rope firm. On retiring from this post in 1959 he again became our agent in the Humber area. During this time he specialised in the recruitment and encouragement of fishing trawlers and the present meteorological coverage of the high Arctic, though still far from complete, is largely due to his tireless efforts.

Carr was a member of the International Association of Cape Horners and a former member of the Hull Blue Water Club.

We offer our sympathy to his widow and to his son who, in the Shaw Savill Line, is one of our present voluntary observing officers.

L. B. P.

RETIREMENT.—COMMODORE R. LUNDY, O.B.E., R.D., R.N.R., recently retired as master of the *Camito*, and commodore of Elders and Fyffes' fleet.

Robert Lundy, a native of Northern Ireland, went to sea in 1913 with the Lord Line of Belfast, a company famous for its sailing ships. His first vessel was a steamer equipped with sails. He obtained his Master's Certificate in 1925 when 25 years old and joined Elders and Fyffes in the same year. He received his first command, the *Zent*, in 1948, and then followed the *Golfito* and for the last six years the *Camito*.

Commodore Lundy had the unusual distinction of having a marker buoy named after him. It is the Lundy beacon at Port Antonio. He pressed the nautical authorities for years to place a beacon to facilitate ships entering or leaving this tricky and narrow entrance; they finally agreed to do so, and he helped to work out the position. At first the authorities gave it a local name, but a few months ago, on hearing of his impending retirement, they re-named it the Lundy Beacon.

Commodore Lundy served in the Royal Naval Reserve in both World Wars. For part of the last war he was commodore of coastal convoys, and for his devotion to duty he was awarded the O.B.E. in 1942.

His record with the Meteorological Office dates back to 1935, and in 12 years he has sent in 28 logbooks, 3 of which were classed 'excellent'.

We wish him health and happiness in his retirement.

E. R. P.

RETIREMENT.—CAPTAIN S. JONES, R.D., R.N.R., recently completed his last voyage in command of the *Queen Mary*, and retired from the Cunard Steamship Company on January 31st.

Sydney Jones is the only former White Star officer to command the Queen liners. In a sense he represents the end of an era, for at the time of the Cunard-White Star merger in 1934 he was the most junior of the White Star Junior Officers to turn over to the new company.

A native of Birkenhead, Captain Jones went to sea in 1916 as a cadet in the Ellerman Hall Line. His first ship, the *City of Florence*, was torpedoed in the Bay of Biscay in July 1917. He obtained his Master's Certificate in 1924 when he was 23, and joined the White Star Line in 1925, serving in the *Canopic*, *Majestic*, *Homeric*, *Megantic* and *Doric*. After the merger he continued to serve with Cunard-White Star and received his first command, the *Arabia*, in 1953. Two years later he was appointed to the *Parthia*, and in 1960 to the Queens as relieving master. He has commanded all the present Cunarders except the *Carmania*.

In the last war Captain Jones commanded a French sloop, *La Capricieuse*, on convoy duties and patrols. He also held shore appointments for the Tyne and Western Approaches.

Captain Jones's record with the Meteorological Office dates back to 1925, and in 18 years he has sent in 65 logbooks, 38 of which were classed 'excellent'. He also received 3 Excellent Awards for his valuable work in 18 different voluntary observing ships.

We wish him health and happiness in his retirement. E. R. P.

RETIREMENT.—CAPTAIN H. B. W. CRAY, M.B.E., completed his last sea voyage on 19th February 1964, when he sailed into London in s.s. *Kenya.*

Henry Burnard Wilson Cray was born in Newcastle-on-Tyne in 1907 and commenced his sea-going career as an apprentice with the Nourse Line in March 1924.

He joined the British India Company as Fourth Officer of the *Manora* in April 1928. Passing through the usual grades, Captain Cray was appointed to his first command, the *Ipola*, in May 1954, and subsequently commanded *Uganda*, *Resurgent*, the troopship *Dunera*, and since June 1959, the *Kenya.*

Following three years' service as Second Officer and Troop Officer in the troopship *Nevasa*, Captain Cray was appointed Troop Officer of the *Dilwara* in December 1935. *Dilwara* was one of the first ships specially constructed as a troopship for charter to H.M. Government. He was promoted to Chief Officer of the *Dilwara* in March 1941, and continued in this appointment until April 1952.

Captain Cray's wartime service included the support of operations in Greece, Madagascar and Italy, as well as Japanese-held territories in South-East Asia. The *Dilwara* was frequently attacked by enemy aircraft during her Mediterranean service but without damage.

Captain Cray was awarded the M.B.E. in May 1937 for his service as Troop Officer in Transports employed by His Majesty's Government.

Captain Cray's association with the Meteorological Office commenced in 1947, and in 14 years he sent in 34 logbooks of which 22 have been classified as 'excellent'; he received Excellent Awards in 1960 and 1962.

We wish him health and happiness in his retirement. J. C. M.

RETIREMENT.—CAPTAIN J. C. DAWSON, D.S.C., R.D., completed his last voyage at sea with the arrival at Liverpool of the *Sylvania* on 28th March last. After nearly 46 years at sea, 34 of them with the Cunard Line, he retired on the 31st March 1964.

James Crosbie Dawson began his sea career with the Lamport and Holt line, joining them as an apprentice in 1918, his first ship being the *Raeburn.* Passing for second mate in 1922 and for Master in 1927, Captain Dawson remained with Lamport and Holt until 1930, when he joined the Cunard Line as 3rd Officer of the *Samaria.*

At the outbreak of war in 1939 Captain Dawson was called up for service with the Royal Naval Reserve and served in Submarines, Armed Merchant Cruisers, and Frigates, and was awarded the D.S.C. for his services.

With the cessation of hostilities, Captain Dawson returned to the Cunard Line and was appointed to his first command, the *Fort Cadotte*, in 1949. He subsequently commanded many Cunard ships, including *Assyria*, *Samaria*, *Mauretania*, *Brittanic* and *Sylvania.*

Captain Dawson's record with the Meteorological Office dates back to 1923 whilst serving in *Bernini* and in 20 years observing he has sent in 72 logbooks, 34 of which have been classed 'excellent'. He received Excellent Awards in 1959 and 1963.

We wish him many happy years of retirement. J. R. R.

ADDENDA

The telephone number of Port Meteorological Officer, Glasgow, is: Glasgow City 4379.

Fleet Lists

GREAT BRITAIN (Information dated 31.3.64)

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

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

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

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

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

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

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

Selected Ships

Name of Vessel	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Accra	17.1.64	D. Coughlan	M. Haig, A. Hartwell, D. Mullan	J. Stuart	Elder Dempster Lines
Achilles	12.12.63	R. G. Boyd	P. A. Read, W. B. Johnson, D. B. Chambers, R. K. McDonald	B. V. Jones	A. Holt & Co.
Adelaide Star	20.9.63	J. McInnes	P. G. W. Hutchings, M. B. Foster, M. Frazer	J. J. Kennedy	Blue Star Line
Aden	13.12.63	I. M. Adie	P. D. Curtis, D. Gow, I. B. Cook	R. J. E. Chapman	P. & O.-Orient Line
Adventurer	6.11.63	L. J. Sharman	P. Clements, J. M. Procter, D. A. Holbert, P. G. Rylands	P. Goulden	Harrison Line
Afric	29.10.63	R. J. Welch	L. J. Harrison, W. Wells, B. Lloyd	H. D. Bray	Shaw Savill Line
Ajana	8.5.63	T. M. Hastings	R. M. Saunders, D. L. D. Llewelyn, K. Oldridge	R. A. Reid	Trinder Anderson & Co., Ltd.
Albany	2.12.63	C. D. Ratcliff	M. K. Molineaux, J. W. E. Thwaites, R. A. M. Brown	D. M. Watson	Royal Mail Lines
Albistan	17.6.63	D. L. Cook	G. D. Downes, D. A. Wright, C. J. McKeon	—. Rogers	Strick Line
Aldersgate	13.12.63	J. B. Wyness	P. R. Griffiths	J. Rush	Silver Line
Alert	*	J. P. Ruddock	D. Alford, D. MacDonald, A. Fulton, J. Lowe	R. MacDonald	H.M. Postmaster General
Alva Bay	29.12.60	R. G. Roberts	E. Thiebe, E. Fehr, A. Philippot	J. P. Christie	Alva S.S. Co., Ltd.
Amalric	10.3.64	F. Charnley	D. Sweet, I. S. M. Conde, R. M. Newton	R. G. Davry	Shaw Savill Line
Amazon	3.10.63	G. S. Grant	B. A. Darling, W. Image, I. Farquharson, R. Burnett	F. Goodall	Royal Mail Lines
Amoria	1.1.64	R. F. Garrod	J. A. Marshall, A. Charlesworth, R. G. Taylor, F. R. Keer	E. C. Mackenzie	Shell Tankers (U.K.), Ltd.
Andania	19.2.64	J. G. Bradley	F. A. Wood, N. Doughlass, R. Stansfield	A. G. MacLean	Cunard Line
Andes	20.3.64	L. T. Peterson	A. F. Hawkins, P. Barker, A. Milward, A. Everett	G. Sewell	Royal Mail Lines
Apapa	25.6.63	J. A. Brooke	A. G. Maxwell, F. T. Bullen	G. Lilling	Elder Dempster Lines
Aragon	10.1.64	W. S. Thomas			Royal Mail Lines
Araluen	27.2.64	H. G. Chafer	H. P. Mann, J. Holder, P. Butcher	B. Kenny	Trinder Anderson Co., Ltd.
Aramaic	11.12.63	B. Hammond	D. M. Cole, B. E. Collingwood, A. G. Ening, W. A. Murison	F. Kirk	Shaw Savill Line

Argentina Star	19.3.64	E. R. Pearce, O.B.E.	D. Smith, P. Keenan, R. Mayes	P. Hankinson	Blue Star Line
Argyllshire	28.1.64	I. C. Scott	B. L. Reid, I. M. Shearer, O. T. Ross	G. Martyn, M.B.E.	Clan Line
Arlanza	21.1.64	T. W. F. Bolland	A. E. Manser, W. Carruthers, J. O. Jardine	F. R. Dunk	Royal Mail Lines
Arthur Albright	24.3.64	S. Bristow			James Fisher & Co., Ltd.
Asphalion	17.2.64	J. T. Knox	J. A. C. McGregor, B. O. Martin, R. H. L. Henry	J. Williamson	A. Holt & Co.
Astyanax	24.7.63	G. W. Povey	C. K. Harber, R. A. Mason, G. Owen	E. E. Milburn	A. Holt & Co.
Athelcrest	6.9.63	J. M. Lloyd	W. A. Woodward, N. A. Porter, J. Sensier		Athel Line Ltd.
Athelmere	*	C. Roberts	P. Satchell, R. Hamilton	M. Scully	Athel Line Ltd.
Athelprince	7.2.64	J. P. Coffey	J. McCourt, D. C. Williams, R. Davies, J. H. Nelson	R. Cooper	Athel Line Ltd.
Athelsultan	2.3.64	D. G. Billing	J. E. Bolton, J. A. Hagger, R. P. McDonnell	C. McCusker	Athel Line Ltd.
Athenic	4.12.63	G. Heywood	G. H. Lowis, B. Hills, R. Gilliland, H. E. Williams	H. Knight	Shaw Savill Line
Athlone Castle	7.5.63	J. D. B. Fisher			Union Castle Line
Aureol	7.1.64	W. E. Humphreys	N. J. Powell, H. Hathway, D. Banbury, E. F. Boyd	J. Noonan	Elder Dempster Lines
Australia Star	15.11.63	J. T. Lowe	R. J. Thake, D. S. Newbold, J. D. Mann, D. C. Allison	L. Cooper	Blue Star Line
Australind	31.1.64	J. D. Blake	H. Goulden, T. M. Dene, A. Braddock	D. W. Cross	Trinder Anderson & Co., Ltd.
Author	27.9.63	W. E. Williams	R. T. Platt, C. W. Kirkby, J. Dwyer, J. A. Billington	T. A. Harris	Harrison Line
Ayrshire	13.12.63	P. Macmillan	T. M. Johns, A. Sillars, A. Plant, H. Rissor	G. MacIndoe	Clan Line
Avon Ranger	19.3.64	L. H. Hillman	P. A. E. Charlton	P. B. Killeen	London Overseas Freighters, Ltd.
Baltistan	22.8.63	E. C. Thompson	C. Baker, M. Robinson, C. Morris	A. Stevens	Strick Line
Bamburgh Castle	8.1.64	P. L. Johnson	D. Simpson, B. Bagnall, J. Conn, C. Paterson	S. J. Bowes	W. A. Souter & Co., Ltd.
Bankura	13.9.62	D. S. Hutton	J. C. Taylor, P. J. Pederson, J. Evans, T. E. Roderick	D. Wilson	British India Line
Baron Ardrossan	18.3.63	T. B. McLeod	D. M. Cowell, T. Gilmour, J. Kirk	D. D. Rocca	Hogarth Line
Barrister	3.2.64	R. Sutcliffe	I. Barbour, R. Myles, R. French, E. Williams	G. Ferranti	Harrison Line
Baskerville	6.6.63	R. J. Lungley	R. Anderson, R. Goodfellow, M. Forwood, C. Simmons	R. Thomson	Canatlantic Ltd.
Bassano	26.3.64	B. Waldie	G. Bell, R. W. Lawson, A. Smith	W. Cartwright	Ellerman's Wilson Line
Beaverash	30.12.63	R. Walgate	P. R. Trehearne, P. Denholm, M. Brewer, J. Griffin	R. Cockett	Canadian Pacific Line
Beaverbank	28.2.64	W. Ellarby	W. H. Martin, A. E. Kitchingham, E. J. Ray	J. J. G. Noone	Bank Line
Beaverelm	17.2.64	W. E. Williams	P. Trehearne, B. Clark, P. Denham	G. Arnup	Canadian Pacific Line
Beaverpine	16.10.63	J. A. N. Bezant	T. B. Pool, G. Hughes-Jones, C. E. Turner, S. S. Shaw, G. Carter, N. Hebden	S. R. Sutherland	Canadian Pacific Line
Benarty	19.3.64	C. Donnelly	J. F. Craigen, A. J. Ross, D. Barr	W. Paterson	Ben Line
Bencleuch	*	R. S. Lumsden	R. Griffin, R. Ansell	J. M. Alston	Ben Line
Benhope	29.11.63	W. D. Cowie	T. S. Sutherland, A. Syme, R. Aiken	N. McKenzie	Ben Line
Benlomond	*	A. Sinclair	M. MacDonald, E. Travers, D. Staff	W. G. Watt	Ben Line
Benrinnes	7.2.64	R. Griffiths	W. C. Mackay, J. N. Milne, I. D. Fletcher	W. Parkinson, M.B.E.	Ben Line
Benvannoch	7.10.63	W. J. Kinnaird	I. Barclay, A. Kidd, W. Milne	I. Barclay	Ben Line
Bhamo	31.1.64	J. Gibson	A. Temple, J. Barrat, A. McVitie	L. Cameron	Henderson Line
Bishopsgate	16.9.63	H. H. Howie	G. Salter, N. Tuddenham, J. Reith, R. A. Jones	R. Ryan	Silver Line
Black Prince	13.3.64	E. A. Kemp	M. W. Connelly, G. Waite, R. A. Gale, B. C. Hodges	S. Marchant	Prince Line
Bombala	24.9.63	F. A. Everret	R. Newbery, H. Chambers, A. Barker, R. Strudwick	E. Rogers	British India Line
Booker Vanguard	*	S. Armitage	G. R. Cowap, G. Stevens, R. Williams	A. Moss	Booker Line
Booker Venture	13.1.64	J. A. Carter	C. I. B. Paton, K. Jones, R. Sutton, S. Collins	D. MacRae	Booker Line
Braemar Castle	17.1.64	J. B. James	G. M. Williams, A. A. Parker, D. E. Wiles	S. P. C. Harden	Union Castle Line
Brandon Priory	*	W. Brett	D. P. Feasey, R. Lancaster, D. Brand, M. Porter	A. Law	Warwick Tanker Co., Ltd.
Brasil Star	14.1.64	D. MacPhail	S. V. E. Gallon, J. Gathercole, R. E. Skinner	W. J. Rignall	Blue Star Line
Bravo	11.2.64	J. A. Etches	S. Gallon, M. A. Morrill, J. P. Morton	H. Wilton-Gleisher	Ellerman's Wilson Line
Brecon Beacon	*	G. A. Austen	H. Carlisle, I. Kemp	P. J. Boys	Medomsley Steam Shipping Co., Ltd.
Breconshire	6.2.64	F. M. Curphey	K. Swales, M. J. Godbehear	B. J. Potter	Glen Line
Bristol City	24.3.64	W. H. Stoodley	K. D. Miller, A. F. Ashton, P. T. Barling	T. M. Jenkins, M.B.E.	Bristol City Line
British Ambassador	23.12.63	E. J. Simpson	E. C. Heppenstall, G. Collins, R. G. McConnach, M. J. Cannell	I. J. Newbury	B.P. Tanker Co., Ltd.
British Bombardier	*	W. Jackson	R. D. Othick, C. O. Brown, G. H. Smith, D. Brown	A. C. Roberts	B.P. Tanker Co., Ltd.
British Cygnet	*	N. Johnson	J. Aitchison, S. Hunter, N. Cheshire	M. Linn	B.P. Tanker Co., Ltd.

Name of Vessel	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
British Freedom	12.12.63	F. W. Mann	M. C. Hollinrake, D. G. Dixon, A. Smith	M. Prestwood	B.P. Tanker Co., Ltd.
British General	3.2.64	P. Edmondson	H. J. Shields, H. J. K. Rodway, K. R. Holmes	D. Younghusband	B.P. Tanker Co., Ltd.
British Resource	8.1.64	J. W. P. Foster	D. Bowley	G. B. Orr	B.P. Tanker Co., Ltd.
British Sailor	10.1.64	C. V. Harrison	D. Southon, —. Murphy, —. McKay, R. Thomas	T. J. O'Shea	B.P. Tanker Co., Ltd.
British Splendour	11.10.62	L. McRitchie	R. F. Shaw, W. J. Sayer, M. S. Jefferson	M. D. Cooper-Mitchell	B.P. Tanker Co., Ltd.
British Strength	17.12.63	G. Dowson	P. R. Marriott, B. G. Roberts, E. Coates, W. C. Matthews	J. Power	B.P. Tanker Co., Ltd.
British Trust	29.7.63	C. V. Harrison	J. A. Maslen, G. Luff	P. Abdey	B.P. Tanker Co., Ltd.
Bulimba	9.3.64	D. C. Murison	E. G. Rowley, W. Herman, M. A. Ruddlesden, P. Farrell	J. A. Rankine	British India Line
Cairndhu	18.7.63	G. H. Percy	P. Wallace, A. Quinan, J. Liston, A. Stuart	J. Richards	Cairn Line
Cairnforth	5.3.64	J. Hogg	R. Wilson, K. B. Lowery		Cairn Line
Cairngowan	21.10.63	I. Foster	R. Andrews, G. Ross, J. Jackson, M. W. Robson	E. Johnson, D. Davies, T. O'Brien	Cairn Line
Calchas	30.1.64	R. C. Riseley	M. G. Collins, J. N. Binnes, G. P. Home, P. Dawson	D. C. Ogden	A. Holt & Co.
Caledonia	29.11.63	J. L. Gibson, O.B.E.	W. Stockley, N. Cameron, A. Michie	J. MacConnell	Anchor Line
Caltex Canberra	24.3.64	R. Napier	W. G. M. White, J. Lees, K. Maxwell, P. Heckingbottom		Overseas Tankship (U.K.), Ltd.
Caltex Edinburgh	18.9.63	E. C. Adams	J. Brewster, R. C. White, N. Clay, R. R. Russell	S. J. Duffy	Overseas Tankship (U.K.), Ltd.
Caltex London	18.10.63	D. Stokoe	C. H. Scudahore, D. J. Read, B. N. Loane, J. Nicholson	J. Denman	Overseas Tankship (U.K.), Ltd.
Caltex Saigon	*	A. Anderson	W. A. Hursey, E. T. Turner, D. T. McLellan	—. MacDonald	Overseas Tankship (U.K.), Ltd.
Camito	30.1.64	R. W. Lundy	J. S. Dudley, J. Robinson, O. Springett	A. C. Knight	Elders & Fyffes
Cannanore	10.1.64	R. Bullock-Webster	J. S. Hanna, N. M. Adamson, A. H. Falkner	D. I. McLean	P. & O.-Orient Line
Canopic	9.8.63	T. H. Davies	P. Morgan, K. Newton, R. Pedlow	J. Wilson	Shaw Savill Line
Canterbury Star	6.11.62	G. E. Waddell	K. S. Devo, R. Fozard, D. Filmer, M. Probert	A. McFaul	Blue Star Line
Cape Franklin	17.3.64	C. G. Mallet	G. Anderson, R. Marshall, P. Richardson	D. McSweeney	Lyle Shipping Co., Ltd.
Cape Nelson	12.12.63	R. D. Love			Lyle Shipping Co., Ltd.
Cape Sable	7.10.63	R. O. Allen	H. Weddel, R. Wilkinson, M. Power	N. A. Lawrence	Lyle Shipping Co., Ltd.
Capetown Castle	26.3.64	A. J. Hart	J. Wise, A. J. Blackler, D. C. Peters	T. Peake	Union Casle Line
Cardiganshire	21.1.64	A. Lane	J. Carter, C. M. Sandy, G. C. Downie	C. Knibb	Glen Line
Carinthia	2.12.63	W. E. Warwick	R. A. Woodall, G. Cooke, R. T. Dootson	I. MacDonald	Cunard Line
Carmania	25.11.63	W. J. Law	C. C. Walker, P. Walton, J. West, M. J. Pratt	C. H. Pennington	Cunard Line
Caronia	11.1.63	G. T. Marr, D.S.C.	M. W. Roberts, P. Seymour, H. Smith, M. Doyle	G. Parsons	Cunard Line
Carrigan Head	9.8.63	E. G. Davey	H. Thompson, W. Niblock, C. Stewart	R. M. Stirling	Head Line
Caslon	7.10.63	T. O. Hodgeson	M. J. Forwood, N. Smith, J. Tait	W. D. Brown	Canatlantic Ltd.
Caxton	*	J. G. Wilson	D. Lorrimer, C. Keenan, I. C. Rolls	—. Edwards	Transatlantic Carriers, Ltd.
Ceramic	28.1.63	N. S. Milne	M. A. Culley, C. Wynne-Eyton, M. Godfrey	R. O'Shaughnessy	Shaw Savill Line
Chakla	*	P. M. Pitcairn	D. M. Ledger, R. J. Dorman, J. W. Tanner	J. F. Carty	British India Line
Chantala	29.7.63	H. N. Severs	—. Woolley, —. Hunt, —. Fisher, —. Turner	J. W. Fields	British India Line
Cheshire	1.1.64	L. H. Sheldrake	G. F. Dobson, R. M. S. Woodham, R. M. Ellison, D. C. Mon	R. A. Waller	Bibby Line
Cheviot	13.11.63	T. G. Goldie	B. G. Longley, D. Mustarde, A. McGrath, C. A. Hilton	L. G. Cuthbert	Bamburgh Shipping Co., Ltd.
Chindwara	15.10.63	F. A. J. Downer	B. R. Sanderson, A. P. Miles, J. Betterton, P. R. White	J. Cooper, J. Aspinall	British India Line
Cilicia	17.1.64	W. MacVicar	D. K. G. MacArthur, D. Bisset, W. Murray, J. Currie	S. J. D. Taylor	Anchor Line
City of Birmingham	12.8.63	G. G. Francis	C. S. Clark, P. G. Pike, P. Ballantyne, T. Mallory	R. Kennedy	Ellerman Lines
City of Brisbane	5.4.61	W. Kerr	A. J. Evans, B. Butler, D. M. P. Lynch, P. K. Leatham	G. Barlow	Ellerman Lines

City of Brooklyn	•	K. B. B. James	R. Owens, J. Cowper	W. A. Rance	Ellerman Lines
City of Chester	12.11.63	J. T. Waddleton	F. D. McKenna, M. P. Lamble, J. Bradley, B. S. Nibbs	M. Gannon	Ellerman Lines
City of Coventry	11.10.63	T. H. Fairhurst	C. Watt, M. Graham, D. Kennedy, J. Burtt, T. Lyons, G. T. Taylor	A. Pritchard, K. Bennett	Ellerman Lines
City of Glasgow	31.12.63	B. T. Wortley	M. W. N. Smith, R. S. Purkiss, D. M. Bridge	C. B. Smith	Ellerman Lines
City of Johannesburg	2.7.63	H. E. Roberts	M. Thorp, J. L. Blanch, R. Jones, A. Cowie	D. McMahon	Ellerman Lines
City of Khartoum	14.1.64	P. S. Morrison	K. B. Leech, W. S. Coutts, J. M. Campbell, A. H. Goudie	J. F. A. Sharples	Ellerman Lines
City of Liverpool	24.9.63	T. S. Dennis	D. W. Pounder, R. Hardy, R. F. Bailey, W. G. Wilson	P. B. Mooney	Ellerman Lines
City of London	16.9.63	R. W. Tyrrell	K. El'Esedy, J. B. Pendry, D. Jamieson, G. Robertson	H. Holdridge	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	18.12.63	J. W. E. Caffyn	C. G. R. Spencer, T. R. M. Lane, A. B. Vaughan	J. M. Balfe	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	15.1.64	T. H. Fairhurst	J. G. Tew, J. M. Bradley, T. W. Fitchet, O. Henderson	E. B. Bridgeman	Ellerman Lines
City of Pretoria	26.8.63	R. H. Broadbent	C. J. Pickering, J. Rolliston, J. B. Smith, H. Owen	D. Foster	Ellerman Lines
City of Swansea	1.1.64	D. Quinn	M. Woodroffe, J. Katz, J. Drury, W. Locker	P. Balzian	Ellerman Lines
City of Wellington	1.7.63	E. M. Jenkins	M. J. Raison, T. Lane, J. Pearsall	D. L. Hopkins	Ellerman Lines
City of Winchester	24.3.64	J. Ingoldsby	R. H. Nightingale, T. H. Owen, F. Beaufort	P. Hogan	Ellerman Lines
Clan MacDonald	28.1.64	H. D. T. Lockyer	C. MacIver, D. Barnsley, M. Jackson	D. Laing	Clan Line
Clan MacDougall	29.8.63	R. B. Linsley	A. D. Stewart, R. D. Brown, J. A. Swindlehurst	G. E. Randall	Clan Line
Clan MacGillivray	15.11.63	F. H. S. Petherbridge	R. Harden, J. K. Currie, C. F. Knott	G. A. P. Galbraith	Clan Line
Clan MacGowan	14.1.64	C. M. Powell, M.B.E.	G. R. Spittal, P. C. Byrne, J. R. Hobkirk	S. Joice	Clan Line
Clan MacGregor	1.1.64	A. M. Kennedy	R. S. Grant, R. E. Todd, P. A. MacNiven	E. I. Kelly	Clan Line
Clan Macilwraith	29.7.63	K. C. Simpson	D. M. Grant, G. S. Gann, G. R. Spittal, D. R. Youles	W. Saville	Clan Line
Clan Macindoe	21.10.63	L. Pogson	J. Conacher, W. Marshall, A. R. Macintyre, J. Wilcock, M. J. Gardner	J. Blackwell	Clan Line
Clan Maclaren	29.7.63	W. J. Freestone, M.B.E.	A. Rawlins, A. Terras, B. Fairweather	T. C. Duncan	Clan Line
Clan MacLay	6.3.64	S. R. J. Woods	G. H. Watt, D. L. Bark, R. A. G. Simmonds, I. N. Scott	M. E. Mercer	Clan Line
Clan MacLean	24.3.64	A. G. Beynon			Clan Line
Clan MacLeod	28.10.63	R. Harber	M. B. Fowkes, W. Maltman, A. B. Wright, P. R. Lawrence	M. Cain	Clan Line
Clan MacNab	1.1.64	J. G. Smith	M. C. Banbury, P. Gnanendran, R. W. Grant, C. J. Abbott	R. W. Moore	Clan Line
Clan MacNair	11.11.63	J. Browne	P. B. Bagley, G. A. Findlay, J. D. W. Chapple, J. L. Cameron	J. K. Paterson	Clan Line
Clan MacTavish	26.2.64	C. A. Thomas	M. B. Whitford, R. P. Royan, J. W. Costley, H. Urry	P. Entwisle	Clan Line
Clan Sutherland	24.1.64	A. F. Banks	R. A. Hunter, A. A. Graham, R. R. MacDougall	W. Gay	Clan Line
Clan Urquhart	17.7.63	T. R. Halliday	P. C. Howard, C. Thomson, A. R. Collier, O. T. Ross	P. Wiggins	Clan Line
Colina	13.3.64	W. F. Joyce	D. Naismith, P. Telford, A. G. M. Michie	J. Bailey	Donaldson Line, Ltd.
Corinaldo	10.1.64	S. P. Ewing	I. Morrison, R. S. McLundie, J. MacDonald, W. Woodger	J. C. Martin	Donaldson Line, Ltd.
Corinthic	22.1.64	H. O. V. Andersen, M.V.O.	M. B. Sandell, J. Richmond, M. Coghlan, M. Lacey	H. Polkinghorne	Shaw Savill Line
Cornwall	31.1.64	W. Dan	T. Wright, H. Harkins,	I. Cross	Federal Line
Cortona	31.10.62	R. Allan	D. C. McGugan, A. T. Johnston, H. J. Moss	W. S. Stone	Donaldson Line
Cotopaxi	17.9.62	R. B. Bryant	—. Leewright, D. Peacham, J. Hurley, —. Ellis	M. Garrett	Pacific S.N. Co., Ltd.
Cretic	23.8.63	V. H. Vizer	P. V. Haswell, A. F. Pitt, J. Calvert	E. Cathcart	Shaw Savill Line

Name of Vessel	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Crinan	21.10.63	R. J. Buckley	D. MacDonald, P. Kilvington, T. K. Whyte, W. K. McAuslane, N. C. Kerr	K. Daly, P. M. Hodgson	J. & J. Denholm, Ltd.
Crofter	20.1.64	H. G. Skelly	H. Traynor, T. Slaughter, F. Quick, J. Heppard	J. A. L. MacDonald	Harrison Line
Crystal Bell	11.9.63	R. M. Pitt	C. E. Houghton, J. Kirkman, A. Taylor	J. G. McConnell	Sugar Line, Ltd.
Crystal Cube	*	K. R. MacKenzie	B. MacKay, N. Lancaster, H. H. Scally	A. Monaghan	Sugar Line, Ltd.
Crystal Jewel	*	D. Patrickson	M. J. Wareham, B. Bhattacharjee, M. D. Price	—. Aust	Sugar Line, Ltd.
Cumberland	9.10.63	S. W. Lambrick	S. J. Dobell, J. P. Crowder, A. W. Cripps	D. R. Lake	Federal Line
Cuzco	10.9.63	T. Wilcockson	P. Howes, M. Llewellyn, J. Davie		Pacific S.N. Co., Ltd.
Cymric	4.12.63	G. Conolly, D.S.C.	G. R. Crease, C. R. Downes, G. E. N. Holmes, W. G. Lockie	J. J. Cameron	Shaw Savill Line
Dalesman	*	W. S. Eustance, O.B.E.	A. G. Hill, J. Kaighan, P. MacParlin	J. Cooper	Harrison Line
Darro	18.11.63	M. Larrive	P. A. Brown, B. Hotter, M. Baskerville, J. Escolme	A. Chalmers	Royal Mail Lines
Debrett	4.6.63	D. S. Leicester	J. J. Barrowcliffe, F. Boden, M. Cawood	W. Thomson	Lamport & Holt Line
Delphic	28.2.64	T. de M. Ogier	T. M. Tyler, E. D. Buckle, P. E. Storey	F. Sellen	Shaw Savill Line
Denbighshire	10.3.64	C. R. B. Goodman, M.B.E.	B. Tang, P. D. Roberts, P. Hamilton		Glen Line
Deseado	16.3.64	J. Fox	R. Little, E. Long, F. G. Nickson, J. Evans	D. Franklin	Royal Mail Lines
Devis	*	J. I. Jones	D. J. Owen, M. P. Roberts, B. Mann	F. Brady	Blue Star Line
Devon	11.12.63	I. C. Davison	D. J. Southworth, N. H. Coupland, D. Davies	M. Cull	Federal Line
Devon City	13.2.64	J. D. Lloyd	D. B. Wootton, G. F. Ellerby, B. Jones	J. S. Louden	Sir Wm. Reardon Smith & Son
Devonia	29.11.63	Commodore B. A. Rogers, O.B.E., D.S.C.	M. F. Davison, D. M. Ledger, P. J. Simms	D. C. M. Turner	British India Line
Diomed	28.2.64	W. T. D. McMillan	E. J. Watterson, I. K. Conroy, D. Hamilton, I. H. Morris	R. B. Paley	A. Holt & Co.
Discovery	16.12.63	C. Alexander	J. A. Scott, L. Swanson, E. Anstead	I. M. Champion	National Institute of Oceanography
Donegal	20.9.63	R. Wilcocks	P. J. Stevens, S. R. Cottell, W. Cowan	A. Worthington	Trinder Anderson & Co., Ltd.
Dorset	2.12.63	J. S. Laidlaw	A. P. I. McGuigan, A. Aston, G. Morris, P. Wright	A. Hirst	Federal Line
Drina	9.12.63	A. J. G. Barff	W. Image, R. Pennington, C. Earl, P. Brachor	R. Stuart	Royal Mail Lines
Dryden	6.1.64	N. L. Mylchreest	W. A. Cuthill, W. E. Roberts, W. D. Jones	B. D. Fletcher	Lamport & Holt Line
Dukesgarth	20.1.64	J. P. Waldock	A. Reay, D. Cory, A. J. Stuart, R. Hymes	P. A. Dunne	Wm. Cory & Son, Ltd.
Dunedin Star	19.8.63	R. H. Stark	R. Drakes, J. Rawding, P. Birkenhead	G. Morrison	Blue Star Line
Dunera	28.10.63	R. Baker	R. Beedel, R. Worthington, M. S. Heasman	M. R. Sturgess	British India Line
Durham	26.2.64	J. D. Guyler	B. C. Davis, R. B. Blood, D. Watt, W. N. J. Drummond	A. McInnes	Royal Mail Lines
Eden	24.5.62	R. D. Jones	M. R. Eden-Smith, J. C. Jardine, G. B. Panes, P. Campbell	J. Duignan	Royal Mail Lines
Edenmore	24.3.64	A. L. Wiles	J. Barton, J. S. Rutherford, P. Bennison	K. Jenkins	Furness Lines
Edinburgh Castle	2.9.63	R. A. D. Cambridge	I. McKendrick, J. Grieves, D. Cook, H. Walker	J. H. W. Summers	Union Castle Line
Edward Wilshaw	7.10.63	G. T. Robinson	A. Sutherland, J. Thornton, J. Rice, W. Watson	S. Culpan	Cable & Wireless, Ltd.
Egton	*	J. S. Pinkney, O.B.E.	C. Stenhouse, E. T. Kinnaird, S. Jackson		Rowland & Marwood
Elmbank	1.10.62	A. F. King	D. Christie, I. B. Hanson, F. J. Austin	I. Pegg	Bank Line
Empire Star	10.2.64	G. T. King	T. H. L. Jones, A. Moir, P. Row	P. M. Lockhart	Lamport & Holt Line
Empress of Britain	8.2.63	L. H. Johnston, M.B.E.	P. Denham, P. Adair, J. G. Griffin, P. Coulthurst	J. Mann	Canadian Pacific Line
Empress of Canada	24.3.64	W. S. W. Main	G. Cotton, G. Colclough, D. Burt, T. Parker	P. B. McNab	Canadian Pacific Line
Empress of England	30.8.63	E. R. Connorton	R. M. H. Hall, A. R. Whyte, T. G. Hughes, J. Thompson	W. Maudsley	Canadian Pacific Line
English Star	20.1.64	E. C. Laidlaw	A. C. G. Symes, F. Mawdesley, J. Collier	R. Davies	Blue Star Line
Ernest Holt	18.2.63	E. A. Binnington			Ministry of Agriculture, Fisheries & Food
Essequibo	7.2.64	R. Phillips	S. D. Orme, L. P. Fenner, G. N. Coombe	G. Camm	Royal Mail Lines
Essex	13.1.64	S. G. Robinson, M.B.E.	K. P. Mills, G. H. Webber, E. G. Gunnah	K. D. Wilson	Federal Line
Esso Cambridge	11.10.63	R. Hawkins	R. G. Morrison	R. Harbut	Esso Petroleum Co., Ltd.

Esso Canterbury	25.3.64	E. W. Thomas	H. D. East, J. A. Duncan, A. Hill	R. W. Mann	Esso Petroleum Co., Ltd.
Esso Exeter	14.8.62	J. A. MacLeod	G. D. Newell, M. W. Murrish, J. Furnaux, D. O. Dutfield	A. Lambert	Esso Petroleum Co., Ltd.
Esso Hampshire	3.12.63	G. R. Eunson	A. Leadbeater, D. Boler, W. Walters, D. Wyatt	T. Daly	Esso Petroleum Co., Ltd.
Esso Pembrokeshire	22.1.64	S. R. Dance	M. Birchmore, T. Potts, D. Campbell	F. Devlin	Esso Petroleum Co., Ltd.
Esso Warwickshire	11.11.63	B. L. Bater	G. W. Purvis, R. I. Cape, J. Leney, J. Humble	P. Cagney	Esso Petroleum Co., Ltd.
Explorer m.v.	20.2.64	A. Sutherland	A. J. Watkins, F. Browning, R. J. Smith, J. G. Higgin	D. Holden	Harrison Line
Explorer (F.R.S.)	15.1.64	E. A. Bruce, O.B.E.	A. A. Baxter, J. Craig, J. Steven, W. Gatt	J. Steven	Dept. of Agric. & Fish. for Scotland
Farsistan	6.2.63	R. Connacher	W. J. S. Burr, A. Jenkins, A. B. Alyward	H. A. Buck	Strick Line
Fidra	23.9.63	J. B. Kerr	C. Begg, W. Anderson, N. McLean		Chr. Salvesen & Co., Ltd.
Firbank	12.7.63	L. O. Moody	W. H. Martin, R. A. Waistell, P. M. C. Morris	B. Delaney	Bank Line
Flamenco	28.2.64	A. S. MacLean	E. Bowyer, S. D'arcy, C. Dewsnap	J. Hitchen	Pacific S.N. Co., Ltd.
Flintshire	25.3.64	G. Edge, M.B.E.	K. J. Radley, W. C. Cuthill, P. J. Duff	A. W. Jones	Glen Line
Forthfield	25.3.64	R. P. Gardner	T. Armstrong, T. Palmer, J. Colon, J. A. Cotton	J. Hanna	Hunting & Son, Ltd.
Franconia	•	R. J. Nicholas, R.D.	T. H. L. Boyd, D. Williams, J. A. Mackellar	E. P. Bishop	Cunard Line
Fred Everard	5.3.64	W. G. Hunt	J. A. Tweddle, J. Mackinnon, J. London		F. T. Everard & Sons, Ltd.
Frederick T. Everard	25.3.63	G. Brown	G. M. Henderson, A. Livingstone		F. T. Everard & Sons, Ltd.
Fresno City	24.3.64	D. L. G. Jones	T. E. Thistleton, J. S. Murray, N. Sainsbury	R. R. Caldwell	Sir Wm. Reardon Smith & Sons
Galway	2.1.64	E. J. Ridout	D. Cooke, W. Wright, P. Guerrier	R. Hilldrup	Trinder Anderson & Co., Ltd.
Georgina V. Everard	21.3.63	L. Andersen	A. O'Connor, J. May, G. Willoughby	D. N. Ascott	F. T. Everard & Sons, Ltd.
Glanely	8.1.64	F. I. Day	M. P. Salmon, G. C. Preston, J. E. Omond	R. J. A. Marshall	W. J. Tatem, Ltd.
Glenartney	6.1.64	R. G. Rippon	P. E. Revill, R. N. Adams, J. K. Winn, R. M. Ireland	R. Bryce	Glen Line
Glenearn	20.2.64	D. D. McIntosh	I. Faulkner, A. R. Gerrard, N. R. Moon	C. Ronald	Glen Line
Glenfalloch	•	T. R. Walker	D. J. Metcalf, H. F. Teare, D. M. Maclean	W. Britton	Glen Line
Glengarry	1.11.63	N. Willis	I. J. Wilkinson, J. C. Creer, E. Walpole, D. G. Harsh	J. Blarr	Glen Line
Glengyle	13.3.64	J. K. Edmonds	G. E. Job, B. Gobey, J. Iliff, P. Lloyd-Jones	M. Bailey	Glen Line
Glenlyon	24.2.64	W. K. Hole	A. R. Mackay, S. Minshall, H. Davis	G. Hemming	Glen Line
Glenmoor	•	F. Bradfield	R. H. Weatherley, T. Martin, G. Spencer	J. A. Lynch	Moor Line
Glenogle	21.1.64	W. J. Moore, D.S.C., R.D.	D. J. Callagher, E. A. Owen, I. B. Bagshaw	J. M. Watson	Glen Line
Glenorchy	19.12.63	H. S. Clarke	N. Aiton, R. M. Simason, J. B. N. Hodgeson, J. A. M'Kinley	K. N. Hargraves	Glen Line
Glenpark	23.12.63	J. McVicar	J. Leask, P. McMillan, L. Bell	M. P. Bowler	J. & J. Denholm, Ltd.
Glenroy	9.12.63	I. R. Atkinson	A. M. Kirkland, K. S. Owen, J. P. A. Clarke	—. Brunthwaite	Glen Line
Gloucester	13.3.63	D. E. Moran	A. I. McNeill, R. E. Barnard, A. J. Lang	M. A. Thompson	Federal Line
Gloucester City	27.9.63	E. Irish	A. Johansen, W. Coombes, R. Adamson	M. Brett	Bristol City Line
Gloucestershire	•	P. Saunders	R. Tiller, J. Routledge, D. I. Jones, R. Driver	B. Waller	Bibby Line
Golfito	13.11.63	W. F. Young	C. A. Hare, T. S. Lindsay, R. A. Silsbury	P. J. Kelly	Elders & Fyffes
Gothic	11.3.64	G. Campbell	J. D. Howie, J. Brew, A. Catesby	B. McGovern	Shaw Savill Line
Gothland	6.1.64	J. M. Laing	A. M. Simpson, R. Dickson, H. Cole	T. L. McKinney	Currie Line, Ltd.
Governor	23.4.63	C. S. S. Boam	N. M. Whyte, J. Brierley, J. M. Williams, W. Donaldson	J. Barnie	Harrison Line
Great City	21.2.64	H. Lloyd Evans	R. A. H. Vanner, J. Cann, A. Khalique	N. Beech	Sir Wm. Reardon Smith & Sons
Haparangi	28.11.63	W. J. T. Stevens	T. Hughes, B. Bagott, R. Young, P. Wheeler	A. T. Harris	New Zealand Shipping Co., Ltd.
Hauraki	17.10.63	E. F. H. Allen	J. D. Thomson, J. Rutherford, A. R. Pope, P. Lemarquand	D. N. Bissell	New Zealand Shipping Co., Ltd.
Hazelmoor	•	E. Howlett	H. Anson, J. Hall, H. Burn	W. James	Moor Line, Ltd.
Hector	4.3.64	S. S. Howie	J. Eddie, B. Hill, T. S. Main, J. Geddie	W. Phillips	A. Holt & Co.
Hector Heron	14.11.63	S. K. Williams	P. A. J. Bowes, W. R. Ward, B. B. King, R. K. Wilson	J. L. Lamb	Hector Whaling, Ltd.
Helenus	28.2.64	C. T. Collett	J. F. C. Lindsay, J. Spain	J. Smallthwaite	A. Holt & Co.
Hemiglypta	22.3.63	A. A. Nicol	G. A. Helm, C. Pague, D. Daniel	J. Agius	Shell Tankers (U.K.), Ltd.
Hemiplecta	•	D. A. Doyle	A. B. Reynold, M. P. Lee, R. Baker		Shell Tankers (U.K.), Ltd.
Herefordshire	12.12.63	A. N. Williamson	G. R. Excell, R. H. Jones, P. Coventry	J. E. Unsworth	Bibby Line

Name of Vessel	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Hertford	4.2.64	H. C. R. Dell	A. J. Champion, A. Dorkins, J. B. B. Ashford, S. N. A. Wells	S. J. Braithwaite	Federal Line
Himalaya	6.2.64	P. G. Lawrence			P. & O.-Orient Line
Hinakura	19.2.64	P. R. Robinson	M. G. Bishop, A. J. Lamont, P. T. Legg	S. Edwards	New Zealand Shipping Co., Ltd.
Horomya	22.1.64	A. Rylett	B. P. Randoll, A. M. Tennant, G. F. J. Hall	D. Carruthers	Shell Tankers (U.K.), Ltd.
Hororata	11.9.63	C. P. Robinson	P. B. Snow, A. J. Ward, W. B. Anderson, J. E. E. Crawford	F. E. Watts	New Zealand Shipping Co., Ltd.
Hubert	3.2.64	J. Whayman	A. West	V. Dalton	Booth Line
Huntingdon	26.3.64	T. Alderman	D. R. J. Plimsaul, D. H. Lovering, A. S. Jackson, J. Hazell	E. Pooley	Federal Line
Hurunui	12.8.63	S. W. Andrews	C. J. Roberts, C. H. T. Whale, F. J. Lafferty	M. Holroyd	New Zealand Shipping Co., Ltd.
Iberic	*	J. Gunning	C. Sharp, D. Cornish, J. M. Omerod	R. Baker	Shaw Savill Line
Illyric	8.1.64	R. G. James	W. Downing, J. Hines, B. Kay	H. Preen	Shaw Savill Line
Imperial Star	18.10.62	G. L. Evans, O.B.E.	R. D. Bremner, B. R. Wood, J. Mann	D. R. Whitehead	Blue Star Line
Inverbank	*	G. D. Scott	F. Saunders, J. T. Jenkins, H. Wright		Bank Line
Inverewe	22.8.63	J. T. Rose	P. Kilvington, J. MacNeil, F. Danks	J. Smyth	J. & J. Denholm, Ltd.
Ionic	9.10.63	R. G. Grant	C. C. Paterson, E. Cairns, T. F. O'Morain, R. Ferry	D. Waterhouse	Shaw Savill Line
Iron Age	21.10.63	G. E. Dixon	M. T. Richardson, E. Cowell, H. Graham	D. Smith	Common Bros., Ltd.
Iron Barque	25.10.63	I. S. Taylor	G. Vale, H. Best, T. Stafford	R. Maskell	Common Bros., Ltd.
Iron Crown	24.3.64	J. D. Morris	J. H. Reay, R. C. Pearce, R. J. McLachlan, C. D. Welch	T. M. King	Common Bros., Ltd.
Isaac Carter	19.12.63	W. T. Coull	J. Mein, H. Towers, T. Kennedy	A. Irwing	Canatlantic Ltd.
Ixion	22.11.63	F. N. Fisher	R. S. Grond, E. H. Davies, M. L. Morgan	S. R. MacQuire	A. Holt & Co.
Jamaica Planter	7.10.63	G. E. M. Jenkins			Kaye & Son & Co., Ltd.
Jamaica Producer	11.7.63	T. A. Kidd	B. S. Looker, E. F. Warwick, J. A. Pearson	D. Fisher	Kaye & Son & Co., Ltd.
Jason	21.2.64	N. A. Rae	B. Cushman, B. Ball, J. Thoburn, W. J. A. Payne	I. Gall	A. Holt & Co.
John Biscoe	13.6.63	W. Johnston	R. N. Cumbers, M. J. Cole, T. Woodfield	J. A. Quinn	Government of Falkland Is.
Kenilworth Castle	3.5.63	H. N. Dryden, D.S.C.	H. N. Jones, M. K. Jamieson, J. C. Turner, R. J. C. Parkin	P. Heald	Union Castle Line
Kenuta	17.1.64	R. K. C. Thomas	P. T. McGonigal, B. Goodall, W. J. Turner, D. J. Good	R. Roberts	Pacific S.N. Co., Ltd.
Kenya	26.11.63	H. B. W. Cray, M.B.E.	I. W. Dancer, R. O. M. Wilson, K. W. Marks	J. Masterman	British India Line
King Arthur	19.3.63	G. B. Craig	G. R. S. Holder, C. Gowans, J. Macauley	R. T. Bates	King Line
King City	13.2.64	F. J. Johns	B. Boyer, C. Davidson, J. Newman	G. Davies	Sir Wm. Reardon Smith & Sons
Kohistan	3.2.64	R. Hodgson	J. Bruce, P. Alexander, I. Stroud	L. J. Kidd	Strick Line
Koyan	21.2.63	J. Johnston	A. Temple, M. Williamson, J. Binnie	I. Henderson	Henderson Line
Laganbank	1.3.63	F. F. Feint, R.D.	C. S. Stitt, A. M. D. Lavires	P. Jennison	Bank Line
Laksa	21.10.63	T. W. Lawrence	J. Taylor, H. G. Mackay, R. S. Oakes, J. V. Walgate	H. G. Mackay, J. Taylor	Chr. Salvesen & Co., Ltd.
Lancashire	*	R. L. Hagley	C. Willard, M. J. Horn, D. Hine	R. Ferry	Bibby Line
La Pampa	23.1.64	T. H. Turner	M. C. Gough, A. E. O'Hara, S. P. Gillingham	J. J. Norton	Buries Markes, Ltd.
Laurentia	24.2.64	T. S. Graham	G. Angus, F. Nicol, C. Campbell, W. Doodson	D. Murray	Donaldson Line
Leeds City	24.3.64	J. Thornhill	R. Smith, A. E. French, M. B. Thomas	N. O. S. McLaren	Sir Wm. Reardon Smith & Sons
Leicestershire	16.5.63	H. Keryson	D. H. Mobberley, A. Hudson, M. Wood	C. Beyer	Bibby Line
Limerick	6.1.64	R. Brown	I. D. McLeod, D. Llewelyn, P. Grant, J. Hilton	D. Finlayson	Trinder Anderson & Co., Ltd.
Lindisfarne	13.3.64	H. W. Pyle	R. Stead, R. Cordon, P. E. P. Liddell	M. McManus	Wm. Souter & Co., Ltd.
Linkmoor	*	F. B. Lamb	R. W. Storey, D. Kelly, J. K. Scholfield	J. A. O'Hagen	Moor Line Ltd.
Lismoria	6.3.64	J. L. Downie	R. Muir, N. Dalziel, A. Gardiner, J. Hall	T. S. Service	Donaldson Line
Livorno	6.3.64	W. Walker	D. C. Dutton, G. D. Attkinson, D. A. Brackenbury, P. Bishop	J. Kelly	Ellerman's Wilson Line
Loch Avon	20.2.64	W. Avison	N. B. Harrison, A. MacGregor, P. Linacre	B. Blane	Royal Mail Lines
Loch Garth	2.12.63	G. C. W. Meldrum	T. Brice, R. Fairley, F. G. Nickson, H. Nixon	F. Page	Royal Mail Lines

Loch Gowan ..	14.12.62	F. J. Swallow	S. D'Orme, R. G. L. Oliphant, B. E. Melton, R. J. Brockbank	—. Patterson	Royal Mail Lines
Loch Loyal	13.6.63	W. A. Kennedy	S. Pryce, S. Sugden, D. Foote	D. Stevenson	Royal Mail Lines
Logna	24.12.62	J. Clark	J. Low, C. F. Irvine, L. J. A. Gibb, W. Sinclair		Chr. Salvesen & Co., Ltd.
London Pride ..	24.2.64	A. Armstrong	I. P. Skipp, O. Connor, R. Sutherland, B. Robson	M. Hooks	London & Overseas Freighters, Ltd.
Longstone	25.2.64	F. Surtees	K. Fitzakerly, K. Anderson, A. McGrath, F. Torgersen	F. Drummy	Wm. Souter Co., Ltd.
Mabel Warwick ..	*	N. A. C. Smith	P. Boundy, J. Jacques, K. Stockton	D. Davies	Houlder Line
Magdapur	2.12.63	S. E. Turner	J. S. Torkington, J. R. Taylor, R. E. Roberts, J. E. Ellerbeck	A. Holmes	Brocklebank Line
Mahanada	16.9.63	I. A. MacLaren	J. R. Dovell, D. M. G. Murphy	J. K. Foster	Brocklebank Line
Mahout	13.12.63	J. B. Newman	G. B. Drewery, A. P. Sprigings, D. A. Cosker, D. Pease	D. Butterworth ..	Brocklebank Line
Mahseer	4.3.63	J. G. Nuttall	S. P. McGlue, D. Matthews, I. S. Roberts, P. Slade	P. Y. Wright	Brocklebank Line
Makrana	*	P. D. MacKenzie	C. G. Webster, G. D. Symonds, R. S. Master, B. Walker	T. J. Williams ..	Brocklebank Line
Manchester City ..	11.3.64	G. R. Thompson	J. Chapman, J. Bell, P. Cullen, J. Williamson ..	P. A. Byrne	Manchester Liners
Manchester Commerce	*	—. Cookson	D. K. Perry, D. R. Nutton, J. S. Watson	D. Hodgson	Manchester Liners
Manchester Faith ..	9.9.63	J. E. Askew	D. Deer, W. Hawkes, M. J. Butler	W. MacPherson ..	Manchester Liners
Manchester Fame ..	6.12.63	A. Cookson	W. S. Worthington, K. Lepehuu	G. Norton, B. M. Boynes	Manchester Liners
Manchester Mariner	22.3.63	E. W. Espley	D. Martin, J. Kirkham, A. Copland	M. Doran	Manchester Liners
Manchester Merchant	17.4.63	J. E. Askew	J. A. Stubbs, C. Spence, J. McKay, J. C. Birkenhead	B. E. Bewles	Manchester Liners
Manchester Miller ..	24.2.64	E. W. Espley	L. Clark, N. W. Cockshoot, D. Gregson, J. Illingworth	E. Heywood	Manchester Liners
Manchester Port ..	24.3.64	D. S. Millard	G. G. Shadbolt, O. Selwood, D. Smith	J. Morrow	Manchester Liners
Manchester Progress	21.2.64	J. E. Jones	W. R. Donaldson, D. Barlow, J. Birkenhead, P. Cullen	K. Smith	Manchester Liners
Manchester Regiment	9.9.63	A. Starmer	D. R. Perry, D. Humphrey, D. Wells	T. Berry	Manchester Liners
Manchester Shipper	26.4.63	J. M. Rushworth	R. Wood, J. Bell, A. Copeland, R. J. Higgins ..	Z. Faure	Manchester Liners
Manchester Spinner	3.2.64	W. Hine	I. Borrowdale, A. Rowlands, J. A. McKay ..	J. Reid	Manchester Liners
Manchester Trader ..	*	J. R. Stephens	M. I. Bowen, J. Grey, A. Tilmouth	I. Salgo	Manchester Liners
Manipur	24.2.64	J. J. Reddan	J. D. Smyth, J. E. Millichap, A. C. Stallard, A. H. Lord	A. J. Dunn	Brocklebank Line
Marabank	3.2.64	C. S. Holbrook, M.B.E.	A. J. Hall, C. B. Davies, G. H. Cogle	N. J. Muddle	Bank Line
Marengo	18.2.64	F. Barnes	B. Robinson, J. Myers, D. A. Ellerby, J. Turley	F. A. Butler	Ellerman's Wilson Line
Maron	6.11.63	A. R. Davidson	B. K. Micklam, R. F. J. Dixon, M. E. Edward, P. P. Taylor	I. F. Stocks	A. Holt & Co.
Martand	23.1.64	E. W. C. Watkins	D. F. W. Stone, B. P. Ross, C. D. Croall	C. C. Connerty ..	Brocklebank Line
Matina	26.2.64	E. R. Williams	B. Williams, J. F. Stuart, J. Milhench, C. E. Marsh	J. E. Parry	Elder Fyffes, Ltd.
Mauretania	16.1.64	W. J. Law	A. Bennell, P. Lawley, K. D. R. Lamb, P. Carling	—. Kidson	Cunard Line
Media	*	A. Bridgewater	C. E. E. Jones, A. L. Gosset, G. Ferguson ..	R. C. Taylor ..	Cunard Line
Melbourne Star ..	6.3.64	G. T. Bowden	M. W. Dent, A. Cooper, R. Fieldsend	T. W. Elliot	Blue Star Line
Mercury	*	G. H. C. Reynolds	D. J. Hider, W. J. Venables, M. Humphrey, D. S. Macfarane	J. Otley	Cable & Wireless, Ltd.
Middlesex	30.12.63	R. E. Baker	P. J. Lealley, H. Hynard, W. E. Lewis, A. Savill	R. G. Heath	Federal Line
Monarch	31.10.63	O. R. Bates	B. D. C. Franklin, A. M. H. Thurgood, R. R. Phillips	A. H. Hindmarsh ..	H.M. Postmaster General
Montreal City ..	19.3.64	J. R. Campbell	D. Simpson, G. Channer, G. D. Snowdon, P. Wright	C. Wilkin	Bristol City Line
Muristan	21.2.64	H. Gilchrist	D. Lee, J. Frost, G. Noblet, D. M. Foster ..	S. Belshaw	Strick Line
Nestor	30.12.63	J. F. Burnett			A. Holt & Co.
Newcastle Star ..	17.10.63	R. S. Hopper, D.S.C.	C. Wood, P. Keenan, R. Drakes	J. Clarke	Blue Star Line
New York City ..	3.3.64	E. Irish	M. J. Winter, P. W. Doble, D. F. Williams ..	J. T. W. Moody ..	Bristol City Line
New Zealand Star ..	29.10.63	J. D. W. Davies	T. A. H. Gray, I. G. N. Ali, A. E. Walker, J. E. Sanderson	T. C. F. Morrison ..	Booth Line
Nordic	2.1.64	C. Blakey	M. Ogilvy, J. Wade, D. Mossman	N. Hatswell	Prince Line
Northern Star ..	30.1.64	L. H. Edmeads	G. S. Stewart, B. Pittar, J. L. Manser	C. L. Carpenter ..	Shaw Savill Line

Name of Vessel	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Northumberland	15.1.64	M. J. Heron	E. M. Smith, J. Thorpe, D. Butcher, J. Ayers	B. Cullimore	Federal Line
Nottingham	30.9.63	G. McCathie	R. M. McNair, J. Ell, C. R. Edmonds	S. Adams	Federal Line
Obuasi	28.6.63	W. E. Bellamy	A. Lester, D. Parnum, W. Jemson	A. Jones	Elder Dempster Lines
Ocean Monarch	*	R. Marshall	R. B. Dickson, T. Avens, P. Miller	J. Hynes	Furness Lines
Orcades	8.1.64	E. G. H. Riddelsdell	J. B. Kilner, R. D. Cookman, I. M. Nichol, M. F. Hicks	R. C. Crompton	P. & O.-Orient Line
Oronsay	6.12.63	E. V. Harris	V. B. Broome, D. B. Miller	F. Harrop	P. & O.-Orient Line
Orsova	23.1.64	R. J. Craddock, O.B.E.	A. M. Blackstock, M. R. Tyler	P. Parish	P. & O.-Orient Line
Otaio	3.2.64	F. S. Angus	M. H. Weston, J. Cosker, R. A. Date, R. A. Cooke	L. H. Sutton	New Zealand Shipping Co. Ltd.
Otaki	30.1.64	I. Y. Bateley	R. A. Laycock, R. J. Bayliss, R. C. Ford, A. Duncan	C. L. Lambe	New Zealand Shipping Co., Ltd.
Otra	17.2.64	G. A. Walterson	J. Reid, L. J. A. Gibb, S. McGillivray		Chr. Salvesen & Co., Ltd.
Pacific Envoy	6.3.64	A. H. Cooke	C. E. Nicholls, A. Cameron, D. A. Whitaker, A. B. Woodley	F. Blyth	Furness Lines
Pacific Fortune	27.2.64	B. R. Simons, M.B.E.	H. Campbell, F. Pearson, R. H. I. Gray, E. W. Foxworthy	J. Lumsden	Furness Lines
Pacific Northwest	9.12.63	J. L. Sims	R. Driver, O. Pascoe, C. R. Giles	J. Wallace	Furness Lines
Pacific Reliance	15.10.63	C. G. Killick	T. Avens, L. J. Stephenson, A. Hardy	W. G. Peddie	Furness Lines
Pacific Stronghold	21.5.63	G. Brown	R. Ward, D. Milliken, J. Sellar, J. Marriot	J. C. Yates	Furness Lines
Pampas	7.2.64	J. T. Jones	M. Rayson, E. Clements, R. Forrester, S. Gledhill	G. Smith	Royal Mail Lines
Papanui	19.7.63	J. F. Milner	P. D. H. Richards, M. Eglon, P. Robertson, R. Markham	I. Cross	New Zealand Shipping Co., Ltd.
Paparoa	20.11.63	E. T. Rowland	A. J. Fulton, H. G. Williams, W. Galer, N. M. Parry	R. F. MacManamon	New Zealand Shipping Co., Ltd.
Paraguay	25.2.63	G. G. Chatterly	M. Rayson, J. Flood, B. Hotter	T. Kehoe	Royal Mail Lines
Pardo	25.10.63	J. M. Holt	P. R. Brown, R. P. Harris, J. E. Lambert	T. Slattery	Royal Mail Lines
Parthia	*	A. E. Irvine	G. Coker, L. Portett, J. Rudguard	A. Turner	Cunard Line
Pegu	3.3.64	K. S. Marsh	J. R. Pearson, W. W. McGlashan, A. Smart	J. H. Brown	Henderson Line
Pendennis Castle	6.2.64	G. W. B. Lloyd	M. S. Stokes, M. D. Cox, M. I. Bell	M. P. Williams	Union Castle Line
Pennyworth	23.1.64	I. Gault	T. Lazarus, J. G. Nielson, J. MacKenzie	T. Walker	R. S. Dalgleish, Ltd
Perim	4.6.63	R. Bullock-Webster	D. Farrar, M. N. Hulkes, P. R. D. Cutmore	N. B. Bagent	P. & O.-Orient Line
Perseus	9.8.63	S. C. Llewellyn	R. J. M. Hogg, R. Dyne, M. D. Gall, B. Healy	R. Hinchcliff	A. Holt & Co.
Persic	5.2.64	G. W. Houchen, O.B.E.	P. H. Organ, J. Sayers, J. Neil, P. Tozer	W. Peat	Shaw Savill Line
Piako	10.1.64	D. E. Moran	W. A. I. Killackey, A. M. Doig, G. C. Stalker, E. G. Dixon	K. Anderson	New Zealand Shipping Co., Ltd.
Pilcomayo	19.3.64	S. D. Gibson			Royal Mail Lines
Pipiriki	22.5.63	W. F. T. Dan	J. Hook, I. Thomson, J. Mills, D. Chadwick	E. Pooley	New Zealand Shipping Co., Ltd.
Pizarro	20.9.63	G. E. Turner	T. Williams, M. Quine, J. Ross, I. Steverson, M. Quirk	J. Newman	Pacific S.N. Co., Ltd.
Port Adelaide	3.5.63	E. W. Dingle, M.B.E.	M. Baker, P. Mitchell, M. Jarvis	C. Hill	Port Line
Port Auckland	1.11.63	C. R. Townshend	A. G. Williamson, J. A. Cullen, P. J. Hayman, D. J. Morton	H. Horrocks	Port Line
Port Brisbane	16.12.63	F. J. Lavers	D. S. Hellier, J. D. Cartmell, K. D. Pykett	P. J. Maguire	Port Line
Port Fairy	*	M. Coombs	M. G. Mills, M. J. Harden, G. D. Wilson		Port Line
Port Hobart	30.1.64	J. S. Moate	P. J. Shaw, P. E. M. Kelway, J. M. Harger	B. F. Flinders	Port Line
Port Invercargill	28.10.63	R. H. Finch	D. J. Campbell, J. J. Gladstone, W. J. Wearn	M. M. Garrett	Port Line
Port Jackson	2.7.63	W. J. Williams	P. J. Shaw, J. W. Gunn, R. L. Jones	B. Flinders	Port Line
Port Launceston	3.3.64	A. J. Hawkins	J. H. Pring, J. W. Gunn, J. P. B. Snape	F. V. Harford	Port Line
Port Lincoln	19.3.64	V. A. Hunt	J. E. Crowsley, J. W. Fisher, R. B. Chalk	G. Foers	Port Line
Port Lyttelton	17.2.64	A. W. Kensett	N. A. Rea, R. Mitchell, E. E. Chapman	D. Uglow	Port Line
Port MacQuarie	17.3.64	J. M. Read	D. L. B. Marriott, R. K. Sturge, J. W. Johnson	J. D. Smart	Port Line
Port Napier	19.12.63	V. G. Battle	P. Sheppard, A. Atkinson, R. Wallace, R. Howell	T. Hargrave	Port Line

Port Nicholson	13.3.64	E. W. R. Young	J. H. Corse, I. Lister, P. L. B. Coulthurst	J. Bryce	Port Line
Port Phillip	1.11.63	P. E. Packwood	I. G. Watson, P. M. P. Muirhead, G. E. Oliver	R. Stopford	Port Line
Port Pirie	20.11.63	L. T. Skailes	E. C. Harrison, P. Mitchell, R. E. D. Clifford	J. S. McPherson	Port Line
Port Townsville	4.12.63	C. J. H. Gorley	R. J. M. Grey, B. M. Eaton, J. S. Napier	T. S. Stevenson	Port Line
Port Victor	23.1.64	L. W. Cady	G. Hay, J. J. Banister, F. Hope	T. J. Britt	Port Line
Port Vindex	30.10.62	A. Brown	J. Lloyd-Jones, J. Cartmell, J. Crowsley	J. Ruthven-Murray	Port Line
Port Wellington	10.6.63	C. A. Hodson	G. Hay, D. Gunn, P. J. Dewar	W. O'Connell	Port Line
Port Wyndham	10.3.63	D. J. Cloke	L. J. Carman, N. R. Sinclair, G. W. Hay	W. A. Mason	Port Line
Potaro	8.1.64	J. Chester	J. S. Wisden, F. I. Hopkinson, P. A. Brown, M. Crimp	P. Doris	Royal Mail Lines
Potosi	31.10.63	P. D. O'Driscoll	D. B. Bird, K. P. Swift, J. Gardner	F. J. Curran	Pacific S.N. Co., Ltd.
Pretoria Castle	30.1.64	J. P. Smythe	P. Noble, R. Brown, R. Lyall, J. Hewitson	—. Kilmister	Union Castle Line
Queen City	13.8.63	J. Vaughan	J. Mitchell, A. D. Lightfoot, P. Haworth	J. D. Watson	Sir Wm. Reardon Smith & Sons
Queen of Bermuda	16.1.64	M. E. Musson	S. Vass, M. Gough, R. House	R. Stennet	Furness Line
Queensland Star	11.11.63	R. White, D.S.C.	A. Carrier, M. Robert, A. Goodman	L. Price	Blue Star Line
Raeburn	24.3.64	F. W. Grist	R. Chambers, D. Donnett, D. Dickson, D. Wells	G. Crawford	Watts, Watts & Co., Ltd.
Rakaia	17.6.63	R. S. Webster	P. J. B. Low, K. M. Lingard, G. S. Stalker, R. Cooper	R. Birkenshaw	New Zealand Shipping Co., Ltd.
Ramillies	10.2.64	W. J. Thomas	D. Hedger, A. Hollis, H. J. Summers	R. Docey	J. Cory & Son, Ltd.
Ramon de Larrinaga	19.3.64	A. J. Rawson	R. D. Parry, B. Milligan, J. H. Crane, G. Waring	J. Morrow	Larrinaga S.S. Co.
Ramore Head	2.1.64	J. J. Gomez	R. J. A. Copeland, T. Pratt, T. McI. Hamill, G. Keough	D. E. Byron	Head Line
Rangitane	5.3.64	D. H. Chadwick	E. B. Daubeny, T. Webb, G. Summers, R. Miller	L. C. Whittington	New Zealand Shipping Co., Ltd.
Rangitoto	10.11.64	L. W. Fulcher	J. M. Sargent, R. E. Barnard, M. W. Parrott, D. M. Mountford	F. W. Fowler	New Zealand Shipping Co., Ltd.
Raphael	31.1.64	C. E. Legg	G. Dobbie, R. V. Jones, A. Murchie		Lamport & Holt Line
Rathlin Head	16.10.63	S. J. Stark	R. Harris, M. Chappie, B. McShane, P. C. Dobbs	A. V. Davidson	Head Line
Redcar	16.12.63	J. E. Reikstins	G. M. Long, D. J. Fullwood, C. Wilson	O. O'Neill	Bolton S.S. Co., Ltd.
Regent Eagle	30.12.63	P. S. L. Nobes	P. J. Stead, G. W. Choubal, M. A. Maung, L. Pilling	R. Milner	Regent Petroleum Tankship Co., Ltd.
Regent Falcon	25.11.63	J. D. Pedersen	I. E. McVicar, P. Roberts, R. S. Hawkins, A. McGuaghey	T. B. Ellis	Regent Petroleum Tankship Co., Ltd.
Regent Royal	21.10.63	R. Peters	D. Nelson, N. H. Brown, N. Fletcher, G. O'Shane, R. Fuller, A. Jameson, N. Shepherd	L. Kesson	Regent Petroleum Tankship Co., Ltd.
Remuera	23.1.64	R. G. Hollingdale	P. Petherbridge, C. M. Turner, A. Allen, J. Collins	G. Parker	New Zealand Shipping Co., Ltd.
Rhodesia Castle	16.12.63	F. J. Pye, M.B.E.	A. J. Blackler, C. Brown, W. O. Dineley, A. R. Clark		Union Castle Line
Rialto	20.2.64	H. Greenhill	R. A. Blencoe, D. Ellerby, H. Blagdon	K. Alexander	Ellerman's Wilson Line
Richard de Larrinaga	27.6.63	L. G. Daniel	J. B. Fillingham, J. Sullivan, H. Janson	T. Farren	Larrinaga S.S. Co., Ltd.
Richmond Castle	*	C. Lorains	S. Stokes, J. Trickett, J. MacFarland		Union Castle Line
Ripon	10.2.64	J. Burns	M. Jessop, G. W. Brown, K. Fulker	R. H. Stephenson	Bolton S.S. Co., Ltd.
River Afton	14.2.64	D. Robertson	G. S. Oakley, W. E. E. Lake, R. Mattik, J. Parker	N. O'Connor	Hunting & Son Ltd.
Romanby	30.12.63	J. R. Copping	A. Zebrak, T. Cary, J. Williams	E. S. Mays	Sir R. Ropner & Son Ltd.
Roonagh Head	22.11.63	W. A. Haddock	J. Auld, R. Maxwell, J. McParland, F. Best	D. J. McKeown	Head Line
Rossetti	3.10.63	D. Mudd	P. W. Fletcher, D. P. Marshal, M. Flanagan	C. R. Glennon	Lamport & Holt Line, Ltd.
Rowallan Castle	11.7.63	C. E. Lorains	A. P. Coala, B. R. Truman, E. Syring	M. Evans	Union Castle
Royal Crown	13.11.63	S. H. Beer	B. L. Miller, M. A. Smith, I. R. J. Brown, E. G. Mylrea	E. Hodge	Hall Bros. S.S. Co., Ltd.
Ruahine	28.11.63	A. Hocken	C. S. Baugh, J. F. Pollard, M. K. Handfield, R. MacD. Mair	W. F. Shepherd	New Zealand Shipping Co., Ltd.
Runa	11.1.63	A. D. MacNab	W. I. Taylor, J. P. Skinner, M. Hamilton	P. Driscoll	Glen & Co., Ltd.
Runswick	10.9.63	L. Z. Weatherill	P. Palframan, L. Miles, J. Wood	P. Thomas	Headlam & Son, Ltd.
Rushpool	5.6.63	A. Dekonski	M. B. Bradley, C. B. Tingle, A. Medd, K. Clark, D. Rattray	W. A. Innes	Sir R. Ropner & Son Ltd.
Sacramento	23.1.64	H. Grunnill	G. Johnson, A. J. Collard, D. B. Horton	R. Drake	Ellerman's Wilson Line
Sagamore	3.3.64	W. F. Swann	G. R. Bennett, D. J. Cook, P. H. Warne, J. G. Usher	R. A. Wilson	Furness Lines

Name of Vessel	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
St. John	24.3.64	T. E. Roberts	I. McKendrick, K. C. Purnell, L. H. Bainton	R. C. Harris	South American Saint Line
Salamanca	20.6.63	C. Pringle	W. Exell, R. Davies, W. Jenkins	J. Kenrick	Pacific S.N. Co., Ltd.
Salaverry	22.11.63	W. J. Campbell	W. Nightingale, C. Rountree, F. Harling	J. Beilby	Pacific S.N. Co., Ltd.
Salinas	15.2.63	R. T. Riley			Pacific S.N. Co., Ltd.
Salmela	27.3.63	J. W. Leask	F. Wilson, G. A. Walterson, J. R. Keddie	A. Thomson	Chr. Salvesen & Co., Ltd.
San Edmundo	2.1.64	C. D. Michael, M.B.E.	B. Ashley, G. Bradley, J. E. Hagan	M. J. E. Henderick	Shell Tankers (U.K.), Ltd.
San Ernesto	*	W. Plenty	E. Roberts, G. Anderson, J. H. Gadsdon		Shell Tankers (U.K.), Ltd.
San Fortunato	30.12.63	P. H. Bech	J. C. Beaumont, I. D. S. Ogilvy, A. J. Fee	E. Barnes	Shell Tankers (U.K.), Ltd.
Santander	14.3.63	A. S. MacLean	S. Roscoe, D. Bishop, I. D. Barr	R. Inman	Pacific S.N. Co., Ltd.
Sarmiento	13.8.63	E. Gowland	D. C. Tripp, D. Pugh, J. McBride	W. Elliott	Pacific S.N. Co., Ltd.
Saxonia	*	F. J. Storey, R.D.	J. N. Griffiths, G. Ferguson	D. Ridley	Cunard Line
Scottish Hawk	24.3.64	J. Thorn	D. S. Williams, P. Flatau, W. Moss, R. A. Milne	N. E. Wynne	Scottish Tanker Co., Ltd.
Scottish Star	17.6.63	M. R. Bremberg	S. Bunney, M. Cramb, H. Cross	W. E. L. Gittins	Blue Star Line
Serenia	2.3.64	G. W. Sharpe	J. Clevland, J. Lucas, A. Evans	F. Baker	Shell Tankers (U.K.) Ltd.
Shackleton	29.5.63	D. H. Turnbull	R. H. Thompson, J. A. Martin, V. J. Wheatley	N. S. Ford	Government of Falkland Islands
Shropshire	1.1.64	H. B. Peate	A. L. Bath, D. Clayton, J. Beckett, N. Steiner	J. Cave	Bibby Line
Sidonia	21.2.64	G. Ramage	J. Swan, J. Jones, R. Watt, J. Currie	J. Gourley	Anchor Line
Silverbeck	17.2.64	A. A. Walker	M. C. McGregor, J. V. Gilbert	D. B. Drummond	Silver Line
Silvercrag	24.3.64	M. R. Duke	C. M. Allan, M. J. Lock, R. L. Jones	G. M. Smith	Silver Line
Silverpoint	5.2.64	F. Moorcraft	R. Whittington, E. Coombes, B. Magerison	C. Marrable	Silver Line
Sir Wm. Hardy	21.2.64	A. Whittleton	A. W. Stephen	A. W. Stephen	Torry Research Station
Sneaton	*	S. Ward	V. Squibbs, R. Rotie, C. Lang	P. Costelloe	Headlam & Son, Ltd.
Socotra	4.2.64	S. A. Turk	M. B. Harvey, C. E. Alexander, D. H. Williams	D. J. Warth	P. & O.-Orient Line
Somerset	4.9.63	A. C. Davies	J. Hill, J. Hume, M. Keat, H. Crane	I. Rae	Federal Line
Southbank	23.12.63	D. Campbell	F. D. Parsons, C. J. Ford, J. R. Hughes	A. Murphy	Bank Line
Southern Cross	27.2.64	A. Baber	G. Hairsine, T. Ffowces-Williams, J. B. Fowler, C. Phelan	D. MacRae	Shaw Savill Line
Stirling Castle	10.10.63	D. W. Sowden	K. L. Barker, D. King	M. R. Bristow	Union Castle Line
Suevic	13.3.64	R. Frisby	C. T. Dampier, M. Clark, F. W. Miller S. J. S. Ramsay	J. J. Lucey	Shaw Savill Line
Suffolk	6.1.64	H. J. D. Sladen	G. I. McL. Martin, P. Hornby, J. Jennings	P. Leigh	Federal Line
Sugar Carrier	*	J. R. L. Atkinson	D. L. Chant, A. G. Rex, D. Mustarde	H. Myhill	Sugar Line, Ltd.
Sunda	3.2.64	M. R. Prowse	J. D. Clark, C. Goddard, J. W. Fisher	G. C. Alton	P. & O.-Orient Line, Ltd.
Sunek	24.2.64	H. Syversen	K. Dutton, P. A. Dyer, R. C. Green	J. McNally	John Kilgour & Co., Ltd.
Surrey	29.11.63	R. B. C. Brown	C. Greenwood, R. Bayliss, J. Shirley, C. C. Hufflett	D. E. R. Watts	Federal Line
Sussex	15.1.64	J. R. Ramsay	D. Prime, R. Longworth, W. G. Chaplin, J. M. Burn	D. J. Hinds	Federal Line
Sydney Star	25.3.64	C. P. Leighton	R. J. Thake, P. W. Hutchinson, E. W. Liddle, J. O. White	D. R. Whitehead	Blue Star Line
Sylvania	21.10.63	J. Crosbie-Dawson, D.S.C., R.D.	R. G. Turner, K. D. A. Lamb, I. A. M. Wyatt	A. N. Henderson, A. F. Crosby	Cunard Line
Tabaristan	12.12.63	R. B. Arthur	M. Byrne, A. A. Seymour, N. Wray, C. E. J. Simmons	J. F. Bryson	Strick Line
Tactician	3.2.64	R. H. K. Ledger	O. M. Owen, J. B. Dodds, A. Gatiss, R. B. R. Vart	F. P. Lawton	Harrison Line
Tamele	24.2.64	J. A. Cleator	R. K. Prakel, P. J. Finan, A. J. Deshe, A. Hardman	T. Ainsworth	Elder Dempster Lines
Tantallon Castle	18.11.63	W. R. Carr			Union Castle Line
Tarkwa	2.12.63	R. McWilliam	N. M. Gordon, R. Magee	D. Grieves	Elder Dempster Lines
Tasmania Star	23.12.63	C. H. Watson	P. A. Cain, R. H. Fells, R. M. Fozard	F. Huggett	Blue Star Line
Thistledowne	6.2.64	C. C. Brown	J. L. Brown	C. Grey	Allan Black Co.
Tidecrest	10.7.62	E. G. Best	P. W. Finnie, L. Richards, D. Semple	J. Collier	Ivanovic & Co., Ltd.
Tinto	1.1.64	S. H. Bennett, M.B.E.	C. Nesbitt, W. Wood, D. Martin	A. Leary	Ellerman's Wilson Line

Torr Head	2.1.64	A. Fee	E. R. Dunwoody, W. Morrison, T. Sellers	M. Hannon	Head Line
Transvaal Castle	11.11.63	A. J. Hort	P. Manson, D. Innes, I. Lewis, R. Gadsby	J. Eager	Union Castle Line
Trebartha	23.9.64	W. F. Denyer	J. B. F. Barnett, R. Richards, G. T. Smith	A. D. Easton	Hain S.S. Co., Ltd.
Trecarne	14.1.64	L. J. Annett	M. R. Cowton, H. B. Fawcett, P. M. Sadler	B. Smith	Hain S.S. Co., Ltd.
Trecarrell	12.11.63	E. F. Boyd	J. C. Perkin, R. G. Whisker, J. Spall, J. Ashbridge	J. A. Lynch	Hain S.S. Co., Ltd.
Trefusis	24.2.64	R. B. Oliver	D. R. Mitchell, A. V. Rowles, M. A. Cooper	I. Farren	Hain S.S. Co., Ltd.
Tremayne	3.1.64	C. D. Abbott, D.S.C.	M. J. Ball, D. C. Penberthy, L. G. Ridyard	M. Scully	Hain S.S. Co., Ltd.
Treneglos	6.3.64	W. Phillips	G. T. Smith, L. Lennox, J. M. F. Barnett	J. C. Smith	Hain S.S. Co., Ltd.
Tremeadow	19.12.63	S. O. Watkins	J. K. H. Munday, D. Green, D. Loud, J. O. Spence	A. Watt	Hain S.S. Co., Ltd.
Tremorvah	25.10.63	G. A. McKay	J. Watson, J. Wallace, D. Garthan	P. Hughes	Hain S.S. Co., Ltd.
Trevalgan	17.10.63	C. E. Pratt	L. Lennox, J. H. B. Armstrong, R. Morris	J. Breen	Hain S.S. Co., Ltd.
Trevaylor	23.4.63	H. Gravell	J. Carmichael, F. J. Adams, K. Curry, D. K. Green	E. P. Creegan	Hain S.S. Co., Ltd.
Trewidden	*	G. A. MacKay	L. E. Quigley, I. Smith, J. O. Spence		Hain S.S. Co., Ltd.
Turakina	12.12.63	D. B. Brittain	M. Perfect, T. Thompson, C. C. Hufflitt, R. Bayliss	W. Aitchison	New Zealand Shipping Co., Ltd.
Turkistan	2.1.64	R. L. Cain	J. S. Catlow, W. Mackenzie, A. C. McCulloch, J. Brown	H. Finley	Strick Line
Velletia	6.2.64	A. Howe	D. Spence, L. Hughes, W. R. Ezzard	J. Holmes	Shell Tankers (U.K.), Ltd.
Venassa	10.3.64	M. E. Holdron	A. G. Mount, W. Brierley, A. Greener	S. Boner	Shell Tankers (U.K.), Ltd.
Volvatella	5.3.64	R. R. Griffith	E. J. Gubbins, J. Waters, F. West, H. E. Mortimer	K. J. O'Connor	Shell Tankers (U.K.), Ltd.
Waiwera	27.2.64	J. Richmond	J. N. K. Mansell, A. N. Jackson, W. M. Douglas	J. G. McKechnie	Shaw Savill Line
Warkworth	31.10.63	N. Thompson, M.B.E.	R. Tompkinson, C. J. McKeon, K. Scollay	D. W. Cummins, S. Cowan	R. S. Dalgleish, Ltd.
Waroonga	5.3.64	P. H. Bidmead	W. K. Barber, D. W. Keighley, J. W. Edwards	R. B. Field	British India Line
Welsh City	25.2.64	A. B. Parkhouse	T. R. McNulty, T. H. White, J. J. Kalnins	W. Lennard	Sir Wm. Reardon Smith & Sons
Welsh Herald	14.1.64	A. S. Anthony	H. P. Davies, D. M. Ward, W. Davies	M. A. Shinners	Welsh Ore Carriers, Ltd.
Wendover	19.11.63	A. M. Brown	M. Donkin, J. MacCobb, A. W. Hughes	N. Wilson	Watts, Watts & Co., Ltd.
Westbank	*	L. O. Moody	A. V. MacKay, J. Janczewski, P. J. Kenworthy	J. C. Carmody	Bank Line
Weybridge	12.11.63	E. A. Peirce	J. Coleman, M. W. England, J. R. Timms	P. Whittle	Watts, Watts & Co., Ltd.
Willowpool	*	F. D. Lloyd	T. Jones, C. Tingle, R. Taylor	W. Limpet	Sir R. Ropner & Son, Ltd.
Windsor Castle	30.1.64	A. J. Hort	A. S. Lack, I. Matheson, F. Jones	E. Pitt	Union Castle Line
Woodford	23.11.62	A. J. Cox	J. L. P. Harty, M. J. Ross, J. R. Timms	P. Hawkins	Watts, Watts & Co., Ltd.
Yorkshire	28.5.63	R. L. Hagley	P. J. MacDermott, J. F. Beckett, R. M. Ellison, C. J. Vaughan	R. A. Waller	Bibby Line
Zaphon	20.1.64	G. A. C. Nelson	R. C. Shaw, —. Coldwell, A. N. Leyland, —. Strangman	J. A. Boyle	Shell Tankers (U.K.), Ltd.

Supplementary Ships

Name of Vessel	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Aaro	12.11.63	W. C. Gill			Ellerman's Wilson Line, Ltd.
Apollo	21.10.63	G. V. Barnes	S. S. Church, P. Abbott, M. Hogan		Bristol S.N. Co., Ltd.
Ariosto	3.10.63	—. Tyler	P. C. Poston, D. M. Cornes, J. Turley, I. Watts	R. Balfe	Ellerman's Wilson Line Ltd.
Bendoran	*	J. Cringle	A. J. Milligan, J. Hamilton, J. Prosser	A. Dobson	Ben Line
Benlawers	23.12.63	J. L. Forsyth	C. R. Cullen		Ben Line
Benmacdhui	12.11.63	W. G. Watson	J. B. Lyall, D. Hutchison, G. Walker, J. G. Austin	J. Kenny	Ben Line
Benvorlich	12.12.63	R. McPhee	J. A. McIntosh, D. Brown, A. Wilson	A. Gordon	Ben Line
Borodino	29.10.63	A. T. Jardine	G. Mitchell, M. Elvin	A. Sinclair	Ellerman's Wilson Line Ltd.

Supplementary Ships (*contd.*)

Name of Vessel	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
British Chivalry	4.12.63	A. Hicks	A. J. Breeze		B.P. Tanker Co., Ltd.
British Destiny	*	G. M. Barton	G. T. Sheridan, T. Brant, D. Goodwin	J. Guttrie	B.P. Tanker Co., Ltd.
British Energy	*	J. E. S. Robinson	M. Buchanan, H. Harrison, A. L. Watson	J. D. Kilgour	B.P. Tanker Co., Ltd.
British Oak	24.3.64	A. C. Browne	R. J. Pilley, R. Chew, K. Fox	H. Taylor	B.P. Tanker Co., Ltd.
British Reliance	*	S. C. Davies	K. C. Newcombe, D. Sinclair, D. McCallum	J. Uttley	British Tanker Co., Ltd.
Byland Abbey	11.2.64	B. Brown	R. Ockleton, M. Goodman, B. Lee, H. Garner	A. Stockdale	Associated Humber Lines, Ltd.
Camellia	1.5.63	G. W. Mortimer	M. D. Staniforth, R. Sidney, J. B. Moralee		J. Robinson & Son
Carlo	17.5.62	E. R. Corp	J. G. Jones, M. W. Salsbury, J. Ayers, E. P. Metham	M. Powell	Ellerman's Wilson Line Ltd.
Catford	8.4.63	E. Clarke	L. Thompson, G. Beattie	A. Corkhill	South Eastern Gas Board
Cicero	28.10.63	E. Tyler	R. A. Blencoe, C. R. Tutty, J. D. Edwards, L. Gibson	R. A. Newton	Ellerman's Wilson Line Ltd.
Circassia	23.9.63	W. S. Thomson, O.B.E.	J. A. Scrimgeour, T. Robbins, J. J. Craig	D. Letcher	Anchor Line
Croydon	*	H. G. N. D'Evelin	A. W. Dixon	A. W. Dixon	South Eastern Gas Board
Dartwood	16.12.63	J. Germaine	B. L. Bass, B. Taylor, A. E. Archer, A. B. Powell	J. Montieth	Wm. France, Fenwick & Co., Ltd.
Dido	*	J. Thatcher	S. Church, M. J. Hogan		Bristol S.N. Co., Ltd.
Echo	26.3.64	J. L. Jenkins	P. Abbott, J. Corbett, H. Grant, K. May		Bristol S.N. Co., Ltd.
Esso Lancashire	19.3.64	T. S. McMaster	M. Stacey, R. MacKinnon, G. Harrison, M. Lockrie	J. M. Murphy	Esso Petroleum Co., Ltd.
Esso York	*	G. H. Union	W. McCormack, E. Morrison, L. Arrissmith	J. Kilbain	Esso Petroleum Co., Ltd.
Glitra	5.6.62	G. Reid	W. N. H. Anderson, J. V. Walgate, R. D. McGlashan		Chr. Salvesen & Co., Ltd.
Gloxinia		J. Shaw	E. Hutchinson, W. Sutherland, D. Staniforth		Stag Line
Hudson Deep	11.9.63	J. C. Gibbons	D. Willey, A. A. Brown, L. J. Stevens, J. G. Melia		Hudson S.S. Co., Ltd.
Kirkham Abbey	16.3.64	H. W. Crabtree	E. J. Robinson, M. Walker, J. Sitch, W. G. Calam		Associated Humber Lines, Ltd.
Lord Codrington	6.12.63	R. Hanson	A. Kamdron, J. King, J. Whitney	T. O. Bradey	Ship Finance Management Co., Ltd.
Malmo	24.9.63	L. R. Stillwell	J. B. Drinkall, K. B. Grayson, E. R. Lear	G. Anderson	Ellerman's Wilson Line Ltd.
Mangla	9.10.63	A. E. Evans	J. I. Clucas, A. P. Briggs, P. F. Blackburn, R. A. Powell	W. Curry	Brocklebank Line
Maskelyia	20.1.64	J. Moore	P. Brimley, K. J. G. Bell, D. M. Woolfendon	E. MacKinnon	Brocklebank Line
Mawana	18.9.63	L. E. Jeans	A. K. Lloyd	P. Y. Wright	Brocklebank Line
Milo	3.2.64	W. R. Kays	E. Foley, B. Murphy		Bristol S.N. Co., Ltd.
Mirror	3.2.61	G. Garrett	R. M. D. Wright, P. J. Duff, G. J. Ayrton	J. Kinson	Cable & Wireless, Ltd.
Riseley	*	J. Ord	J. Milne, T. Roberts, M. Donkin	J. D. Rye	Stephens, Sutton, Ltd.
Sanguity	25.3.64	M. B. Elsey	J. London		F. T. Everard & Sons, Ltd.
Soutra	9.7.62	W. Sinclair	A. Nicolson, C. F. Irvine, S. Allan		Chr. Salvesen & Co., Ltd.
Springheather	*	J. Cowie	D. Mair		Kettlewell & Son
Streambank	7.11.63	A. M. Williamson	J. Morrison, S. Mallory, P. J. Lanchdon, L. C. Tate	B. A. Stock	Bank Line
Tolsta	28.6.63	M. Polson	A. Birchell, L. J. A. Gibb, C. J. Nicolson	L. J. A. Gibb	Chr. Salvesen & Co., Ltd.
Truro	22.1.64	J. K. Marrow, M.B.E.	J. M. Jarratt, B. A. Gash, R. J. Palmer, G. Atkinson	T. P. M. Kieran	Ellerman's Wilson Line Ltd.
Tudor Prince	15.11.63	A. H. Kent	B. Ditchburn, M. Smith, G. Wilson, B. S. Young	P. Richardson	Prince Line
Tynemouth	8.1.64	J. Barrass	G. Wood, A. Robertson	J. F. Morris	Burnett S.S. Co., Ltd.
Uganda	19.3.64	J. D. Hamilton	C. J. Sample	J. W. Soulsby	British India Line
Volo	18.10.63	W. K. Tadman	L. Gibson, R. Jones	J. Strong	Ellerman's Wilson Line Ltd.
Winga	25.2.64	R. J. McNinch	A. MacIntyre	W. C. Doyle	Glen & Co., Ltd.
York	10.9.63	J. W. Lavrack	R. Shaw, B. Wooler, J. Marr		Associated Humber Lines, Ltd.
Zinnia	11.12.63	W. R. Hunter	S. D. Hyland, H. Selkirk, W. Fallon	J. J. Sullivan	J. Robinson & Son

'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
Adriatic Coast	D. McAusland	Coast Lines Ltd.
•*Alderney Coast*	R. O. Hanson	British Channel Islands S.S. Co., Ltd.
•*Amsterdam*	A. W. Greenham	British Transport Commission
•*Angularity*	D. O'Leary	F. T. Everard & Sons Ltd.
•*Arnhem*	F. B. Allen	British Transport Commission
Ballylagan	A. Barrow	John Kelly Ltd.
Bardic Ferry	K. Hocking	Atlantic Steam Nav. Co.
•*Bolton Abbey*	H. Aaron	Associated Humber Lines Ltd.
•*Brenda*	J. McKinnon	Dept. of Agric. for Scotland
B.P. Manager	F. M. Cain	Shell-Mex & B.P. Ltd.
•*B.P. Marketer*	J. MacIntyre	Shell-Mex & B.P. Ltd.
B.P. Transporter	P. Brown	Shell-Mex & B.P. Ltd.
Caeserea	V. Newton	British Transport Commission
Caledonian Princess	J. F. D. Hey	Caledonian Steam Packet Co.
Cambria	W. J. Roberts	British Transport Commission
Cardiffbrook	G. Hudson	Comben, Longstaffe & Co., Ltd.
Cantick Head	A. Alvis	Henry & Macgregor Ltd.
Cerdic Ferry	C. E. Tanner	Atlantic Steam Nav. Co.
Cheshire Coast	C. A. Hopkins	Coast Lines Ltd.
Claymore	N. Campbell	MacBrayne & Co.
•*Clupea*	J. Jappy	Dept. of Agric. & Fisheries for Scotland
•*Corfen*	F. Martin	Wm. Cory & Son, Ltd.
•*Cormead*	R. Lilley	Wm. Cory & Son, Ltd.
•*Cormoat*	A. E. Clarke	Wm. Cory & Son, Ltd.
Corncrake	G. C. Longfield	General Steam Nav. Co., Ltd.
Darlington	W. Brown	Associated Humber Lines Ltd.
Devon Coast	D. Campbell	Coast Lines Ltd.
Doric Ferry	D. Burges	Atlantic Steam Nav. Co.
Dorset Coast	W. R. Walker	British Transport Commission
Drake	J. Ward	General Steam Nav. Co., Ltd.
•*Dryburgh*	G. Patience	G. Gibson & Co., Ltd.
•*Duke of Argyll*	—. Greenwood	British Transport Commission
•*Duke of Lancaster*	J. Irwin	British Transport Commission
•*Duke of Rothesay*	J. B. Williams	British Transport Commission
Elk	H. L. Woolly	British Transport Commission
Elwick Bay	W. G. Dennison	Elwick Shipping Co.
Ettrick	J. Murray	Geo. Gibson & Co., Ltd.
Fauvic	H. S. Shugar	Channel Shipping Ltd.
•*Fernhurst*	E. C. Ford	Stephenson, Clarke Ltd.
Ferryhill	J. Innes	Aberdeen Coal & Shipping Co., Ltd.
•*Fulham X*	D. Battle	Stephenson, Clarke Ltd.
Guernsey Coast	P. Meras	Coast Lines Ltd.
Hadrian Coast	W. B. Browne	British Channel Is. Shipping Co., Ltd
•*Helmsdale*	A. Ross	Northern Trading Co., Ltd.
•*Heron*	E. C. Painter, D.S.C.	General Steam Nav. Co., Ltd.
Hesperus		Northern Lighthouse Board
•*Hibernia*	E. A. Horspool	British Transport Commission
•*Hibernian Coast*	G. Mearns	Coast Lines Ltd.
•*Iberian Coast*	G. Croxford	Tyne, Tees Shipping Co., Ltd.
•*Innisfallen*	T. McVeigh	City of Cork Steam Packet Co.
Ionic Ferry	W. Close	Atlantic Steam Nav. Co. Ltd.
Irish Coast	J. MacReinon	Coast Lines Ltd.
Jade	A. Fletcher	Wm. Robertson Ltd.
Jersey Coast	P. Meras	Coast Lines Ltd.
Kelvin	H. A. Matheson	Wm. Sloan & Co., Ltd.
Lairds Crest	J. T. Wood	Burns Laird Line Ltd.
Lairds Glen	A. Palmer	Burns Laird Line Ltd.
Lairds Loch	F. M. Flint	Burns Laird Line Ltd.
•*Lancashire Coast*	R. E. Holt	Coast Lines Ltd.
•*Leinster*	G. Barry	Coast Lines Ltd.
•*Loch Ard*	D. Gunn	D. MacBrayne & Co.
•*Loch Carron*	H. Matheson	D. MacBrayne & Co.
Loch Linnhe	H. McArtney	J. Rainey Ltd.
Loch Nor	D. McLeod	D. MacBrayne & Co.
•*Loch Seaforth*	J. Smith	D. MacBrayne & Co.
May	D. McCorquodale	Northern Lighthouse Board
Melrose	W. Fisher	G. Gibson & Co., Ltd.
Melrose Abbey	J. Blackburn	Associated Humber Lines Ltd.
Mitcham	W. L. Purvis	South Eastern Gas Board
Moose	A. Moir	British Transport Commission
Mountstewart	H. A. Matheson	Coast Lines, Ltd.
•*Munster*	J. Williams	Coast Lines, Ltd.
•*Mytongate*	F. Williams	Hull Gates Shipping Co.
•*Netherlands Coast*	E. Fisher	Tyne, Tees Shipping Co., Ltd.
Olivian Coast	T. S. Stewart	Tyne, Tees Shipping Co., Ltd.
Orelia	D. S. Craven	Houlder Bros., Ltd.
Orselina	T. Jarvis	Commodore Shipping Co., Ltd.
•*Pearl*	W. Campbell	Gem Line Ltd.
Pharos	C. Campbell	Northern Lighthouse Board
Pluto	E. Jones	Bristol Steam Nav. Co., Ltd.
Pole Star	A. W. Walker	Northern Lighthouse Board

• These ships report wind and weather.

'Marid' Ships (*contd.*)

Name of Vessel	Captain	Owner/Manager
Princess Maud	R. Roberts	British Transport Commission
St. Andrew/St. David	D. Griffiths	British Transport Commission
St. Clair	T. Gifford	North of Scotland Shipping Co., Ltd.
•*St. Magnus*	J. Harvey	North of Scotland Shipping Co., Ltd.
St. Patrick	C. E. Hatchley	British Transport Commission
St. Rognvald	J. Bisset	North of Scotland Shipping Co., Ltd.
•*Sappho*	N. J. Llewellyn	Bristol Steam Nav. Co., Ltd.
Sarnia	G. Cartwright	British Transport Commission
•*Scotia*	A. M. Finlayson	Dept. of Agric. & Fisheries for Scotland
•*Scottish Coast*	J. S. Nicholson	Coast Lines Ltd.
Seamew	C. Johnson	General Steam Navigation Co., Ltd.
Silvio	H. Whitfield	Ellerman's Wilson Line, Ltd.
Slieve Bawn	L. C. Mills	British Transport Commission
Slieve Bearnagh	D. H. Johnson	British Transport Commission
Slieve Bloom	J. R. Rowlands	British Transport Commission
Slieve League	G. Davey	British Transport Commission
Slieve More	G. J. Butterworth	British Transport Commission
Southern Coast	J. G. Casey	Coast Lines, Ltd.
•*Spray*	J. Andrews	Ellis & McHardy
Stormont	A. N. Blundell	Belfast S.S. Co., Ltd.
•*Superiority*	R. W. Jones	F. T. Everard & Sons, Ltd.
Taliskar	L. Lamont	Wm. Sloan & Co., Ltd.
Tay	D. McDonald	Wm. Sloan & Co., Ltd.
•*Teano*	F. Barnard	Ellerman's Wilson Line
The President	A. Turner	J. Hay & Sons
•*Torquay*	G. Youngson	J. & A. Davidson, Ltd.
Warwickbrook	D. J. Moyes	Comben, Longstaffe & Co., Ltd.
•*Whitby Abbey*	—. Wooler	Associated Humber Line, Ltd.
Winchester	B. Picot	British Transport Commission
•*Woodlark*	J. Everett	General Steam Navigation Co., Ltd.
Woodwren	C. C. Reynolds	General Steam Navigation Co., Ltd.
Yewarch	S. M. Broughton	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	Firth Steam Trawling Co., Ltd.
B. A. Ashcroft	A. J. Nettleship	Hellyer Bros., Ltd.
P. E. Craven	D. L. Verity	North Cape Fishing Co., Ltd.
J. E. Dobson	K. H. Massey	Thomas Hamling & Co., Ltd.
M. Hough	J. H. Large	Thomas Hamling & Co., Ltd.
J. Kersey	E. D. Constantine	Hudson Bros. Trawlers, Ltd.
B. Lee	J. McKillen	Kingston Steam Trawling Co., Ltd.
A. Nelson	A. J. Nettleship	Hellyer Bros., Ltd.
C. A. Nielsen	R. T. Murphy	Kingston Steam Trawling Co., Ltd.
M. Redfearn	J. Robinson	Hudson Bros., Ltd.
A. Salter	A. F. Fletcher	Hudson Bros., Ltd.
T. Sawyer	J. H. Large	Thomas Hamling & Co., Ltd.
S. Spark	S. Blackshaw	Thomas Hamling & Co., Ltd.
E. Thundercliffe	C. Duplock	Hellyer Bros., Ltd.
R. Waller	R. R. N. Laing	Hudson Bros., Ltd.
B. C. Wharam	L. Hought	St. Andrews Steam Fishing Co., Ltd.
G. Whur	A. Ramsay	Hudson Bros., Ltd.

Training Establishments

The following is a list of Training Establishments which submit logbooks, kept by the cadets under training.

Establishments	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. L. Argles, O.B.E., D.S.O., R.N. (Retd.)

Light-vessels

NAME OF VESSEL	MASTERS
Bar	E. E. Abbott, N. S. Burns
Dowsing	H. Frost, T. W. Dodd
East Goodwin	G. A. Alp, T. J. Mills
Galloper	S. R. Woolnough, W. G. Burroughs
Humber	D. A. Bacon, D. W. Bird
Longstone (Lt. Ho.)	R. D. Evens, F. Hayleton
Newarp	W. E. Fenn, A. C. Edwards
Royal Sovereign	B. J. Key, G. Davies
St. Gowan	N. T. Evans, R. J. Owen
Seven Stones	W. E. Harvey, D. J. Harris
Shambles	H. Price, A. C. Edwards
Shipwash	B. G. Simpson, J. Goldsmith
Skulmartin	D. Hawkins, J. O'Neill
Smith's Knoll	B. E. Cunham, W. Semple

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.

AUSTRALIA (Information dated 1.4.64)

NAME OF VESSEL	OWNER
Selected Ships:	
Arafura	E. & A.S.S. Co.
Arawatta	E. & A.S.S. Co.
Aros	Australia–West Pacific Line
Bamora	B.I.S.N. Co.
Barossa	McIlwraith McEacharn Ltd.
Barpeta	B.I.S.N. Co.
Bass Trader	Australian National Line
Burwah	Howard Smith, Ltd.
Bulolo	Burns Philp & Co.
Cape Don	Aust. Lighthouse Supply Service
Carpentaria	B.I.S.N. Co.
Chakrata	B.I.S.N. Co.
Chandpara	B.I.S.N. Co.
Charon	A. Holt & Co.
Delos	Australia-West Pacific Line
Eastern	E. & A.S.S. Co.
Fremantle Star	Blue Star Line
Gorgon	A. Holt & Co.
Hobart Star	Blue Star Line
Kangaroo	State Shipping Serv.
Koojarra	State Shipping Serv.
Koomilya	Associated Steamships Pty. Ltd.
Koorawatha	McIlwraith McEacharn Ltd.
Malaita	Burns Philp & Co.
Malay	Austasia Line Ltd.
Malekula	Burns Philp & Co.
Mandama	Austasia Line Ltd.
Mandowi	Austasia Line Ltd.
Milos	Australia–West Pacific Line
Montoro	Burns Philp & Co.
Nankin	E. & A.S.S. Co.
Nardana	B.I.S.N. Co., Ltd.
Nellore	E. & A.S.S. Co.
Port Melbourne	Port Line Ltd.
Port New Plymouth	Port Line Ltd.
Port Quebec	Port Line Ltd.
Rhexenor	Blue Funnel Line
Rona	Colonial Sugar Refining Co., Ltd.
Samos	Australia–West Pacific Line
Shansi	Butterfield & Swire
Soochow	China Navigation Co., Ltd.
Stentor	Blue Funnel Line
Tenos	Australia–West Pacific Line
Tientsin	China Navigation Co., Ltd.
Townsville Star	Blue Star Line
Triadic	Phosphate Commissioners
Trienza	Phosphate Commissioners
Tsingtao	China Navigation Co., Ltd.
Tulagi	Burns Philp & Co.
Wangara	Australian National Line
Wharanui	New Zealand Shipping Co.
Windarra	J. Bourke Ltd.

Australia (*contd.*)

Name of Vessel	Owner
Supplementary Ships:	
Binburra	Australian National Line
Delamere	State Shipping Serv.
Dorrigo	State Shipping Serv.
Dulverton	State Shipping Serv.
Kabbarli	State Shipping Serv.
Koolama	State Shipping Serv.
Wongala	Tucker Shipping Co.

CANADA (Information dated 23.3.64)

Name of Vessel	Owner
Selected Ships:	
A. T. Cameron	Govt. of Canada
Arcadia	P. & O.-Orient Lines
Athelduke	Athel Line, Ltd., Liverpool
Baffin	Govt. of Canada
Beaverfir	Canadian Pacific Steamships
Bluenose	Govt. of Canada
Camsel	Govt. of Canada
Canberra	P. & O.-Orient Lines
Cartier	Govt. of Canada
C. D. Howe	Govt. of Canada
Cyrus Field	Western Union Telegraph Co.
d'Iberville	Govt. of Canada
Edward Cornwallis	Govt. of Canada
Hudson	Govt. of Canada
Imperial St. Lawrence	Imperial Oil Ltd.
Irving Glen	Glenco Co., Ltd., Bahamas
John A. Macdonald	Govt. of Canada
Kapuskasing	Govt. of Canada
Labrador	Govt. of Canada
Lakemba	Pacific Shipowners, Singapore
Letitia	Donaldson Line Ltd., Glasgow
Lord Kelvin	Western Union Telegraph Co.
Montcalm	Govt. of Canada
Narwhal	Govt. of Canada
N. B. Maclean	Govt. of Canada
Northern Shell	Shell Canadian Tankers, Ltd.
Oriana	P. & O.-Orient Lines
Port Dauphine	Govt. of Canada
Rally	Govt. of Canada
Rapid	Govt. of Canada
Relay	Govt. of Canada
Saldura	Chr. Salvesen & Co., Ltd., Leith
Simon Fraser	Govt. of Canada
Sir Humphrey Gilbert	Govt. of Canada
Sir William Alexander	Govt. of Canada
Thor I	A. S. Thor Dahl, Sandefjord, Norway
Thorshope	A. S. Thor Dahl, Sandefjord, Norway
Thorsriver	A. S. Thor Dahl, Sandefjord, Norway
Thorstream	A. S. Thor Dahl, Sandefjord, Norway
Waihemo	Union Steamship Co. of New Zealand
Wolfe	Govt. of Canada
Supplementary Ships:	
Abegweit	Govt. of Canada
Acadia	Govt. of Canada
Anna Bakke	Knutsen Line, Norway
Banksland	Hudson Bay Company
Bonneville	A. F. Klaveness & Co., Oslo
Bougainville	A. F. Klaveness & Co., Oslo
Bronxville	A. F. Klaveness & Co., Oslo
Emerillon	Shell Canadian Tankers, Ltd.
Imperial Halifax	Imperial Oil Ltd.
Imperial Quebec	Imperial Oil Ltd.
Indiana	Ameritalia & Co., Trieste
Maxwell	Govt. of Canada
Octavia	H. Daulsburg, Bremen, Germany
Princess of Acadia	Canadian Pacific Railways
Sunadele	Zurich Shipping Co.
Sunnyville	Klaveness Line
Sunprincess	Princess Shipping Co., Monrovia
William Carson	Canadian National Railways

Auxiliary Ships:
Canada has 17 ocean-going Auxiliary Ships and 27 Auxiliary Ships operating on the Great Lakes

HONG KONG (Information dated 22.4.64)

Name of Vessel	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Anking	R. C. W. Gorman	F. F. D. Pook, D. A. Daish, S. O. Swanwick	Lum A. Gwan Ying	China Navigation Co., Ltd.
Anshun	A. J. Keddie	J. M. Wigham, H. A. Feather, L. Kane	Lai Mou Wah	China Navigation Co., Ltd.
Changsha	J. F. O'Connor	C. J. H. Ennion, A. Young, J. W. Simpson	Cheng Yui Man	China Navigation Co., Ltd.
Chefoo	M. O. Burbridge	J. Paisley, D. R. Groves, B. F. Rogers	Tsin Kwong Loi	China Navigation Co., Ltd.
Chekiang	K. D. Johnson	J. K. Davies, T. S. Payne, T. Collom	Kong Shi Wei	China Navigation Co., Ltd.
Chengtu	J. A. McDonald	C. D. Nisbet, M. Bufton, G. A. Fairclough	Yue Shiu Ming	China Navigation Co., Ltd.
Chungking	F. Cunningham	D. R. Owens, J. L. MacInnes, R. M. Booth	Omar Ismail	China Navigation Co., Ltd.
Clara Jebsen	G. Andersen	J. E. Soerensen, F. Nissen, B. Nielsen	Ong Sze Chin	Jebsen & Co.
Dana	J. Johnsen	A. Johannessen, R. Rasmussen, M. Viken	Hung Siu Kie	J. H. Nordboe
Eastern Argosy	J. M. Marshall	G. W. S. Ison, D. Smith, R. C. Porteous	R. Sadler	Indo-China S.N. Co., Ltd.
Eastern Glory	I. C. W. Marr	K. Millar, G. T. Norton, Leung Kwan Yu	D. I. Griffiths	Indo-China S.N. Co., Ltd.
Eastern Maid	W. G. White	R. W. Gibson, G. G. Taylor, D. A. C. Allardice	T. J. O'Driscoll	Indo-China S.N. Co., Ltd.
Eastern Moon	R. K. Learoyd	R. M. F. Bertram, G. T. Colbeck, A. F. Spaull	F. J. Bateman	Indo-China S.N. Co., Ltd.
Eastern Muse	I. H. Nichols	R. G. MacDonald, E. G. Edmondson, P. R. Hammond	T. W. Bolton	Indo-China S.N. Co., Ltd.
Eastern Queen	J. F. G. Fotheringham	J. D. McNeill, J. S. W. D. Popplewell, T. M. Muir	R. G. Brennan	Indo-China S.N. Co., Ltd.
Eastern Ranger	W. J. Bartlett	D. M. Cauvin, M. G. Lever, G. F. Hammonds	N. C. Watchorn	Indo-China S.N. Co., Ltd.
Eastern Rover	F. H. Main	D. Wilson, M. L. Olesen, J. R. Denney	R. O. Smith	Indo-China S.N. Co., Ltd.
Eastern Saga	M. I. Groundwater	J. G. Boyle, J. C. Jones, M. K. Montgomery	E. A. Dunford	Indo-China S.N. Co., Ltd.
Eastern Star	W. E. Reeve	J. A. C. Hunter, A. I. Webb, K. A. Ashworth	E. J. O'Brien	Indo-China S.N. Co., Ltd.
Eastern Trader	C. Preston	J. D. R. Witschi, M. Price, J. Wroughton	D. H. Holvey	Indo-China S.N. Co., Ltd.
Elsbeth	A. C. Tai	C. S. Barboza, C. F. Tang	Y. F. Yeung	Shun Cheong S.N. Co., Ltd.
Fengning	N. C. Pearson	B. W. Bland, L. Chatfield, S. Y. Ng	Tsang Pui Leung	China Navigation Co., Ltd.
Fengtien	M. T. Anderson	D. T. Hollands, H. Davis, Y. P. Ngan	Ngu Chi Siang	China Navigation Co., Ltd.
Foochow	B. J. Williams	J. R. C. Hanman, J. B. Wells, C. H. Ip	Lo Kin Chek	China Navigation Co., Ltd.
Francis Drake	G. L. Bremner	P. D. Carlson, J. C. Rodgers, D. Campbell	J. W. Watson	H. C. Sleigh Ltd.
Fukien	J. Keates	W. B. Jones, A. J. White, W. K. Li	Tsang Kau	China Navigation Co., Ltd.
Funing	R. E. Brooks	C. G. Cocksedge, R. D. Keene, D. C. Williams	Leung Shu Fun	China Navigation Co., Ltd.
Hai Hing	H. Yndestad	K. Jakobsen, Odd Andersen, O. Hovland	Chung Yeuk	Norwegian Asia Line
Hai Lee	O. Johannessen	N. Klokk, Torleiff Egeland, H. Tjoflot	Chan Wuie Iu	Norwegian Asia Line
Hai Meng	T. Thorkildsen	R. L. Andersen, T. Lundegaard, W. J. J. Jacobsen	Chan Kam Tsun	Norwegian Asia Line
Halldis	A. Lerstang	J. Bogwald, L. Moen, A. Øverland	M. Saugen	Norwegian Asia Line
Halldor	N. Soelberg	A. Grønvik, Stein Olsen, H. Kolnes	Jar Erling Dahl	Norwegian Asia Line
Hallvard	O. Schibsted	G. Forde, K. M. Knutsen, T. Hemingby	Aa. Antonsen	Norwegian Asia Line
Hang Sang	B. O. Jensen	B. G. Cox, B. T. Scarbrough, Yuen Chok Ying	A. M. Baily	Indo-China S.N. Co., Ltd.
Heinrich Jessen	H. P. Fallesen	N. F. Moeller, J. E. Jensen, E. K. Frandsen	M. J. Fernandez	Jebsen & Co.
Helios	N. O. Wilhelmsen	Arne Johnsen, Niels Kaaber, S. Birkeland	Ip Yuk Fai	Norwegian Asia Line
Henrik	Ake Sjøberg	R. Farstad, O. Langva, H. Saeteroy	Chiu Tze Kong	Norwegian Asia Line
Hermod	O. J. Apold	Odd Andreassen, T. Monsen, E. N. Kristiansen	Poon Chee Pooi	Norwegian Asia Line
Hero	H. Andersen	J. Krakemo, T. Samset, Steinarlien	Bjurn Tangerud	Norwegian Asia Line
Hervar	O. H. Andersen	Knut Dagsland, Odd Stromsness, Kolbjorn Digerness	Lai Kwong Yin	Norwegian Asia Line
Hin Sang	L. C. Cox	P. Ferrar, P. L. Ballantyne, Hsu Chien Szu	J. S. Mathers	Indo-China S.N. Co., Ltd.
Ho Sang	G. C. Taylor	D. N. Greenhalgh, B. E. W. Woods, Cheung Kai Ming	W. Dobbie	Indo-China S.N. Co., Ltd.
Hoi Wong	J. Ekrene	A. Bjelland, F. Torsen, B. Lilleland	H. Fastingsen	H. M. Wrangell & Co., Ltd.
Jacob Jebsen	E. Andersen	W. Fabricius, L. M. B. Soerensen	Lam Bun	Jebsen & Co.
Kuala Lumpur	A. Watson	M. H. A. Swift, D. W. Boys, C. E. Royle	Mak Yau	China Navigation Co., Ltd.
Kwangsi	J. M. K. Kelley	R. Kennett, H. G. Reid, C. E. M. Graham	Shiu Ping Fan	China Navigation Co., Ltd.
Kwangtung	J. M. Parker	J. Lough, D. Bendall, A. P. Clements	Li San Kau	China Navigation Co., Ltd.
Kweichow	W. Pollock	R. J. Shipp, J. R. Stevens, T. W. Allsop	Tang Yuen	China Navitation Co., Ltd.
Kweilin	A. Harper	B. A. Owen, I. D. Goddard, O. I. Isherwood	Choi Pong Cheung	China Navigation Co., Ltd.
Michael Jebsen	R. Felotmann	A. J. Andresen, J. D. Feddersen, P. Hedlund	Lai Cho Hoi	Jebsen & Co.

Hong Kong (*contd.*)

Name of Vessel	Captain	Observing Officers	Senior Radio Officers	Owner/Manager
Mui Heng	O. Antonsen	A. Lervik, R. Lorentzen	Lee Hor Chung	Sveen Shipping Co., Ltd.
Sinkiang	K. H. Nettleship	J. H. Gomersall, A. J. Brown, S. C. Lam	Ling Shiu Ming	China Navigation Co., Ltd.
Star Alcyone	C. E. Haggblad	N. S. Forsberg, S. O. V. Hellstorm, P. A. Hansen	U. G. Seger	Everett S.S. Corporation S/A
Star Antares	C. G. Moberg	S. A. Bengtson, K. A. J. Thomson, L. O. Sandstorm	P. O. Eiriksson	Everett S.S. Corporation S/A
Star Betelgeuse	O. C. G. Warfvinge	T. Wiioik, C. G. Persson, E. E. J. Stefansen	R. I. Aspenberg	Everett S.S. Corporation S/A
Szechuen	B. McLennan	M. J. Tidey, A. J. Mill Irving, C. H. Fu	Wong Woon Man	China Navigation Co., Ltd.
Taiyuan	D. A. Hutchinson	P. S. Flening, C. G. Murray, D. C. Ramsey	U. In Sang	China Navigation Co., Ltd.
Tai Wah Shan	E. L. M. Merrett	J. Kiely, Cheung Chuen, Chor Chung	Leung Kit Cheun	Shun Cheung S.N. Co., Ltd.

NEW ZEALAND (Information dated 7.4.64)

Name of Vessel	Owner	Name of Vessel	Owner
Selected Ships:		*Moana Roa*	New Zealand Govt.
Kaimanawa	Union S.S. Co. of New Zealand, Ltd.	*Ngakutu*	Union S.S. Co. of New Zealand, Ltd.
Kaimiro	Union S.S. Co. of New Zealand, Ltd.	*Ngatoro*	Union S.S. Co. of New Zealand, Ltd.
Kaitoa	Union S.S. Co. of New Zealand, Ltd.	*Port Montreal*	Port Line, Ltd.
Kaitoke	Union S.S. Co. of New Zealand, Ltd.	*Saracen*	Crusader Shipping Co., Ltd.
Kaituna	Union S.S. Co. of New Zealand, Ltd.	*Tarawera*	Union S.S. Co. of New Zealand, Ltd.
Karamu	Union S.S. Co. of New Zealand, Ltd.	*Tofua*	Union S.S. Co. of New Zealand, Ltd.
Karitane	Union S.S. Co. of New Zealand, Ltd.	*Waikare*	Union S.S. Co. of New Zealand, Ltd.
Katea	Union S.S. Co. of New Zealand, Ltd.	*Waimate*	Union S.S. Co. of New Zealand, Ltd.
Kawaroa	Union S.S. Co. of New Zealand, Ltd.	*Waimea*	Union S.S. Co. of New Zealand, Ltd.
Kawatiri	Union S.S. Co. of New Zealand, Ltd.	*Waipori*	Union S.S. Co. of New Zealand, Ltd.
Kawerau	Union S.S. Co. of New Zealand, Ltd.	*Wairata*	Union S.S. Co. of New Zealand, Ltd.
Komata	Union S.S. Co. of New Zealand, Ltd.	*Wairimu*	Union S.S. Co. of New Zealand, Ltd.
Koraki	Union S.S. Co. of New Zealand, Ltd.	*Waitemata*	Union S.S. Co. of New Zealand, Ltd.
Koranui	Union S.S. Co. of New Zealand, Ltd.		
Koromiko	Union S.S. Co. of New Zealand, Ltd.	Supplementary Ships:	
Kowhai	Union S.S. Co. of New Zealand, Ltd.	*City of Auckland*	Ellerman & Bucknall S.S. Co., Ltd.
Kurow	Union S.S. Co. of New Zealand, Ltd.	*Holmburn*	Holm & Company
Kurutai	Union S.S. Co. of New Zealand, Ltd.	*Taranui*	South Pacific Shipping Co. (Suva)
Matua	Union S.S. Co. of New Zealand, Ltd.	*Knight Templar*	Crusader Shipping Co., Ltd.

Auxiliary Ships: New Zealand has 10 Auxiliary Ships.

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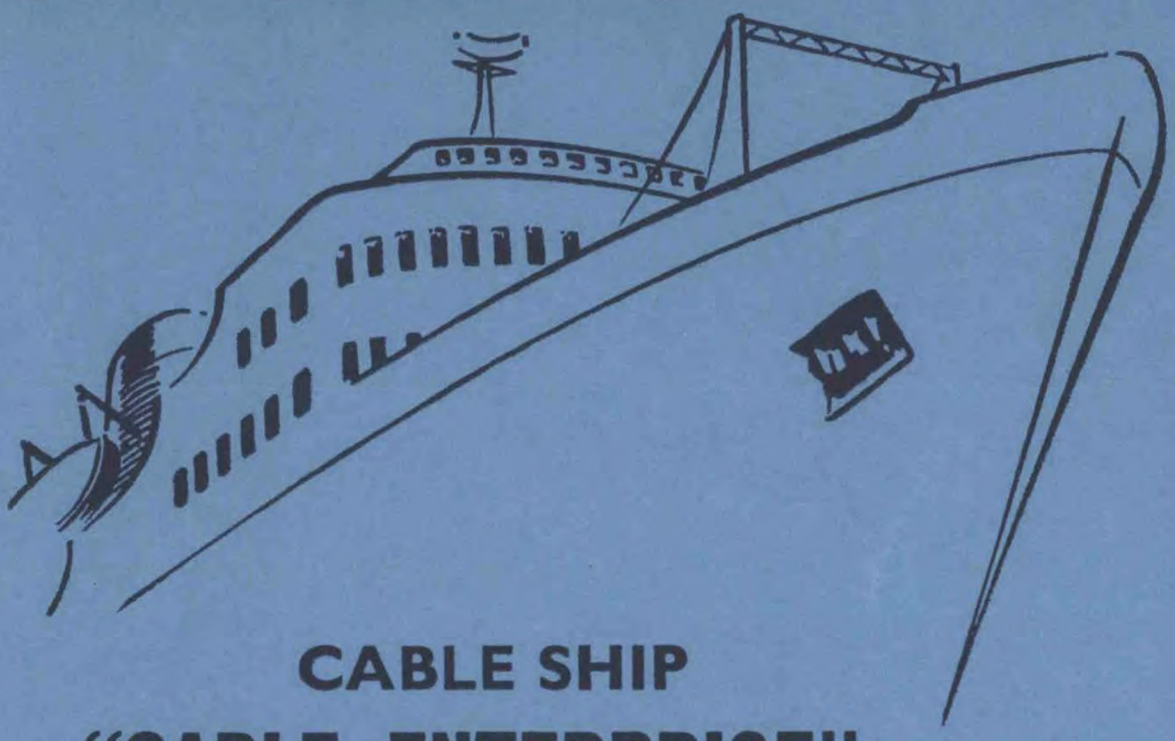
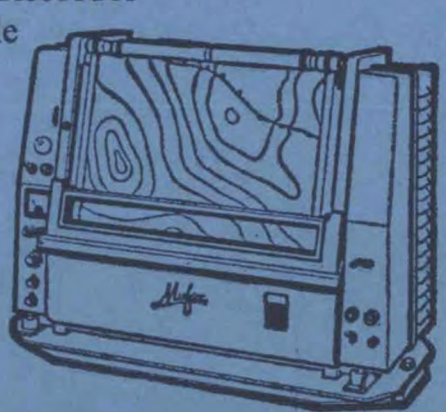
MUFAX IN SHIPS



CABLE SHIP "CABLE ENTERPRISE"

Up-to-the-minute weather information is essential to a cable ship. That's why Cable and Wireless Ltd. have installed a Mufax Weather Chart Recorder in their new cable repair ship C.S. Cable Enterprise. This is the *sixth* cable ship of Cable and Wireless to be fitted with a Mufax recorder—a tribute to the excellent service these machines give. Weather-wise mariners know that Mufax Recorders are easy to use and reliable in service.



MUIRHEAD

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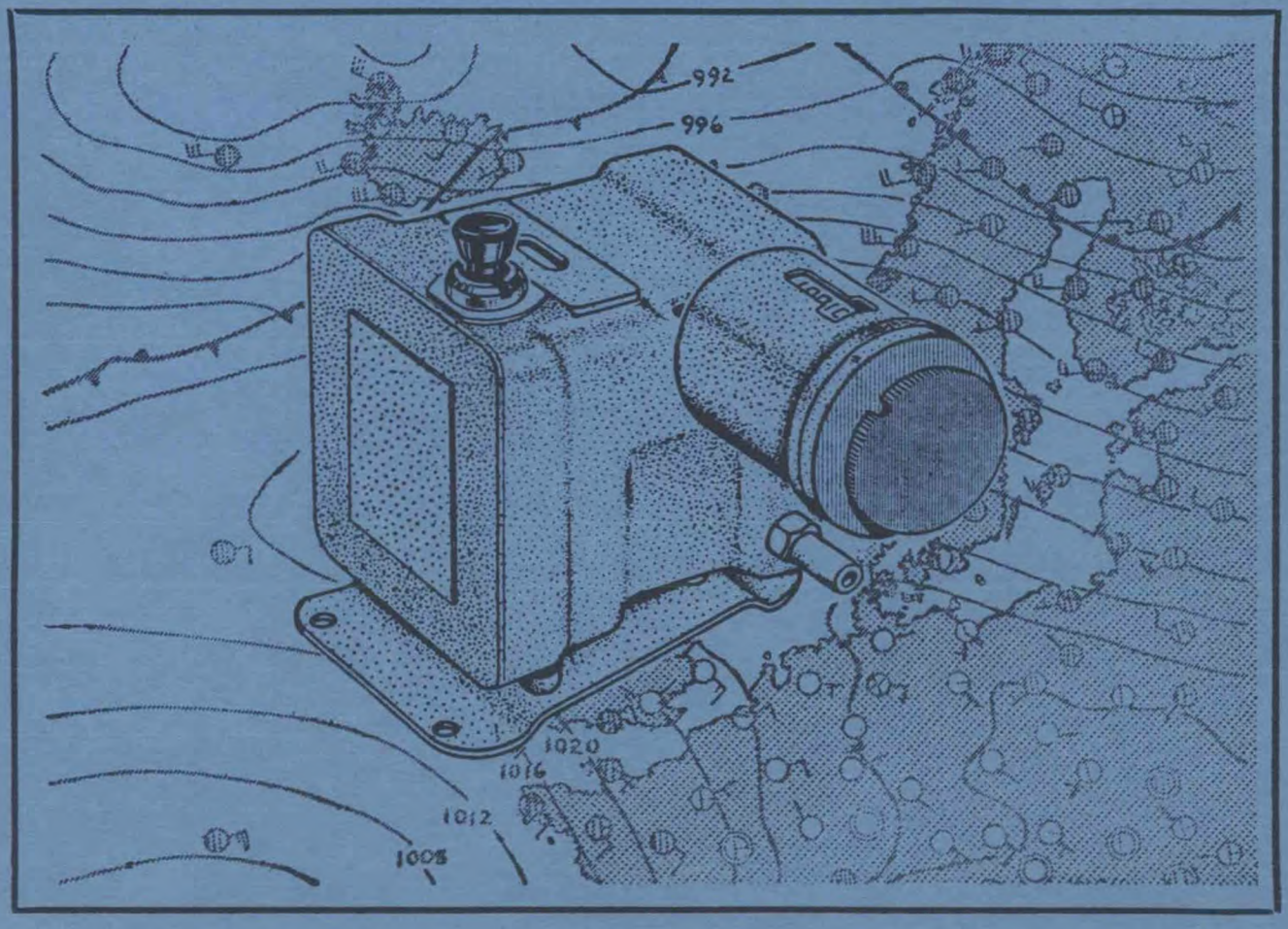
MUIRHEAD INSTRUMENTS INC., 1101 Bristol Rd., Mountainside, New Jersey, U.S.A. *Tel: Code 201, No. 233-6010*

MECHANISM PRECISION ANEROID BAROMETERS WITH DIGITAL READOUT FACILITATE WEATHER REPORTING



A large quantity of these instruments has been ordered by the METEOROLOGICAL OFFICE *for use in ships responsible for making official weather reports where their* ROBUSTNESS, PORTABILITY, *and* ACCURACY *under adverse conditions make them the ideal choice.*

RANGE: 900 to 1050 mb. **DISCRIMINATION: 0·02 mb.**

ACCURACY: At 20°C, ± 0·3 mb. At 5°C & 35°C, ± 0·5 mb. Max. change.

MECHANISM

MECHANISM LIMITED

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