

M.O. 579

The Marine Observer

*A quarterly journal of Maritime
Meteorology*



Volume XXIV No. 163

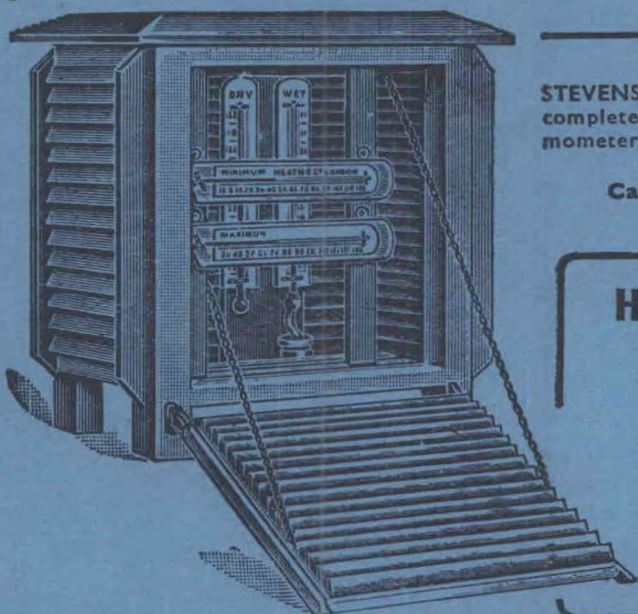
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THE MARINE OBSERVER

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

VOL. XXIV

No. 163

JANUARY, 1954

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*Letters to the editor, and books for review, should be sent to The Editor, "The Marine Observer,"
Meteorological Office, Headstone Drive, Harrow, Middlesex*

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A MESSAGE FROM THE DIRECTOR OF THE METEOROLOGICAL OFFICE

Among the treasures of the Meteorological Office is a handsome carriage clock of traditional design. It bears an inscription saying that it was presented by the French Government to Vice-Admiral Robert Fitzroy in 1864, "*pour les services rendus à la Marine Impériale*". This gift to the first Director of the Meteorological Office is a reminder (if need be) of the essential part which the sea, its ships and its men, have played in organised meteorology. The British weather service is now nearly 100 years old, and throughout this long period observations by ships have been an essential factor in providing the basic information on which the science of meteorology depends.

We are a sea-going people who at times are inclined to forget what we owe to our seamen and our ships. This is not likely to happen with the meteorologist. Our weather comes for the most part from the North Atlantic, and without accurate information from these waters we could not hope to maintain, let alone improve, our forecasts. The merchant ship weather organisation, which operates in all parts of the world, is something to which we as a nation have contributed much and of which we may be very proud. Throughout the years British ships have built up an enviable reputation for accuracy and reliability. The thanks of all those who study or use meteorology go out to the masters and officers who have maintained and are still contributing to this great work.

As the Director of the Meteorological Office I am very conscious of this long and honourable tradition. I hope that during my tenure of this office I shall have opportunities of meeting some of the masters and officers in person; I would like them all to know how highly we value their work. Meanwhile, may I wish those who contribute to this service the best of fortune and add once more the thanks of the Meteorological Office for all that they are doing.

O. G. SUTTON.

Editorial

Casting around for a subject for an Editorial of this New Year number of *The Marine Observer* it seems that one cannot do much better than to discuss the content of this magazine. But before doing so we send to all our readers, whether they be afloat or ashore, on behalf of the Director and staff of the Meteorological Office, our best wishes for 1954.

The first number of *The Marine Observer* appeared in January 1924 with a Foreword by Dr. G. C. Simpson, then Director of the Meteorological Office, and an Editorial by Captain L. A. Brooke-Smith, who was then Marine Superintendent. So with this present number *The Marine Observer* celebrates its thirtieth birthday, and it contains appropriately enough a Foreword by our new Director, Professor O. G. Sutton.

That the science of meteorology has advanced considerably since 1924, in so far as it affects the mariner, can be seen from a study of the various volumes of *The Marine Observer*. The advance of aviation has done much to stimulate meteorological research and to improve forecasting accuracy, and at the same time industry and agriculture have become increasingly aware of the value of meteorological knowledge. Throughout this period (war-time excepted) international co-operation in the meteorological world has been quite admirable and has ensured that shipping of all nationalities in all oceans has, year by year, gradually received more thorough and more accurate meteorological information. Weather forecasting is as yet by no means a perfect science, and despite the fact that observations are now so readily available, both from the upper atmosphere and from the surface,

we have still much to learn about the behaviour of the atmosphere. The part that the voluntary observer at sea himself has played in building up our meteorological picture up to the present is of great importance, and it is quite certain that the value of this information from the oceans will not diminish as the years go by. It is a difficult task for the Meteorological Office to keep in touch with a fleet of some 500 ships, scattered all round the world, but it is hoped that *The Marine Observer* has during these last 30 years, assisted by the personal visits which Port Meteorological Officers and Merchant Navy Agents are able to make, succeeded in some small measure in bridging the gap.

The most regular and important feature of this magazine has always been the "Marine Observers' Log". As the years go by one must surely have the feeling that the quality and variety of the observations contained in this section of our magazine improve. A perusal of its pages brings home the fact that although there are no more lands to discover, there is still romance, adventure and scientific discovery, as well as beauty, at sea. The variety of subjects which appear in this section of the magazine in itself bears this out and emphasises how the duties of a voluntary meteorological observer sharpen one's powers of observation—a useful attribute in any seaman. There was a time when the mariner was considered somewhat incoherent, but the high quality of the English which appears in the "Marine Observers' Log" shows that this is by no means true of the ships' officers of today.

With all due modesty we consider the "Marine Observers' Log" a unique chronicle of meteorological, oceanographical and astronomical phenomena as observed at sea. There is no doubt that this section of our magazine is of real scientific value. Information about waterspouts taken from all available copies of *The Marine Observer* was recently used for a comprehensive article on this subject. Data about phosphorescence are providing the subject of a comprehensive classification of bioluminescence being undertaken by Mr. E. W. Barlow. Other items such as aurora, astronomical phenomena and radar phenomena are regularly referred to the appropriate authorities for comment and information, and from the comments we are able to publish it is obvious that ornithological and biological observations are of considerable interest and value to the authorities concerned with these subjects.

Another thought that emerges from the study of this magazine is the practical value of some elementary science to the ships' officer. Not only is it interesting in itself but it enables him the better to appreciate the marvels and beauties of nature that he sees during his voyage. It is difficult for a navigator to appreciate the limitations, for example, of radar and the echo-sounding apparatus unless he is scientifically minded, and in the pages of *The Marine Observer* we try to stimulate a scientific attitude among ships' officers.

The general articles appearing in this number seem to emphasise the varied interests into which a study of meteorology can lead us, and indeed the numerous applications of meteorology to the job of a seaman. For example, a study of condensation nuclei over the oceans cannot easily be undertaken by a ship's officer, but some understanding of the importance of this to cloud and fog formation and rainfall at least helps him to understand something of the physics of meteorology. Radar echoes from precipitation may adversely affect the navigational range of radar, especially if the precipitation is in the form of large snowflakes which will simultaneously have an adverse effect on optical visibility. Perhaps the most spectacular illustrations of precipitation echoes have been the extremely clear P.P.I. pictures which have been presented by the eye of tropical storms. But by the time such a picture is available on the radar the ship would already be considerably involved in the storm, so one could scarcely consider this as being of great practical navigational aid except as a confirmation of the bearing of the storm centre. Meteorological echoes and the consequent attenuation of the sound from a ship's whistle not only emphasises that "sound is conveyed in a capricious manner

through the atmosphere ", but seems to have an analogy in the attenuation to which radar echoes are subjected under certain meteorological conditions. Even bird navigation has its meteorological significance, but birds appear to have no electronic aids at their disposal such as seamen have when solar observations are unobtainable.

The modern navigator is indeed fortunate, but as *The Marine Observer* and many other marine publications have often stressed, radar, echo-sounding and the gyro compass are all of them merely aids to navigation, and the prudent navigator can never afford to neglect ordinary seamanlike precautions including " lead, log and lookout ".

While on the subject of electronic aids to navigation it is relevant to suggest that the Racon beacon (such as the one which has recently been established on the Tongue Light Vessel) will presumably suffer like any other radar apparatus from variability in strength due to meteorological and other causes. It appears, however, that the effect is likely to be significantly less than in the radar as commonly fitted aboard ships, since the beam from the Racon beacon has to travel only once through the atmospheric medium on its way to the receiving ship.

Two unusual selected ships have been recently recruited. The 18-ton yacht *Petula*, with an auxiliary raft in tow, is engaged upon a " drift " voyage in the north equatorial current from Dakar to the West Indies, somewhat reminiscent of *Kon Tiki*. The expedition is under the direction of Mr. F. Evans of London University, and its chief purpose is " a careful and continuous study of marine life in the surface waters ". The 48-ton, 74 ft auxiliary yawl *Princess Waimai*, under the command of Dr. Cwilog, is carrying out observations on atmospheric electricity and meteorology in the southern part of the North Atlantic. Both these vessels are fitted with radio and the leaders of the expeditions have agreed to carry out the normal functions of a selected ship.

MARINE SUPERINTENDENT.

CAPTAIN GEORGE MORE

Obituary

All who remember the interesting and invigorating personality of Captain George More, Meteorological Office Merchant Navy Agent for the Forth, will learn with regret of Captain More's death at his home, " Craigneuk ", Dechmont, on 10th July, 1953.

George More was born at Leith in 1889. Educated at George Heriot's School, Edinburgh, he commenced his apprenticeship aboard Messrs. Wm. Thompson's *Benworlich*. On obtaining his second mate's certificate he continued to serve the Ben Line, employed mainly in the Far East trade. Passing for master in 1915 he joined the Leyland Line, serving aboard their troopships, which were then mainly trading across the western ocean. He saw action at the Gallipoli campaign as navigating officer aboard one of the transports engaged in landing troops under fire at Cape Helles and Gaba Tepe.

After the cessation of hostilities in 1918 Captain More saw service in American ships, mainly on the Hawaiian Island trade. He told many interesting yarns about men and vessels on that trade.

In 1922 Captain More returned to Scotland and entered the service of Messrs. J. Currie & Co. of Leith, where he served as officer until 1927, when he was given command of the S.S. *Haarlem*. He commanded several ships owned by Messrs. J. Currie & Co. In 1932 when master of the S.S. *Minorca* he accepted appointment as assistant dock master to Leith Dock Commission, being appointed to dock master in 1935.

Captain More was appointed Merchant Navy Agent by the Director of the Meteorological Office in 1936 in succession to Captain C. G. Bonner, V.C. It was a very convenient arrangement for Captain More to couple the duties of dock master and Merchant Navy Agent, for it facilitated his visiting a large number of merchant ships with a view to recruiting them as selected or supplementary ships or interesting them generally in maritime meteorology. He retired from the post of dock master in 1946 but still continued his duties as Merchant Navy Agent in an active manner from his home at Dechmont.

Late in the summer of 1952 he and his wife went on a long holiday at California, during which the visiting of voluntary observing ships at Leith was carried out by Captain Reid, the Port Meteorological Officer in Glasgow. It was during his return voyage from California that Captain More was overtaken with his fatal illness.

Captain More was a great lover of horses and always kept one or two horses at his home in Dechmont. He was a very keen member of the Linlithgow and Stirlingshire Hunt and followed the hounds on every possible occasion.

Prior to the First World War, while he was a young man, he spent about a year ranching with a relative in Montana, near a small township called Billings. It was here he first acquired his love for horses. Billings was then quite a classical Western town and Captain More, when recounting his experiences out West, told of the wooden sidewalks and saloons with hitching posts outside to which the cowboys hitched their horses.

Captain More was the holder of the Royal Humane Society's Medal presented to him for diving into the River Neva and rescuing two seamen from drowning when he was chief officer of the S.S. *Cranstadt*.

Among his many varied interests meteorology and astronomy took primary place; he was absorbed in their studies. His well-known figure will be greatly missed in Leith and Grangemouth Docks.

MR. L. STARBUCK

Obituary

We regret to announce the death at a London hospital on 15th September 1953 of Mr. Leonard Starbuck, late Deputy Director of the Hong Kong Observatory. Mr. Starbuck was an active and enthusiastic member of the Commission for Maritime Meteorology of the World Meteorological Organisation. He visited the Marine Branch of the Meteorological Office on more than one occasion and always showed great interest in the work of voluntary observing ships. There is little doubt that Mr. Starbuck's enthusiasm had a lot to do with the large number of selected ships which have been recruited by the Hong Kong Meteorological Service. An article by him concerning the work of the Hong Kong Observatory appeared in the April 1953 number of *The Marine Observer*.

C. E. N. F.

THE MARINE OBSERVERS' LOG



January, February, March

The Marine Observers' Log is a quarterly record of the most unusual and significant observations made by mariners.

The observations are derived from the logbooks of marine observers and from individual manuscripts. Photographs or sketches are particularly desirable.

Responsibility for each observation rests with the contributor.

BIRD MIGRATION

Mediterranean Sea

S.S. Matheran. Captain H. G. Allen, M.B.E. London to Port Said. Observer, the Master.

12th March, 1952, 1100 S.A.T. A black line was seen stretching from horizon to horizon. On nearing this line it was seen to be a continuous flight of grey wader-like birds. The estimated heights for the various flights were anything between 100 and 150 ft, heading in a NNW direction and passed the ship about 200 birds per minute. On consulting the chart it would seem that they had approached from the Nile delta.

The actual flight of the birds was slow and ponderous but their bodies were small compared with the wing span. They had long necks and very long trailing legs, and were very awkward in their movements when we disturbed them. Their undersides were creamy and the feathers on their backs were slate-grey.

The birds were in sight for nearly 45 minutes but various flights of what was assumed to be the same type of bird were observed later in the day, too far away for identification.

Position of ship: $33^{\circ} 50' \text{N}$, $23^{\circ} 50' \text{E}$.

Note. This observation proved of great interest to the Royal Naval Birdwatching Society, whose chairman, Captain G. S. Tuck, R.N., had these comments to make:

"Captain Allen may be interested to know that from his description I think he was lucky enough to be witnessing the great northern migration of the white storks from the Nile Valley. There is also a migration route for these birds from North Africa which passes over Gibraltar. My dates for this route for 1951 and 1952 respectively were 12th February and 3rd February, so that 12th March seems rather on the late side. The regularity of their migration is mentioned in the Old Testament: 'The stork knoweth the time of her coming and the time of her departure'."

Readers will remember that on page 132 of the July 1953 number of *The Marine Observer* we published, in connection with a bird observation from the *Parima*, a few details of the use which is made of these observations. The chairman of the Royal Naval Birdwatching Society now informs us that:

"As a result of plotting a large number of sea reports of sea birds the R.N.B.W.S. has just published the first four of a projected series of 'Sea-passage bird-lists'. Each list covers a stated route and contains details and identification description of all the sea birds likely to be seen during the sea passage of the route. Remarks are also included on the seasonal occurrence of certain species and on areas along the route where certain species may be expected in greater or less abundance than elsewhere. In the first editions rare vagrants have been omitted on purpose.

" Lists now available are:

- List 1. Route, United Kingdom to Gibraltar
- List 2. Route, Gibraltar to Port Said
- List 3. Route, Port Said to Aden
- List 4. Route, Aden to Persian Gulf.

" The cost of each list is 1s. 3d."

He states that the Society would be pleased to make these lists available outside their own membership if any voluntary marine observer would care to write for them to the Honorary Secretary, Lieutenant (s) W. L. Critchley, R.N., Royal Naval College, Dartmouth, S. Devon.

PHOTOGRAPHS OF ICE

Gulf of Pechihli

S.S. *Hunan*. Captain C. A. N. Baker. Observer, Mr. D. S. Southey, 2nd Officer.

The photographs opposite page 16 were taken in the Gulf of Pechihli in February 1953. (Date and position not stated.)

Note. The photographs were forwarded to us by the Director of the Royal Observatory, Hong Kong. He commented that " these ice conditions are not exceptional, in that a severe winter occurs every two or three years when ice extends as much as 50 miles south of Taku Bar, and that occasionally the whole gulf is closed to shipping due to ice ".

DISCOLOURED WATER

Off the Guinea Coast

S.S. *Rembrandt*. Captain B. F. R. Thomas. Dagenham to Conakry. Observer, Mr. C. Leith, 2nd Officer.

13th February 1953, 1400 G.M.T. At approximately 130 miles WNW of the River Juba delta on course 180° (T) large patches or strips of discoloured water were seen ahead, stretching for about 2 miles each side of the ship. Depths by chart were about 1,900 fathoms. The lines of discoloration ran parallel with the coast and were very extensive, of a deep red colour. At about 1540 these lines began to thin out and by 1600 all water ahead of the ship was clear. This is the first time these lines of discoloration have been observed after many passages over the same route. Wind NW force 3, slight sea and swell but no rips or eddies noticeable at the edges of the patches. Sea temperature 64°F .

Position of ship: $12^{\circ} 20' \text{N}$, $17^{\circ} 53' \text{W}$.

Off Sierra Leone

S.S. *Manistee*. Captain R. W. Lundy, O.B.E., R.D., R.N.R. Victoria (Cameroons) to Liverpool. Observer, Mr. R. G. Dover, Senior Apprentice.

4th March 1953, 1730 G.M.T. The sea was tinged for about a mile with some reddish-brown substance. A sample was taken and placed in a glass bottle. After a while a reddish sediment settled in the bottom of the bottle, and then what seemed to be a greenish plant appeared to grow from the red particles. After two hours there was no trace of the reddish-brown particles and only small portions of plant matter remained. Air temperature 78°F , wet bulb 74° , sea temperature $78\frac{1}{2}^{\circ}$.

Position of ship: $10^{\circ} 12' \text{N}$, $16^{\circ} 13' \text{W}$.

Note. The above observation was sent to the Marine Biological Association, Plymouth; the following comments were received from Dr. T. J. Hart:

" The original observations confirm that discoloured water hereabouts may be due to living organisms. Unfortunately the sample was not preserved and the larger plant organisms have decomposed until most are unrecognisable, while, in addition to bacteria, flagellates (some green!) and heterotrich ciliates flourish in the bottle. After three weeks this population can bear little relation to that present when the sample was taken, so I have not attempted an accurate estimate."

PHOSPHORESCENCE

Gulf of Aden

M.V. *Nordic*. Captain E. G. Jones. Aden to Fremantle. Observers, the Master and all navigating officers.

9th January 1953, 1545 G.M.T. A band of luminosity was sighted ahead, which as the vessel approached broadened all round the horizon in brilliant white and lit up the night. As the vessel entered the band hundreds of brilliant white lights appeared to flash around as far as the eye could see, and gave the impression that the vessel had steamed into a large fishing fleet. Each of the white lights appeared as a ball of brilliant light, with an effect which was most uncanny. The bow waves were illuminated a brilliant green as they broke. The whole effect lasted for 10 to 15 minutes, and looking astern after passing through the area the flashing lights and brilliant white band could be seen for some time.

None of the observers had ever previously experienced anything to compare with the phenomenon, although various forms of phosphorescence had been seen in the Gulf on many occasions. Sky clear, wind NE force 1 to 2. Air temperature 74°F, wet bulb 72°, sea 76°.

Position of ship: 12° 10'N, 49° 46'E.

S.S. *Theliconus*. Captain C. N. Jenkins. Suez to Mena-al-Ahmadi. Observer, Mr. B. Webster, 3rd Officer.

10th January 1953, 2240 to 2320 G.M.T. The ship passed through several bands of brilliant phosphorescence, each band approximately $\frac{1}{2}$ to $\frac{3}{4}$ mile wide (edges not well defined) and about 2½ miles between each band. A glow in the sky could be seen before the bands were visible, which were continually flashing with pinpoints of light, and stretched from horizon to horizon in a 120°–300°; direction. At 2307 the vessel passed through a band about 20 ft wide of exceptional brilliance (a steady not a flashing light), which temporarily illuminated the whole ship like a greenish-blue searchlight. The band had sharply defined edges and curved slightly from horizon to horizon resembling a tide line, although no floating debris was visible. The glow from this band could be seen for about 6 miles. Air temperature 75°F, wet bulb 69½°. Wind E force 2. Cloud 4/8 Cu.

Position of ship at 2307: 13° 39'N, 48° 18'E.

S.S. *Clan Brodie*. Captain B. Vernon-Browne. Aden to Mombasa. Observer, Mr. E. E. Coote, 3rd Officer.

15th January 1953, 2345 S.A.T. At exactly this time the tops of waves in the vicinity of the ship, and in the ship's wash, suddenly became brilliantly phosphorescent, and in the space of 30 sec every wave top in sight was very luminous, giving the sea a boiling appearance. The phenomenon lasted between 2 and 3 min only, when the sea resumed its normal appearance just as suddenly as the phosphorescence had appeared. Wind ENE force 4 with a moderate sea. Air temperature 77°F, wet bulb 71°, sea 76½°. Cloud 2/8 Cu.

Position of ship: 12° 30'N, 47° 04'E.

Gulf of Oman

S.S. *Strathmore*. Captain J. M. Paice. Bombay to Colombo. Observers, Mr. M. D. Penney, 2nd Officer, and Mr. A. D. Barrett, 4th Officer.

9th February 1953. Between 0130 and 0200 white patches of light were observed on the sea surface. Milky-white patches were first noticed on the starboard beam about 2 cables away and appeared to "flash" about once every second. Later they moved closer to the ship, being as bright as a phosphorus patch, although there was no indication of phosphorescence in the water even when the ship's wake

broke into the patches. The patches had many different movements, each one continuing for a minute or so—rotary, clockwise and anticlockwise—towards the ship in waves and away from it in waves parallel to the ship's course. During the entire time of observation the period of reaching maximum brilliance and fading was about 1 sec, giving a regular flashing appearance.

At 0152 the waves reached their maximum brilliance, appearing to travel from the starboard quarter to the port bow. On switching off the radar the phenomenon ceased abruptly close to the ship, but it was still faintly discernible on the port beam about 2 cables away. At 0157 the radar was switched on again, the phenomenon did reappear close to the ship but only faintly, and soon disappeared altogether. Nothing was observed on the radar screen during this time that was out of the ordinary.

The radar was a Marconi Radiolocator Mark IV on 20,000 yd range, aerial speed 24 r.p.m. Nearest ship 8 miles on port bow; nearest land 10 miles.

Air temperature 80°F, wet bulb 77°, sea 82°. Bar. 1013.5 mb. Weather fine, light variable winds, smooth sea. Depth of water, 20 fathoms. Course 155°, 18 kt. Moon rose at 0206.

Position of ship: 10 miles w of Mount Delby, Malabar Coast.

Note. On pages 190–192 of the October 1952 number of this journal an observation by Captain F. G. Baker of the M.V. *British Premier* was published, showing a possible connection between the switching on of radar and the stimulation of phosphorescence of the sea. The interesting observation by S.S. *Strathmore* has also been forwarded to a number of authorities.

The following extract is from a letter received from the Director of Naval Weather Service:

“As far as is known no similar observations have been made by ships of the Royal Navy even when operating radar in conditions of complete blackout during war-time patrols. The only known effects of radar waves on living tissue are those of heating, so that if the reported phenomena are actually due to radar they would provide evidence of a new property of living tissue. Any further reports would be welcomed.”

The extract below is from the Institute of Navigation:

“It is possible for a very high intensity electric field to excite phosphorescence. However it is very much doubted whether the intensity of the field produced by a radar scanner would be sufficient to cause this effect on most substances at a distance of more than one or two yards. Also it seems very unlikely that this type of phosphorescence could be produced by an electric field in the presence of a good conductor such as salt water. It would of course be foolhardy to say the effect could not have been produced by the radar. However, it is most improbable that it was in fact so produced.”

These observations have aroused much interest among biologists and radar experts, but in the present state of our knowledge no explanation can be given. Further investigation of the matter would be considerably helped if ships in phosphorescent areas could find it possible to switch the radar on and off at intervals and note if any effect is produced. If possible, a specimen of the water should be obtained, adding a few drops of preservative such as alcohol or formaldehyde. This should be sent to the Marine Branch in a sealed bottle. Such specimens would be forwarded to the Marine Biological Association at Plymouth for analysis.

WATERSPOUT

South Pacific Ocean

M.V. *Ashburton*. Captain D. M. Steven. Balboa to Auckland.

18th December, 1952, 1900 G.M.T. Observed a thick and dark Cb cloud, base about 1,000 ft, extending from horizon to horizon and moving in a E-W direction. From this cloud two waterspouts were seen to form. The funnel of the first at 1910 did not quite reach the sea, although disturbance of the surface with spray to 20 ft was visible for about 10 min.

At 1915 a second spout formed and its funnel, with distinct dark edges, extended down to the water. It appeared to be 20 ft wide at its base, from which spray rose to a height of 40 ft. The waterspout passed the vessel about 1 mile to the S. At its nearest approach there was a fall in pressure of 1 mb, though no change of wind

was experienced. The photograph opposite page 17 was taken by the ship's radio officer at 1920.

At 1920. Wind NW force 2-3. Air temperature 69°F, sea 68°, dew point 62°. Bar. 1002.4 mb, steady. Cloud 2/8 Cb, 2/8 Cu, 5/8 Ci in bands. Visibility 25 miles. Sea slight, moderate confused swell.

Position of ship: 30° 48's, 167° 33'w.

ST. ELMO'S FIRE North Atlantic Ocean

S.S. *Caxton*. Captain J. G. Wilson. St. John, N.B., to London. Observer, Mr. R. L. Goodfellow, 3rd Officer.

15th March, 1953, 0045 G.M.T. The vessel experienced a violent squall with hailstones of about $\frac{1}{16}$ in. diameter, falling for a period of about 10 min and covering the deck to a depth of $\frac{3}{4}$ in. Prior to this a large black Cb cloud had been observed to the NW; otherwise it was fine and clear with excellent visibility, barometer steady at 1024.9 mb, light N'y wind. Soon after the violent part of the squall had passed the Cb was noted to cover almost the whole sky except to the N where the edge of it could be seen. From the edge of the cloud to the horizon a soft white light covered the sky, similar to aurora; this light remained, gradually diminishing in brilliance, and light hail and rain persisted until 0145 when the large cloud had passed over.

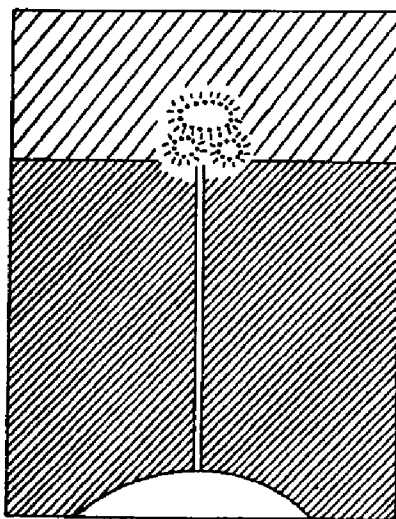
At 0100 the lookout standing on the fo'c'sle head noticed a buzzing sound coming from the peak of his cap. On taking it off and examining it he was amazed to find that all around the peak and over the top of his cap were minute balls of white light "as if hanging by little wires". Apparently they stood out about $\frac{1}{2}$ in. from the material. They also appeared around the cuffs of his jacket. Naturally the lookout tried to brush them off, but with no success. After about 15 min they disappeared.

Position of ship: 49° 00'N, 31° 06'W.

Indian Ocean

S.S. *Somerset*. Captain H. R. Montgomery-Smith. Hobart to Aden. Observers, Mr. N. Sellwood, 2nd Officer, and Mr. W. Nisbet, Cadet.

17th March, 1953, 2100 G.M.T. The ship passed through a heavy rain shower which fell from a massive Cb cloud. On emerging from this shower the ship steamed into a flat calm with the surface of the sea glassy, on which some faint patches of phosphorescence were observed. At 2135 a bright light was sighted ahead, and simultaneously reported to the bridge. The light was observed through binoculars and appeared to be a vessel a great distance off, with her two white steaming lights in an inverted position. This was at first thought to be caused by abnormal refraction, but it was noticed after a few minutes that this light or group of lights rose and fell with the slight pitching of the ship. It was then discovered that it originated from the top of the jackstaff. A seaman was sent forward to investigate, and reported that the top of the jackstaff appeared to be lit up by a light with a bluish tinge. Presently the light faded, and by 2200 had disappeared. At 2220 lightning was observed in the vicinity. The magnetic compasses



appeared to be unaffected. No other points of light were seen in other parts of the ship.

The radio officer reported that at 2136 besides the usual atmospheric noises there was a buzzing noise similar to that produced by scraping the surface of an inflated balloon which continued for about 15 min. The buzzing was intermittent for another half-hour (radio signals being completely swamped) and at 2220 ceased altogether. Wind calm, air temperature 81°F, wet bulb 76°, bar. 1009.1 mb.

Position of ship: 05° 25'S, 75° 30'E.

Note. The observations of S.S. *Caxton* and S.S. *Somerset* are interesting manifestations of St. Elmo's Fire. A note on this phenomenon was appended to the observation of S.S. *San Velino*, published on page 202 of the last number of this journal. When electrical conditions are favourable for the phenomenon the brush discharge is particularly apt to occur from the projecting points, such as the end of the jackstaff in one of these observations and the minute hairs of the material of the cap and cuffs in the other.

The following comment on the observation of S.S. *Somerset* has been received from the Post Office Engineering Department, Radio Branch.

"The bluish light seen at the top of the jackstaff was probably due to an electrical discharge between the jackstaff and a nearby thunder cloud, and may have been an example of the phenomenon known as St. Elmo's Fire.

"This electrical discharge, which is similar to the corona or brush discharge which sometimes takes place from a high voltage point on a ship's aerial, would cause interference to radio reception. This interference would have the distinctive 'buzzing' character noted by the radio officer.

"The fact that the light disappeared at 2200, while the 'buzzing' continued until 2220, when lightning was observed in the vicinity, suggests that the discharge continued until 2220 but was not sufficiently intense to cause a visible glow. The lightning observed at 2220 G.M.T. evidently resulted in the more or less complete discharge of the thunder cloud."

LIGHTNING

Mediterranean Sea

S.S. *Chitral*. Captain K. A. H. Cummins. Sydney to London. Observer, Mr. T. C. Tilden-Smith, 2nd Officer.

14th March, 1953, 0150 G.M.T. A squall force 10 struck the ship: it was accompanied by lightning of great intensity and frequency. The flashes were seen to strike the water with a loud hissing noise, followed immediately by thunder claps. The storm was followed by torrential rain which subsided after half an hour.

Before the squall, wind NNE force 8-7, light rain showers, rough N'ly sea and moderate N'ly swell. Air temperature 48°F.

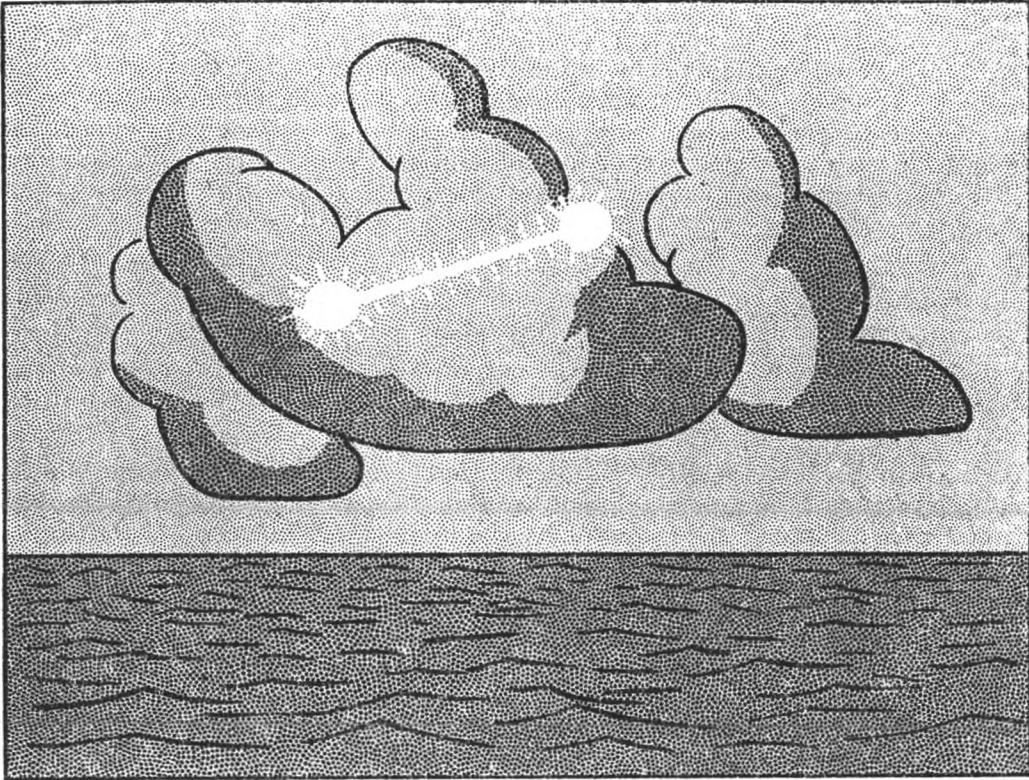
Position of ship: Off Sardinia approaching the Strait of Bonifacio.

Note. Lightning strikes direct to the ground at times, in the absence of trees and buildings, and the same thing must occur at sea. This is a very interesting observation and we do not recollect having received a similar one before.

Indian Ocean

S.S. *Salween*. Captain H. V. V. Poole. Aden to Colombo. Observer, Mr. T. F. Fields, 2nd Officer, and Mr. K. J. Brooks, 3rd Officer.

14th January, 1953, 1830 G.M.T. An isolated Cu cloud was observed ahead of the ship, bearing E. It was noticeably dark on the underside and on one edge. A bluish-white flash of lightning, circular in shape, not unlike a shellburst, appeared



on the upper edge, followed instantly by a "bar" flash and another circular flash similar to the first. The whole phenomenon appeared as in the sketch, and close to the ship, though no sound was heard.

Position of ship: $09^{\circ} 34' N$, $63^{\circ} 02' E$.

Note. This is an interesting observation. What was seen was probably a lightning flash within the cloud, which is quite a common occurrence but usually looks like a sudden diffuse illumination within the cloud. In the present observation there appears to have been a comparatively small thickness of cloud between the flash and the observer so that the flash within the cloud was actually seen as a straight line. At each end of the flash the cloud was presumably thinner still, so that a brighter light was seen momentarily which would appear to give the shellburst effect.

FOG BANK

Gulf of Tehuantepec

S.S. *Oregon Star*. Captain M. B. M. Tallack, O.B.E. Balboa to San Francisco. Observers, the Master and all navigating officers.

31st January, 1953, 1730 G.M.T. A dense fog bank approached the vessel from the N but did not envelop the ship. The bank was about 1 mile deep, of undetermined length, but had a very clearly defined straight edge, along which the vessel steamed. Visibility to port was about 12 miles and to starboard 200 yards. Wind

variable force 1. Temperatures: air 77°F, sea 75°, wet bulb 74°, dewpoint 73°. Course 299°(T), 11 kt.

Position of ship: 13° 37'N, 94° 00'W.

Note. This appears to be an unusual observation as the atlas M.O.518 *Monthly Meteorological Charts of the Eastern Pacific Ocean* shows no fog along the southern coast of Central America in either January or February. In January, however, an area with 2 per cent of mist and haze is shown in the neighbourhood of the Gulf of Tehuantepec, including the Gulf itself.

ABNORMAL REFRACTION WITH GUSTS OF DRY AIR

Western Australian Waters

S.S. *Islander*. Captain S. Keenan. Christmas Island to Fremantle. Observers, the Captain and Mr. G. Griffiths, 2nd Officer.

8th January, 1953, 1300 G.M.T. With the wind SSE force 2, a sudden squall increased the wind to force 5, the direction remaining the same. Immediately afterwards gusts of hot, dry breezes were encountered, readings of the dry and wet bulbs then noted were 88° and 64°F respectively, whereas they had previously read 75° and 68°. These hot, dry breezes continued until 1600 when the wind backed to E force 4 and the dry and wet bulbs regained their normal values. The sky was overcast, a thick layer of Sc predominating, and at times a few spots of rain fell. The nearest land to the vessel was 50 miles to the eastward.

During the phenomena Venus was observed setting. Just before setting a column as of fire shot up from it to a height of a few degrees and remained visible for 30 sec while the planet set.

Position of ship: 30° 25'S, 114° 05'E.

Note. Weather conditions at the time were governed by a high-pressure area over the Australian Bight and a low-pressure system over the sub-tropics, the latter giving rise to thundery conditions over the land.

(The *Islander* is a selected ship recruited by the Malayan Meteorological Service.)

LUNAR RAINBOW AND ARC

Seychelles Islands

M.V. *Glenbank*. Captain J. W. Greig. Trinidad (B.W.I.) to Penang. Observer, Mr. A. F. Wigham, 3rd Officer.

1st January, 1953, 1700 G.M.T. After several hours of squally showers in the vicinity, and periods of slight rain at the vessel from thick Cu and Cb clouds, a lunar rainbow was observed with clear colours, violet, yellow and green. This formation remained pronounced for a few minutes only. A second arc which



formed beside the full moon was white and higher in the sky than the first, although its arch was not so wide and tended to fade near sea level. Nevertheless it was plainly visible for 20 min.

Position of ship: 03° 27'S, 55° 52'E.

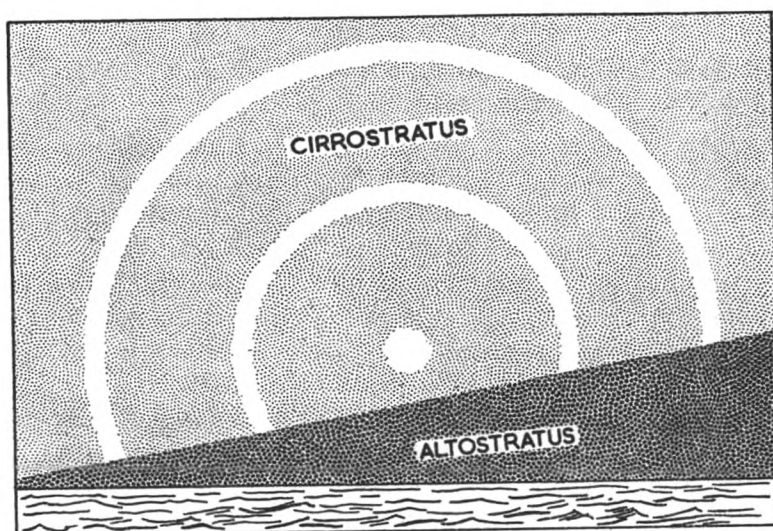
Note. This is an interesting observation of a lunar rainbow showing clear colours. The white arc observed near the moon is very remarkable. It is not a rainbow nor is it any recognised halo phenomenon. Occasional observations have been made of halos or arcs which are not centred on the sun or moon and which do not occupy the known positions of halo phenomena in other parts of the sky. Unfortunately the observation gives no indication as to whether there was any thin cirrostratus or other form of upper cloud in the region of the moon.

SOLAR HALO

Bay of Fundy

S.S. *Irish Oak*. Captain J. Poole. Limerick to St. John, N.B. Observer, Mr. J. W. Stiven, Chief Officer.

15th February, 1953, 1320 G.M.T. The $23\frac{1}{2}^\circ$ and $46\frac{1}{2}^\circ$ halos were visible, the former clearly showing the colours of the spectrum, the latter appearing white and less discernible. The altitude of the sun was 20° .



The cloud was Cs covering $\frac{7}{8}$ of the sky, the other $\frac{1}{8}$ being covered with As. The As covered that part of the sky directly under the sun, from the horizon to 12° above it and tapered out to the horizon on one side. The halos were only visible in that part of the sky covered with Cs.

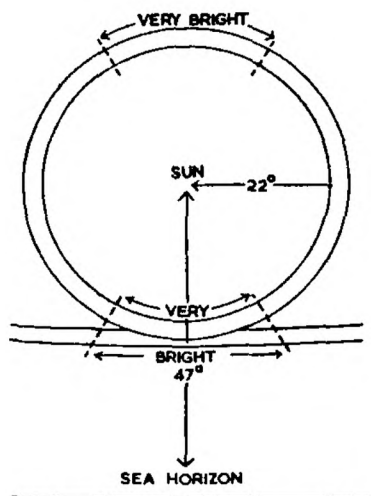
The halo phenomena were the forerunner of one of the most intense depressions experienced in the maritime states of Canada for many years. The lowest pressure recorded aboard this vessel was 976 mb on 16th February, 1953, 1100 G.M.T.

Position of ship: $44^\circ 32'N$, $66^\circ 20'W$.

Note. The above observation was forwarded to us by the Director of the Irish Republic Meteorological Service.

SOLAR HALO WITH CONTACT ARC

Caribbean Sea



S.S. *Oregon Star*. Captain M. B. M. Tallack, O.B.E. Curaçao to Cartagena. Observers, the Master and Mr. J. A. Holloway, 3rd Officer.

23rd January, 1953, 1840 G.M.T. A complete solar halo of 22° radius was observed, very clear with very bright sections as indicated in sketch, and lower contact arc. The altitude of the sun was 47° and the colours from the inner edge of the halo were purple, red, orange, green, blue. The colours were brightest at the beginning of the observation but gradually faded. The halo finally disappeared at 1940.

Position of ship: $12^\circ 20'N$, $72^\circ 14'W$.

Note. The arc touching the bottom of the halo of 22° is known as the arc of lower contact to that halo. It is a well-known arc but is not very often seen. The form the arc takes varies with the solar altitude. The original sketch accompanying this observation is in colour and shows that the full range of spectrum colours was shown in the arc as well as in the halo, the red edge of the arc being nearest the sun.

LUNAR HALO

Gulf of Guinea

S.S. *Manistee*. Captain R. W. Lundy, O.B.E., R.D., R.N.R. At Victoria (Cameroons). Observer, Mr. R. G. Dover, Senior Apprentice.

1st March, 1953, 2030 G.M.T. A lunar halo was observed of radius 16° and altitude $26\frac{1}{2}^\circ$. The halo was very faint and indistinct and was whitish in appearance. It was visible for about half an hour, when it became obscured by cloud. Cloud mainly Cs, with some Sc and Cu.

Position of ship: $03^\circ 55'N$, $02^\circ 53'E$.

Note. This is a valuable observation of a rare form of halo the radius of which has been variously reported as from 16° to over $17\frac{1}{2}^\circ$. In the January 1952 number of this journal, page 66, an observation of this halo by M.V. *Condesa* was published, the radius being given as $16^\circ 44'$. A note was appended on this halo and another rare one that is slightly larger with a radius around 19° . It is particularly important that the radius of any halo, and particularly of a rare one, should be measured from the centre of the sun or moon to the *inside* edge of the halo. We still receive quite a number of observations in which the radius is measured to the outside of the halo. This is quite inaccurate measurement, as the outer edge is not well defined and the width of the visible halo depends on atmospheric factors at the time, including the thickness of the cloud forming the halo.

RARE LUNAR HALOS

Off west coast of Africa

S.S. *Brazil Star*. Captain G. F. Barnard. Rio de Janeiro to London.

22nd January, 1953, 2000 G.M.T. A lunar halo was observed against high Cs cloud. It was very pronounced and subtended a sextant angle of 27° (limb to limb); its width was approximately 2° . At 2330 the halo was observed to have extended upwards, losing some of its former brilliance and subtending a sextant angle of 43° (limb to limb); its width was about 3° . Further observations were made impossible by dense Cs obscuring the area.

Note. These halos were measured to the outer edges in each case. Allowing for the widths of the halos the radius of the first one would be about $11\frac{1}{2}^\circ$ and that of the second about $18\frac{1}{2}^\circ$. The small one, with a radius of about 11° , has only been seen a few times previously so that this observation is of considerable value. The larger one has been seen more frequently but is rare. Its radii have been observed from $18\frac{1}{2}^\circ$ to 20° on different occasions.

METEORS

North Atlantic Ocean

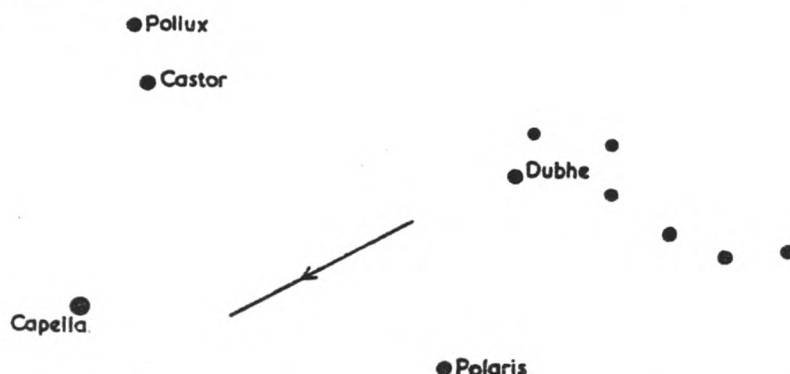
S.S. *Planter*. Captain A. Robertson. Barbados to London. Observer, Mr. W. C. Johnston, Chief Officer.

4th February, 1953, 2148 G.M.T. A very large meteor was observed travelling in a NW-SE direction. It gave off a brilliant white light and was three or four times as bright as Venus. The meteor was visible for about 15 seconds. Sky partly cloudy, light NW breeze, slight sea.

Position of ship: $37^\circ 39'N$, $28^\circ 15'W$.

Caribbean Sea

S.S. *Cuzco*. Captain R. D. S. Eckford. Cristobal to London. Observer, Mr. A. M. Jestico, 3rd Officer.



23rd March, 1953, 0230 G.M.T. A brilliant meteor was observed in the northern sky which lit up the ship as by a flash of lightning. The meteor was of a blue-green colour and left a trail of red sparks which disappeared very quickly. Duration of flight $1\frac{1}{2}$ sec, duration of trail 2 sec.

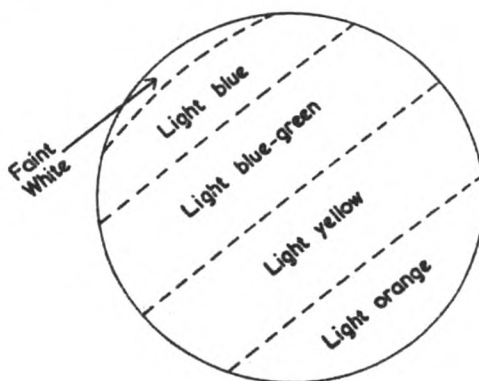
Position of ship: $12^{\circ} 25' N$, $73^{\circ} 47' W$.

TOTAL ECLIPSE OF MOON

North Atlantic Ocean

S.S. *Pacific Importer*. Captain G. Brown. Cristobal to London. Observer, Mr. T. M. Sims, 3rd Officer.

29th–30th January, 1953, 2305 to 0140 G.M.T. The commencement of the eclipse was not observed owing to almost stationary Cu covering the moon. During totality a small white patch of light of low brilliancy moved round the north pole of the



moon until that phase came to an end at 0030. From that time the white patch increased in area until the end of the eclipse at 0140. During the total phase the face of the moon appeared to be coloured in bands of blue, green, yellow and orange as in the sketch, and stars were visible with the unaided eye within 2° or 3° of the moon.

Position of ship at 0000 on 30th: $33^{\circ} 22' N$, $45^{\circ} 20' W$.

Note. The interesting part of an observation of a total eclipse of the moon is the degree of luminosity of the moon during the total phase and its colour. To an observer on the totally eclipsed moon, completely immersed in the shadow of the earth, the body of the earth would be quite invisible, since the sun is then behind it. The observer would, however, see a narrow luminous ring of reddish or orange colour, probably brighter in some parts than others, this



Photographs of ice in the Gulf of Pechihli, taken from S.S. *Hunan* (see report on p. 7).

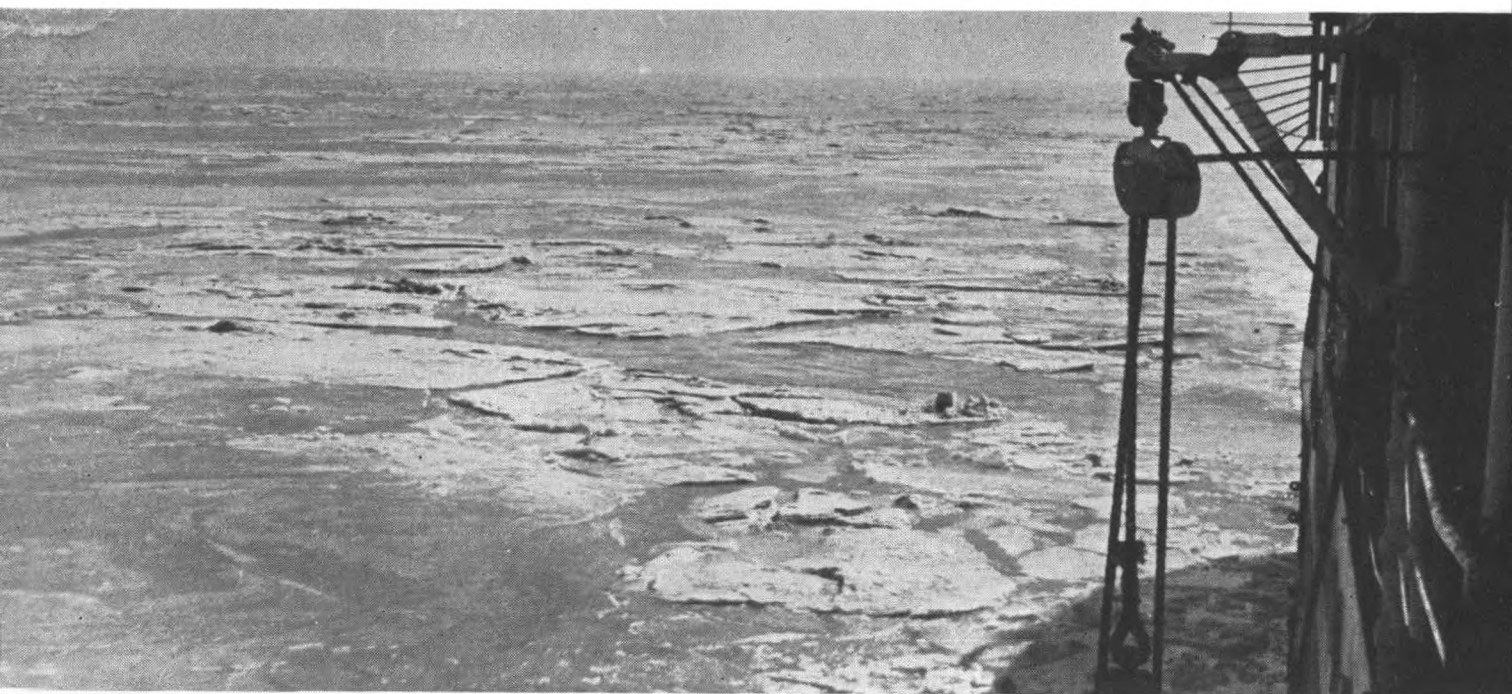




Photo by R. Brown

Waterspout, South Pacific Ocean. Taken from M.V. *Ashburton* (see report on p. 9).

Three Canadian ocean weather ships at Vancouver.



being the section of the earth's atmosphere presented to him in profile and illuminated by the refraction of sunlight through the atmosphere. It is this light which gives the illumination of the moon which we see during the total phase.

The amount of light so transmitted to the moon and its precise colour varies to some extent on the occasion of different eclipses according to the degree of cloudiness and other meteorological conditions in the section of the atmosphere presented to the moon. The totally eclipsed moon usually remains sufficiently bright for the dark markings on its surface to be visible with the unaided eye. The normal colour is reddish, reddish-orange or coppery. On rare occasions in the past the totally eclipsed moon has almost, or even completely, disappeared from view. These "black eclipses", as they are called, are due to the presence of fine dust in sufficient quantity in the earth's atmosphere, due to great volcanic eruptions.

The bands of blue and green reported by S.S. *Pacific Importer* form a very unusual observation, as light of these colours would not normally be refracted by the earth's atmosphere.

Observations of this eclipse have been received from 18 other ships, but some of these were of a partial eclipse only. The colour cannot be properly judged in the partial phase owing to the proximity to the fully illuminated part. There are six of the total eclipse which give details of the colour as follows:

S.S. *Empire Ken*, Captain P. M. Burrell. $32^{\circ} 20'N$, $29^{\circ} 30'E$. Light brown, uniform over moon's surface except for a lighter arc in the northernmost part.

M.V. *Inverbank*, Captain R. A. Lorains. $00^{\circ} 39'S$, $59^{\circ} 37'E$. Bronze, tinged with bluish-white at the lower edge.

M.V. *Kenilworth Castle*, Captain T. H. Whatley. $24^{\circ} 48'S$, $35^{\circ} 10'E$. Dark reddish-brown, with faint pale arc at the lower limb.

S.S. *Manistee*, Captain R. W. Lundy, O.B.E., R.D., R.N.R. $04^{\circ} 05'N$, $02^{\circ} 58'W$. Dark orange.

S.S. *Planter*. Captain A. Robertson. $23^{\circ} 20'N$, $48^{\circ} 11'W$. Light orange-reddish, the moon's rim from N to SE being whiter.

M.V. *Waipawa*, Captain A. E. Warren. $15^{\circ} 50'N$, $77^{\circ} 20'W$. Dull orange.

Canadian Ocean Weather Ships

The photograph printed opposite shows three Canadian weather ships lying alongside in Vancouver. These vessels are employed in the Pacific at Station "P" (position $50^{\circ}N$, $145^{\circ}W$), about 900 miles W of Vancouver. Under the North Atlantic Ocean Station Agreement Canada agreed to assist with the United States in the operation of Station "B", situated about midway between the entrance to Belle Isle Strait and Cape Farewell. By mutual arrangement, however, it was agreed that the Canadians would wholly operate Station "P" in the Pacific and the United States would wholly operate Station "B".

The Canadian vessels were formerly frigates of the Royal Canadian Navy and are thus considerably larger than the corvettes used as British weather ships. As will be seen from the photograph, the radar aboard the Canadian ships is so placed that it has a completely unrestricted range of "vision"—a very important item when the instrument is used for upper wind observations by balloons.

The weather ships in the Pacific carry out duties similar to those of their sisters in the North Atlantic. The Canadian vessels carry a civilian crew of about 56, of whom six are meteorologists, and are operated by the Marine Department of the Department of Transport, in consultation as necessary with the Canadian Meteorological Division.

C. E. N. F.

Measurements of Condensation Nuclei over the Ocean

By D. J. MOORE,

(Imperial College, London)

Introduction

In 1880 John Aitken^{1*} pointed out that clouds can form in the atmosphere only if there are present particles on to which the water vapour can condense. The relative humidity at which condensation will begin is determined by the size and nature of these motes, which are usually referred to as condensation nuclei. Aitken showed that such nuclei are always present in surface air. He measured their concentration with an instrument now known as the Aitken Counter, where a rapid expansion of the air produces a high supersaturation in which all the nuclei grow into cloud droplets of about $1/100$ mm radius, and are counted with the aid of a magnifying glass as they fall on to an illuminated stage. Many observations have been made with this counter, or modifications of it, and it has been found that the concentrations of these condensation nuclei vary enormously, from a few per cc over the ocean to a few millions per cc in the polluted air of large cities.

In natural clouds, where the rate of cooling of the air is always much less than in the Aitken Counter, the larger or more hygroscopic nuclei will grow into cloud droplets when the relative humidity is very near to 100%. These cloud droplets will continue to grow as the air is further cooled and so will prevent the air becoming appreciably supersaturated. Therefore many of the smaller nuclei will not become centres of condensation because the critical relative humidity at which they grow into cloud droplets is never reached. The fraction of the Aitken nuclei which do become centres will thus depend on their size distribution, nature and the rate of cooling of the air. Unfortunately the Aitken Counter gives no idea of the sizes of the nuclei, but it does give an upper limit to the number of cloud droplets which can possibly form in the air sampled.

Once a cloud has formed, rain can fall from it only if there are present either ice crystals, or drops much larger than the majority, which fall through the cloud rapidly, sweep up the cloud droplets in their paths and hence grow rapidly. Ice crystals are generally absent if the cloud-top temperature is above about -10°C , so for clouds entirely below this level the second process will be the important one. Calculations (e.g. Ludlam,² Mason and Ludlam³) show that a droplet cannot reach a size sufficiently large for it to grow into a potential raindrop unless it was quite large before it entered the cloud. So before rain can fall from a cloud which does not extend much above the freezing level, there must be present not only condensation nuclei, but some of these must be several million times heavier than the majority.

The number, size and nature of the nuclei present also determine the visibility at a given humidity. The hygroscopic nuclei become larger as the humidity increases at relative humidities as low as 70%, and Wright⁴ has shown that there is a marked change of visibility with humidity, and that the change is of a different nature near the sea coast with winds blowing off the ocean than it is near large cities. This indicates that the particles which affect the visibility in these different localities are of different origin. Here again, only a fraction of the Aitken nuclei will be involved, i.e. those with radii not much less than the wavelength of light.

Sea salt from evaporated sea-spray is a possible source of all these different groups of nuclei. Other possible sources include the products of combustion, wind-blown soil and sand particles and oxides of nitrogen produced in lightning discharges. Near human dwellings there is no doubt that combustion nuclei predominate, but whether they constitute the majority of nuclei in regions remote from their sources is a matter which has not yet been adequately investigated.

*The numbers refer to references on p. 21.

Some determinations of the total nucleus concentration over the ocean have been made, the most extensive being those of the American Research Ship *Carnegie*.⁵ Measurements of the concentration and range of salt contents of the larger sea-salt nuclei have been made by Woodcock and Gifford⁶ from aircraft over the ocean and at the seashore. Their measurements indicate that large sea-salt nuclei are often present in numbers large enough to initiate showers from cumulus clouds.

In an attempt to supplement present knowledge of the total concentrations of the nuclei and the concentrations and size distributions of large sea-salt nuclei, the author made observations on board the O.W.S. *Weather Observer* at $61^{\circ} 20'N$, $13^{\circ} 30'W$, from 22nd September to 1st October, and at $59^{\circ} 00'N$, $19^{\circ} 00'W$, from 4th to 14th October, 1951. Samples of drizzle and fog droplets were also taken.

Sampling Techniques

The total nucleus concentration was determined with an Aitken Counter. The observations were made as far to windward of the funnel as possible, either on the foredeck or the balloon-shed roof.

The large nuclei were caught on glass slides or rods, coated either with hydrophobic dri-film or with magnesium oxide powder. The former has a contact angle of 90° with water so that droplets on the slide stand up as hemispheres; their volumes at a given humidity could therefore be found by measuring their diameter, and hence their salt contents calculated by bringing them into equilibrium with a salt solution of known concentration. The magnesium oxide coat enabled the size of a droplet at the moment of impact to be calculated.

The heights of the collectors and the Aitken Counter inlet were about 5 metres and 8 metres above the mean sea surface, on the foredeck and on the balloon-shed roof respectively, although the rolling of the ship made these heights rather variable. No nucleus counts were made in rain, fog, drizzle or when spray formed by the waves breaking against the ship was obviously coming on board. The collectors were held into the wind by a wind vane, the height of the collectors and the Aitken Counter inlet above the level of the deck being about 1.3 metres.

To obtain reasonable samples of sea-salt nuclei of a fairly wide range of masses and concentrations, collectors of various sizes were employed. For droplets much smaller than the collector width the collection efficiency, i.e. the ratio of the number of droplets striking a collector to the total number of incident droplets, increases as the wind speed and drop radius increases, and decreases as the width of the collector is increased. Thus a fairly wide collector such as a microscope slide will catch 70% of droplets having a radius $15/1,000$ mm, but only about 10% of droplets with radius $6/1,000$ mm if the wind speed was 14 kt, while a glass rod of $1/10$ mm radius would catch 70% of droplets $1.5/1,000$ mm in radius at this wind speed.

So it is possible to obtain reasonable samples of the large nuclei (radius greater than $15/1,000$ mm) on the microscope slides without their becoming covered with the far more numerous smaller nuclei, while some of these in their turn may be caught on the thin rods exposed for part of the time during which the microscope slide is being exposed.

An attempt was made to catch nuclei too small to be deposited on the glass rods by exposing a network of spiders' threads, but no quantitative results were obtained by this method.

The spiders' threads were produced as required by a number of small spiders kept in cigarette tins in the author's cabin. They were fed irregularly on flies when these could be captured, those which lived gregariously eking out their rations by devouring their less robust companions. After about three weeks they had all perished or escaped.

Experimental Results

The most important results are summarised below: Table 1 gives the results of 27 observations of the total nucleus concentration, made with the Aitken Counter on 15 different days during the voyage.

Table 1. Total Concentrations of Nuclei

Conc. of nuclei/cc.	Less than 100	101-200	201-500	501-1,000	Over 1,000
Number of observations with- in the given range of con- centration	2	5	6	8	6

The lowest concentrations observed were 77 nuclei/cc at 1545 G.M.T. on 11th October and 80 at 1530 G.M.T. on 28th September. On both occasions the air was unstable and Cu or Cb clouds were present. The highest concentrations were 2,460 and 2,360 nuclei/cc on 24th and 23rd September respectively, when the cloud was St.

The variation of the total nucleus concentration with cloud type is shown in Table 2.

Table 2. Variation of Nucleus Concentration with Cloud Type

Cloud type	St	Sc, or Cu and Sc	Cu or Cb
Number of observations	7	11	9
Average conc./cc.	1,282	689	354
Highest conc./cc.	2,460	1,490	740
Lowest conc./cc.	290	132	77

There was no significant variation of nucleus concentration with wind speed or wave height, either when the observations were taken as a whole or divided into groups according to cloud type.

At wind speeds exceeding 14 kt, large nuclei having a radius exceeding 15/1,000 mm on being captured were always present in numbers varying from a few per million cc to a few in a thousand cc. The salt content of such a nucleus exceeds about 5×10^{-8} gm. at 75% relative humidity. These nuclei would have fall velocities exceeding 3 cm/sec, but there should be no difficulty in their being carried up into Cu clouds.

The numbers of these nuclei present on six occasions of relative humidity between 70 and 80% are given in Table 3, in which is also included the total concentration of nuclei on those occasions on which it was measured.

The concentrations of sea-salt nuclei with mass greater than 10^{-11} gm were also found to increase with wind speed, although in a less marked fashion than the larger group, being about 1 in 10 cc at 14 kt and up to five times this concentration at 30 kt.

Discussion of Results

Table 2 shows that convective activity, when the surface air is being mixed with air from higher levels, decreases the total nucleus concentration at low levels, indicating that the majority of nuclei are of surface origin. The fact that there is no appreciable variation of concentration with wind speed suggests either that most of the nuclei are not of maritime origin, or that if they are, their production is not very much affected by the roughness of the sea.

Table 3. Concentration of Nuclei as a Function of the Wave Height and Wind Speed

Conc. of nuclei with radius greater than 15/1,000 mm per million cc.	Wind speed (knots)	Wave height (ft)	Relative humidity (%)	Total nucleus conc./cc measured with Aitken Counter
4,710	30	16	77.5	—
485	35	13	75	—
72	28	10	73	153
61.5	21	10	76	77
8.4	17	5	72	159
2.4	20	5	70	183

From Table 3 it appears that the larger nuclei are evaporated sea-spray droplets and that their rate of production, particularly that of the largest of them, is increased as the sea becomes rougher. This supposition is further supported by the fact that their concentration is more closely related to wave height than to wind speed.

Other factors partially responsible for the changes of concentration of the larger nuclei, besides any actual variation in the rate of production at the surface, are the greater distances which the larger nuclei are thrown into the air and the increased turbulence at higher wind speeds, which helps to keep them airborne.

In conclusion, the results above have been confirmed by similar measurements made on board O.W.S. *Weather Recorder* during a second voyage between 21st June and 12th July, 1952.

Acknowledgements

I should like to thank the Director of the Meteorological Office, and Cdr. C. E. N. Frankcom, O.B.E., for permission to make the voyage, and Capt. N. F. Israel, D.S.C., and the crew of the *Weather Observer* for their friendly reception and help in my various difficulties.

I am also indebted to Mr. B. J. Mason and Mr. F. H. Ludlam for their helpful advice and criticism.

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Photographing Radar Echoes

By L. S. LE PAGE

(At the time of writing Mr. Le Page was a member of the Operational Research Group of the Marine (Navigation Aids) Division, Ministry of Transport)

With the coming of marine radar, seafarers have been given an instrument which frequently displays meteorological phenomena in a more informative and enlightening manner than does visual observation. So far, however, the potentialities of radar photographs in illustrating accounts of meteorological happenings at sea do not appear to have been realised, most photographs of radar displays being of coastal areas of navigational interest. Since the appearance of echoes may be hard to convey in words, it is therefore suggested, in view of the increasing number of references to radar in the reports published in *The Marine Observer*, that the use of the photographic medium should not be overlooked.

The purpose of this article is to describe how satisfactory radar photographs may be obtained with simple apparatus. The amateur photographer who can get good results with ordinary subjects should be able to obtain equally satisfactory pictures when he applies his skill and his camera to the photography of the radar screen. Indeed the technique is simpler in important aspects, since the same focus setting and exposure may be used each time, while as the picture is so nearly flat it will be possible on most cameras to use maximum aperture without noticeably affecting the definition of detail anywhere. One enterprising ship's officer is known to have achieved success merely by using a magnifying glass as lens and mounting it at the correct distance from a photographic plate; however, such a reversion to first principles is not recommended, and the better the camera the better should be the results. The use of a camera with a wide aperture lens (of $f/4.5$ or larger) will ensure that the exposure time is reasonably short.

Apparatus required

The only extra optical gear likely to be required for the average camera is a supplementary lens to enable it to focus at a range of 20 in. or less, this being suitable for a 9-in. cathode-ray tube. For 12-in. tubes the focal length of the supplementary lens should be somewhat longer. Photographic dealers supply such lenses for a few shillings, together with suitable holders which can be clipped over the existing lens; they will also advise as to a suitable focal length.

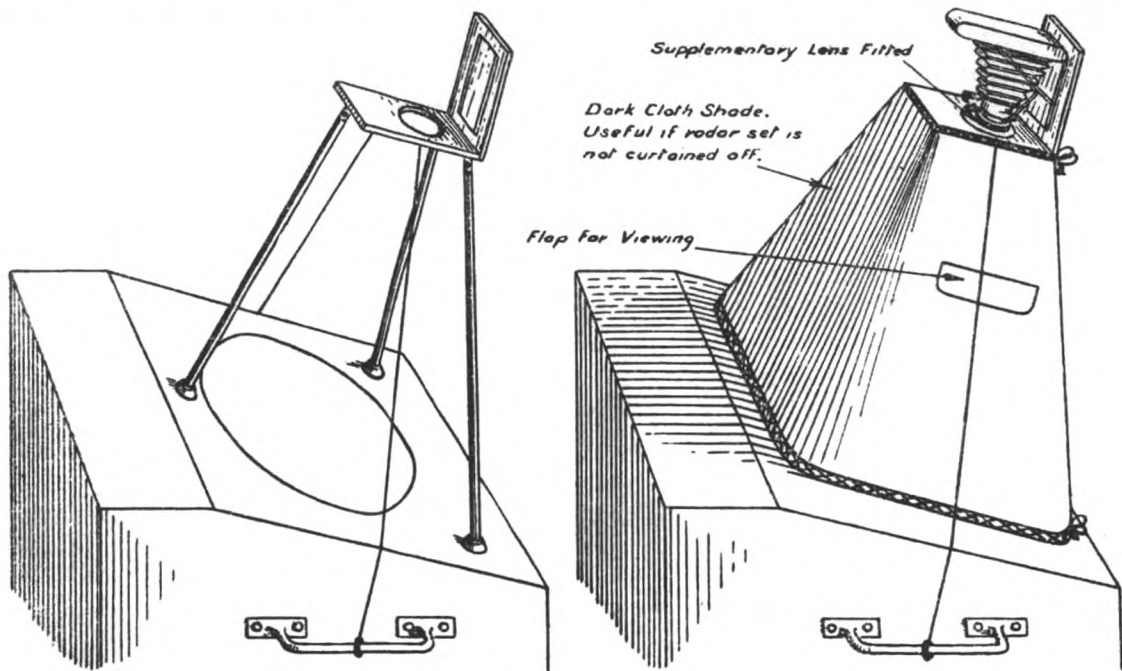
Also necessary is a rigid stand for holding the camera at a fixed distance from the P.P.I. Bearing in mind that meteorological phenomena do not occur to order and often do not remain for long, the stand should be so designed that it can be quickly clamped to or held against the display unit, and so that the camera can be readily slipped in position. Some mild steel rod and the ingenuity of the ship's engineering department should soon solve this problem; alternatively an ordinary tripod stand could be modified in a suitable manner. If blackout curtains are available to exclude extraneous light, such a skeleton framework will be sufficient, otherwise it will be necessary to erect a shade round the P.P.I. to eliminate reflections of windows and portholes in the glass of the C.R.T.

It is recommended that fast panchromatic film such as Ilford HP3 or Kodak Super-XX should be used. Developing and enlarging may be carried out as for ordinary photographs, though some photographers prefer to use materials and methods which give a final high degree of contrast.

Setting up and operating the camera

To focus the camera, which as previously mentioned can be done once and for all, it is advisable not to use the P.P.I. picture itself. It is preferable to carry out

the operation using a piece of newsprint placed against the face of the C.R.T. and illuminated if necessary by a torch, or if the bearing scale happens to be level with the C.R.T. this could be used. With the back of the camera open, and the lens shutter also open at full aperture, the image should be focused on to a ground glass screen or sheet of translucent paper in the place of the film. The opportunity should be taken to ensure that the whole of the P.P.I. can be seen on the film area.



(a) Camera stand and holder. (b) Camera in position, with shade.
 Sketch of a typical arrangement for photographing a radar display.

As regards the exposure necessary, the following times are given as a guide and should be converted into the nearest whole number of revolutions of the trace. (Normal brilliance and gain settings.)

f NUMBER	2	3.5	4.5	5.6	6.3	8	11	16
EXPOSURE	2 sec	6 sec	10 sec	15 sec	20 sec	30 sec	1 min	2 min

The correct exposure time however is best discovered by experiment, as it will also depend on the type of cathode-ray tube and other factors; once determined it should be adhered to.

To ensure that pictures will not be spoilt by odd patches of light, check that with the brilliance control turned down the C.R.T. face is quite dark and free from external illumination or internal light from valve heaters or panel lamps.

The effect of vibration from the ship's engines can only be minimised (bar stopping the engines) by having the camera stand rigidly clamped to the display unit.

If blurring due to yaw or to the ship making a turn is to be avoided, photographs should only be taken when the ship is on a steady course, unless the display is gyro stabilised.

Notes and subjects

Meteorological observers will be fully aware of the desirability of giving full details of the circumstances of an observation if it is to be of value, and the following details are important yet are often overlooked: type of set, height of aerial above sea-level, range scale, and rate of movement of echoes.

Perhaps rain is the commonest weather form to show on a radar screen. When echoes of it are photographed, it is helpful if some quantitative estimate of its intensity can be given, and its effect in masking other echoes described. The same

applies to falling snow or hail. A series of photographs would be useful to show the path and the changing pattern of a rainfall area as a storm progresses.

The effect of precipitation upon radar target areas has not been closely studied, though there have been reports that the echo immediately after rainfall differs from its normal appearance. Fallen snow is also likely to alter the normal radar appearance of a landscape. Photographs on a "before and after" basis would be of value.

Of great importance on many ships is the ability of radar not only to detect ice, but to indicate the best way through or past it. A very good illustrated report on the subject, giving the results obtained with American radars on Swedish ice-breakers, has been published. There is, however, a need for further information from such areas as Hudson Bay and the Antarctic, where entirely different forms of ice are encountered.

Super-refraction and sub-refraction effects, as observed on marine radars, appear to have escaped recording by photography, and here a series of photographs at different stages will best show what happens under these conditions.

While water surface effects fall perhaps under the title of "oceanography" they may be mentioned here. Radar users are usually content to regard all echoes from waves as coming under the apt but derogatory title of "clutter" and having no navigational value. But such clutter can serve to indicate the presence of shallow banks, or of overfalls, while it will form a marked line at the boundaries between currents in river and sea. Radar can also be used as a convenient method of measuring the wavelength from crest to crest of long waves. Most of these phenomena have yet to be satisfactorily recorded.

Conclusion

It is felt that radar photographs can often be a most effective addition to reports of meteorological phenomena, and that they can be made by any good amateur photographer. In particular, when unusual effects are seen on the radar, a photograph may not only save many words of description but will probably facilitate an explanation of the occurrence.

An interesting summary of available information on weather echoes is given in the Marconi Company publication "*Radio-location. Some notes on Radar Target Response and Recognition*".

Maiden Voyage

Laid down at the Conference of the World Meteorological Organisation in Paris, 1951; launched in *The Marine Observer*, January 1953; sailed on her maiden voyage, 1st April, 1953; such is the preliminary history of the new logbook. At the end of the first nine months of her sea-going career it is most encouraging for us to notice that the "cargoes" of the written word brought home to the Marine Branch by the new "ship" are invariably as good as, and in many cases even better and more valuable than, those carried by her predecessors.

The subject of logbooks sounds rather a dull one about which to write, but the value of the material these books contain and the amount of work their preparation may entail for the voluntary observer surely warrant its discussion in this magazine.

From various letters we have from time to time received from officers, and from the enquiries made amongst the Corps of Voluntary Marine Observers by Port Meteorological Officers, we have learned with pleasure that the reception accorded to the new logbook amongst mariners has been good. We have had further proof of this by noting the increasing number of ships who now take temperatures to the decimal point where the nearest degree sufficed before, the increasing number who indicate the method of taking sea temperatures, the increasing number who never fail to indicate the address to which their radio messages have been sent and the

particulars of their despatch, and the numbers of ships who are becoming more regular in their observations.

The general layout of the new logbook makes the former defects easier to remedy, and the time saved in recording the observation and preparing it for transmission has been clearly reflected in the remarks column, the pages for ocean currents and the additional remarks pages, all of which have shown an improvement since the new logbook came into use. The comprehensive nature of the observations which we are extracting from logbooks for publication in the "Marine Observers' Log" in future numbers of *The Marine Observer* is a measure of the broadening interest which officers are taking in the field of maritime science.

The maiden voyage of the new logbook has proved no exception to the rule that a maiden voyage always reveals certain defects, and in the reprint which will shortly be distributed will be found certain minor adjustments. For instance, the "black out" heading of certain columns which was designed to ensure that the material entered in those columns did not find its way into the radio message, will be extended to cover columns 46 to 48, and officers will no longer be burdened with a loose duplicated form for recording data relating to radar propagation, for this will be printed at the end of the logbook as a tear-out page, in a similar way to the present ice report.

L. B. P.

Rule of the Road

1st January, 1954, will be an important date for mariners; it will not only mark the opening of a new year but the introduction of revised international rules for preventing collisions at sea. The revision of the regulations is a result of the International Conference on Safety on Life at Sea which was held in London during 1948, and the introduction of the amended collision rules has been deferred until now so as to give a substantial majority of the governments concerned a chance of officially accepting them.

It is fitting that the collision regulations should figure prominently in the ordeal of the examination room and the new wording of some of them will undoubtedly cause a few headaches to candidates studying for their masters' and mates' certificates. Incidentally there are now thirty-two "articles" as against the long-established thirty-one.

The most important changes are the compulsory introduction of the second mast-head light for vessels over 150 ft in length; an increase in the range of visibility in the lights on fishing vessels; the compulsory introduction of a stern light and an increase in its range of visibility; and an increase in the range of visibility of anchor lights in certain vessels. Provision is made for a power driven vessel to use a specific sound signal in order to warn a "giving way vessel" that she is in doubt as to the latter's movements, and for the use of a sound signal by a power driven vessel nearing an appreciable bend in a channel. Aboard a vessel of more than 350 ft in length when at anchor in fog, a gong or other instrument is to be sounded aft in addition to the customary bell forward. The collision rules have in certain other respects been "tidied up" and brought up to date; for instance the rules concerning lights have been extended to include lights to be carried by seaplanes on the water and for purposes of the steering and sailing rules such are deemed to be "vessels". It seems that the revisions concerned will tend to increase safety at sea. It is probably true to say that all the collision regulations have in some sense or other a meteorological significance. If the weather were always fine, clear and relatively calm and if there were no tides it would not be very difficult to avoid collisions. Meteorological variations particularly of visibility and wind, as well as tidal effects, bring seamanship and the skill of the individual mariner into account in interpreting the collision regulations.

C. E. N. F.

Book Review

Touching the Adventures. Ed. by J. Lennox Kerr. 8 in. \times 5½ in. pp. 256. Harrap & Co., London, 1953. 12s. 6d.

No seaman will deliberately take his ship into a storm. No seaman will deliberately take his ship into the dangers of war. But if either of these two evils seek to obstruct his course, he will fight to defend his ancient right to take his ship where she is bound. He will drive on against all effort of man or weather to deprive him of this right.

This book is the recording of a few experiences of merchant seamen in the Second World War and, as is fitting, the narrators of the 24 stories are with few exceptions the men who themselves lived these experiences in the defence of this prerogative. Among them we are proud to notice names of those who have been active members of the Corps of Voluntary Marine Observers. It is a typical and representative selection, the horrific has not been sought for its own sake and, as the editor states in his preface, there is hardly one story in the book that does not tell a tale that could be duplicated a dozen times out of the merchant seaman's part in the last war.

Though in those years it was with the enemy that the seaman was chiefly concerned, during the battle and even when it was over and the enemy had passed on, it was Nature who had the last word on his survival, as she always will, war or peace. Said a torpedoed shipmaster to his rescuer: "Since we were torpedoed the other morning I've been trying to make the Cape Verdes; but the north-east trades strengthened and what with the unfavourable current things started to look black . . . I finally decided that if I hadn't seen a vessel by daybreak we would go about and try to make the coast of Brazil . . . two thousand-odd miles of blazing hell. . . . That's what you saved us from by coming along tonight." And not infrequently it seemed as if Nature was actually on the side of the enemy: "No sooner had the enemy attack been beaten off than . . . snow blizzards made navigation treacherous. . . . At 0900 an enemy plane had the convoy under observation and yet again nerves were frayed by the anticipation of attack. . . . At 1400 a new factor brought further worry and anxiety to these weary non-combatants. The convoy ran into field ice."

None of the authors is a professional writer, for many of them no doubt this is a maiden effort, and yet without exception the narratives are told with a simple directness and sincerity which is at times most moving. From a story after a sinking: "A day passed and then a day, and then another day; quite soon it began to seem as though we had never lived in any other way. The past was a dream . . . and then we began to die. One of the engineers first . . . nobody even knew he was dead until somebody demanded suddenly, 'What's the matter with Harry?' " Those who are looking for another Joseph Conrad might profitably start their search by reading this book.

Each story is headed by an illustration, the bulk of which are by C. H. W., whose work will be familiar to all readers of *The Marine Observer*.

Such a collection of heroic memoirs is thoroughly deserving of the robust and attractive cover in which the publishers have bound it, whilst a dust-cover by Frank Mason, R.I., completes the appearance of a book which could find an honoured place on the shelves of any seaman.

No payment has been made to any contributor, all fees and royalties usually paid to editors, authors and artists have here been gifted to King George's Fund for Sailors. In an admirable foreword, Mr. John Masefield, O.M., Poet Laureate and seaman, says: "In this book you will find more of the real history of the war than will be put into the history books." The reviewer can say no more.

L. B. P.

Southern Ice Reports

During the year 1953

DATE	POSITION		DESCRIPTION	DATE	POSITION		DESCRIPTION
	LAT.	LONG.			LAT.	LONG.	
JANUARY							
M.V. Biscoe							
14	58 54S	81 08E	Sighted first ice. About 100 more bergs sighted during day.	22	59 39S	86 56E	miles long, 150 ft high; the other four were between 400 and 3,000 ft long, and 100 to 150 ft high. Also numerous growlers.
15	58 16S 60 02S	78 25E 86 32E	Tabular berg. Many medium and large bergs.	23	61 07S	93 55E	Over 200 bergs, bergy bits and numerous growlers in the last 24 hours.
16	61 32S	95 39E	Many bergs and growlers.				Between 125 and 150 bergs and bergy bits during the last 24 hours.
17	63 08S	105 25E	Many bergs and growlers.		63 00S	97 16E	Pack ice, first seen on radar, found to be impassable. Ice blink bearing 030°(T).
18	63 30S	116 06E	Few bergs.	24	62 37S	100 24E	About 100 bergs, bergy bits and growlers in the last 24 hours.
19	64 25S	122 09E	Few bergs.	25	62 58S	109 14E	Between 75 and 100 bergs, bergy bits and growlers in the last 24 hours.
22	63 34S	138 33E	First berg sighted since 19th.				
23	64 56S	146 11E	Large berg, about 100 miles long by 50 miles wide. Numerous other bergs of all sizes.				
24	66 00S	147 31E	Bergs in sight all day.				
25	65 50S	150 10E	Many bergs in sight, pack ice close to S.				
26	65 44S	158 00E	Alongside loose ice and bergs all day.				
27	67 00S	167 20E	Few bergs.				
28	67 12S	168 46E	Few bergs.				
S.S. Bransfield							
23	65 10S	145 55E	Large tabular berg, 100 ft. high, 90 miles long by 40 miles wide, and diamond shaped. This berg was passed again two months later.				
S.S. Polar Maid							
18	52 50S	02 28W	Several bergs and bergy bits.	13	61 55S	48 43E	2 bergs.
	53 48S	02 07W	Several bergs and bergy bits.	14	61 38S	46 54E	2 bergs, several growlers.
19	56 30S	01 48W	Numerous bergs, bergy bits and growlers.		61 28S	44 15E	1 berg.
	57 25S	01 17W	Numerous bergs, bergy bits and growlers.		61 20S	43 37E	2 bergs.
20	59 47S	01 09W	Numerous bergs and growlers.	15	61 12S	42 18E	2 bergs.
	60 40S	01 23W	Several bergs and bergy bits.		61 03S	40 53E	3 bergs.
21	63 00S	01 54W	No bergs, many bergy bits and growlers.		60 53S	39 16E	3 bergs.
	62 57S	03 26W	Numerous bergs, bergy bits and growlers.	16	60 48S	38 14E	4 bergs, several growlers.
30	61 00S	12 00W	Pack ice, bearing 110°-180°.		60 45S	37 27E	2 bergs.
					60 42S	37 00E	3 bergs.
					60 18S	35 24E	5 bergs.
				17	60 12S	34 04E	4 bergs, several growlers.
					60 03S	32 42E	10 bergs.
					59 55S	31 27E	7 bergs, numerous growlers.
					59 43S	30 08E	3 bergs, several growlers.
					59 36S	29 15E	5 bergs.
				18	59 25S	27 54E	2 bergs.
					59 06S	24 46E	3 bergs, several growlers.
					58 54S	23 48E	4 bergs.
				19	58 39S	22 38E	4 bergs.
					58 25S	21 20E	3 bergs, several growlers.
					58 19S	20 25E	4 bergs.
				20	58 12S	19 22E	2 bergs.
					57 55S	17 01E	5 bergs, several growlers.
					57 35S	15 36E	10 bergs, 1 bergy bit.
					57 25S	14 36E	5 bergs.
				21	57 17S	13 31E	8 bergs.
					57 02S	11 39E	19 bergs, several growlers.
					56 44S	10 08E	2 bergs.
					56 21S	08 26E	17 bergs, numerous growlers.
				22	56 12S	07 20E	2 bergs.
					56 12S	05 45E	12 bergs, 8 bergy bits, several growlers.
					56 04S	04 27E	9 bergs.
					56 05S	03 00E	3 bergs.
				23	56 05S	00 02W	1 berg, several growlers.
					56 05S	01 20W	2 bergs.
					56 02S	02 47W	1 berg.
				24	56 02S	05 42W	1 berg.
					56 02S	06 52W	1 berg.
				25	56 06S	11 41W	1 berg.
					56 06S	13 53W	1 berg.
					56 05S	14 44W	1 berg.
				26	56 05S	18 06W	3 bergs.
					56 05S	19 34W	3 bergs, 1 bergy bit.
					56 21S	21 02W	1 berg.
				27	56 00S	22 36W	1 berg.
					55 11S	24 24W	2 bergs.
				28	54 47S	30 14W	1 berg.
					54 37S	32 42W	2 bergs.
M.V. Southern Atlantic							
1	53 56S	36 35W	Small pinnacled berg.				
	52 42S	36 31W	Large tabular berg.				
2	51 39S	36 38W	Medium tabular berg.				
M.V. Southern Collins							
21	59 00S	80 02E	4 tabular bergs: (i) 3,544 ft long, 155 ft high; (ii) 424 ft long, 141 ft high; (iii) 3,200 ft long, 106 ft high; (iv) 1,854 ft long, 184 ft high. Dimensions calculated by nautical tables, the distances being known by radar.				
	59 26S	81 24E	5 tabular bergs: (i) 1½				

DATE	POSITION		DESCRIPTION	DATE	POSITION		DESCRIPTION
	LAT.	LONG.			LAT.	LONG.	
	° /	° /			° /	° /	
S.S. Southern Harvester							
2	57 50S	03 30W	8 bergs, scattered drift ice.	3	62 18S	05 40W	2 bergs, 1 growler.
4	56 42S	02 26W	3 bergs, scattered pack ice.	5	62 01S	08 10W	Several bergs, bergy bits and growlers.
	56 45S	02 18W	Scattered pack ice.	6	63 14S	11 31W	Several bergs, bergy bits and growlers.
5	56 44S	02 16W	2 bergs, scattered pack.	10	61 13S	17 12W	Several bergs and growlers.
6	56 53S	02 06W	15 bergs, scattered pack.		59 26S	19 45W	Numerous bergs and several growlers.
8	57 46S	01 50W	3 bergs, scattered pack.	14	54 30S	33 52W	Several bergs.
9	52 20S	01 36W	4 bergs.	19	53 27S	36 47W	1 berg.
10	58 26S	01 25W	3 bergs.	M.V. Powell			
11	59 02S	01 52W	4 bergs.	6	54 07S	44 25E	1 small berg, the first sighted this season.
	59 12S	02 06W	2 bergs.	11	59 18S	83 50E	Several large bergs and bits.
12	59 14S	02 10W	3 bergs.	12	59 45S	94 01E	Several large bergs and bits.
13	59 30S	02 16W	2 bergs.		59 52S	96 06E	Several bergs and bits.
22	61 12S	06 26W	9 bergs.	14	59 52S	107 28E	Several bergs and bits.
23	60 05S	08 26W	2 bergs.		60 44S	110 14E	Several bergs and bits.
	60 15S	10 06W	Many bergs.	15	61 44S	120 14E	Several bergs and bits.
24	60 24S	10 18W	4 bergs, scattered pack.	17	63 42S	137 13E	1 berg.
25	60 11S	14 44W	32 bergs, scattered pack.	18	64 31S	147 33E	Several bergs.
26	60 15S	14 30W	20 bergs, scattered pack.	19	65 53S	155 00E	1 berg.
27	60 27S	14 33W	9 bergs.	20	67 20S	161 10E	Several bergs.
28	60 40S	14 40W	1 berg.	21	67 18S	161 10E	Several bergs.
29	60 35S	12 40W	6 bergs, scattered pack.	24	66 08S	153 30E	Several bergs and pack ice.
30	60 39S	12 42W	7 bergs, scattered pack.	26	64 35S	146 30E	Large berg 90 miles long checked by steaming along side. Estimated to be 30 to 40 miles wide. Berg drifting east at approx. 1 kt. Heavy pack ice to SW of berg.
	61 00S	10 30W	2 bergs.	M.V. Southern Atlantic			
S.S. Southern Opal							
8	54 20S	31 40W	Scattered bergs.	22	55 50S	36 34W	Medium tabular berg.
	54 27S	30 23W	3 small bergs, 1 growler.	S.S. Southern Garden			
	54 36S	28 42W	Scattered bergs.	21	55 08S	32 20W	3 bergs.
9	54 44S	25 43W	Few bergs.		55 28S	30 52W	2 bergs.
	54 48S	24 30W	1 berg.		55 40S	29 48W	No ice.
10	55 06S	19 00W	Several bergs.	22	56 30S	27 06W	2 bergs.
11	55 25S	13 45W	Several bergs.		57 05S	26 13W	2 bergs, 3 growlers.
	55 41S	10 45W	Few bergs.		57 35S	25 00W	1 berg.
12	56 21S	06 45W	1 berg, 1 growler.	23	58 36S	22 48W	2 bergs.
	56 44S	05 05W	Several bergs.		59 10S	21 40W	2 bergs.
13	57 50S	03 26W	Several bergs and pack ice.	24	60 18S	20 30W	4 bergs.
	59 07S	01 32W	Many bergs and growlers.		60 49S	20 12W	1 berg.
14	60 06S	01 21E	Several bergs and growlers.		61 42S	20 12W	1 berg.
	60 46S	02 49E	1 berg.	S.S. Southern Harvester			
	61 27S	03 34E	1 berg.	1	62 10S	05 30W	4 bergs.
17	59 54S	03 11E	1 berg.	3	61 30S	05 08W	2 bergs.
18	57 58S	00 20W	3 bergs and several growlers.		61 03S	05 25W	2 bergs.
	58 15S	01 46W	2 bergs and several growlers.	4	60 50S	05 23W	2 bergs.
	58 01S	03 50W	Many bergs and growlers.	5	60 53S	05 02W	3 bergs.
19	57 40S	07 36W	Several bergs.		62 22S	08 11W	4 bergs.
	57 18S	09 06W	1 berg.	6	62 20S	09 48W	3 bergs.
20	56 30S	16 55W	2 bergs and numerous growlers.		63 11S	10 44W	2 bergs.
	56 39S	18 40W	3 bergs.	7	63 46S	10 25W	1 berg.
22	55 00S	31 00W	1 berg and 1 growler.		63 42S	10 22W	3 bergs.
S.S. Thule							
2	62 27S	97 33E	56 bergs of various sizes, mostly small. Heavy pack 7 miles to S of ship.		63 48S	10 18W	2 bergs.
FEBRUARY							
M.V. Biscoe							
1	67 34S	172 52E	A few bergs always in sight.	8	63 55S	12 26W	2 bergs.
2	67 12S	173 37E	A few bergs always in sight.	9	63 17S	16 15W	3 bergs.
3-5			Few bergs in this area.		62 50S	15 28W	5 bergs.
5	66 30S	176 16W	Numerous bergs.	10	62 45S	15 26W	6 bergs.
6-12			Few bergs in this area.		62 42S	14 54W	6 bergs.
12	68 06S	170 40W	Numerous bergs, pack ice.		62 29S	14 28W	4 bergs.
S.S. Polar Maid							
2	62 10S	05 45W	3 bergs.	11	62 26S	14 50W	2 bergs, drift ice.
3	62 44S	06 17W	Occasional bergs and growlers.		62 25S	14 51W	2 bergs.
					62 22S	14 46W	3 bergs.
				12	62 17S	15 14W	2 bergs, in lee of pack.
					62 07S	15 22W	3 bergs, in lee of pack.
					62 06S	15 20W	6 bergs, in lee of pack.
				13	62 15S	15 22W	2 bergs, in lee of pack.
					62 15S	15 25W	3 bergs, in lee of pack.
					62 19S	15 25W	6 bergs, in lee of pack.
				14	62 30S	15 40W	4 bergs, in lee of pack.

DATE	POSITION		DESCRIPTION
	LAT.	LONG.	
	° /	° /	
14	62 36S	16 10W	4 bergs.
	62 30S	16 12W	2 bergs.
15	62 15S	16 36W	4 bergs.
	62 12S	16 42W	6 bergs.
17	62 22S	21 40W	5 bergs.
	61 51S	21 11W	6 bergs.
18	61 57S	21 10W	2 bergs, scattered pack.
	61 57S	21 07W	14 bergs, scattered pack.
	62 00S	21 00W	15 bergs, scattered pack.
19	61 58S	20 40W	2 bergs, scattered pack.
	61 56S	21 36W	2 bergs.
	61 54S	21 24W	2 bergs, scattered pack.
20	61 56S	20 05W	Scattered pack ice.
	61 56S	20 02W	18 bergs, scattered pack.
	61 55S	20 05W	18 bergs, scattered pack.
21	61 49S	20 10W	7 bergs, scattered pack.
	61 48S	20 00W	10 bergs, scattered pack.
	61 42S	19 48W	10 bergs, scattered pack.
22	61 50S	19 26W	12 bergs, scattered pack.
23	62 00S	19 38W	9 bergs, heavy drift ice.
	62 08S	19 12W	2 bergs, heavy drift ice.
24	62 25S	19 25W	14 bergs, heavy drift ice.
	62 42S	20 24W	4 bergs, heavy drift ice.
25	62 45S	21 11W	7 bergs, heavy drift ice.
	62 41S	21 42W	4 bergs, scattered pack.
26	62 30S	21 24W	15 bergs, scattered pack.
	62 26S	21 54W	3 bergs, scattered pack.
27	62 92S	22 30W	12 bergs, scattered pack.
	62 28S	22 28W	3 bergs, scattered pack.
28	62 15S	21 15W	11 bergs, scattered pack.
	62 12S	21 12W	6 bergs.
	62 00S	21 10W	2 bergs.
S.S. Southern Opal			
9	64 47S	82 15W	2 bergs.
10	64 47S	88 36W	3 bergs, 1 growler.
11	64 26S	98 35W	Several bergs.
12	64 26S	106 21W	A few bergs and growlers.
13	64 20S	110 13W	Numerous bergs and growlers.
	64 20S	112 07W	2 bergs.
	64 11S	113 35W	Numerous bergs and growlers.
14	64 35S	117 35W	Many large bergs and growlers.
	64 40S	120 10W	Many large bergs.
	64 47S	122 06W	Many bergs and growlers.
15	65 06S	130 40W	Many bergs and growlers.
17	64 20S	140 00W	Congested area of bergs and growlers.
	64 00S	144 28W	Numerous bergs and growlers.
18	64 04S	150 26W	Several bergs and growlers.
20	64 43S	159 49W	Few bergs and growlers.
	65 50S	165 29W	Several bergs.
21	66 26S	167 15W	Several bergs and growlers.
	66 48S	169 18W	Numerous bergs and growlers.
	67 12S	173 15W	Thickly congested area of bergs and growlers.
22	68 00S	173 20W	Numerous bergs and growlers.
	68 07S	171 14W	Few scattered bergs.
23	68 12S	168 20W	1 berg.
26	67 03S	162 38W	1 berg.
	66 58S	164 07W	Several bergs.
27	66 39S	164 31W	Several bergs.
	66 45S	164 08W	Several bergs.
28	66 58S	163 32W	Few bergs, several growlers.
S.S. Thule			
27	64 52S	147 04E	Diamond shaped berg, 90 miles long, 40 to 50 miles wide. A few other bergs from 1 to 4 miles long.
DATE	POSITION		DESCRIPTION
	LAT.	LONG.	
	° /	° /	
MARCH			
M.V. Powell			
1	65 47S	147 25E	Several bergs and bits, broken pack ice.
3	65 36S	145 41E	Several bergs and extensive pack ice to SW.
4	65 25S	144 57E	Several bergs.
	65 23S	144 50E	Several bergs.
5	65 33S	143 48E	Several bergs and broken pack ice.
	65 30S	143 46E	Several bergs and bits.
	65 25S	143 43E	Several bergs and bits.
8	64 16S	138 02E	Several bergs and bits.
9	64 12S	137 52E	Several bergs and bits.
	64 18S	137 24E	Several bergs and bits.
13	64 10S	116 00E	Several bergs and bits.
14	63 50S	114 10E	Pack ice bearing SSW.
	64 07S	113 01E	Pack ice bearing SSW.
20	64 07S	79 40E	Several bergs and bits.
	64 08S	76 50E	Several bergs and bits.
	64 12S	74 10E	Several bergs and bits.
21	64 26S	68 32E	Several bergs and bits.
	64 38S	66 10E	Several bergs and bits.
	64 35S	62 40E	Several bergs and bits.
22	64 34S	57 15E	Several bergs and bits.
	64 54S	54 40E	Several bergs and bits.
23	65 02S	44 46E	Occasional bergs and bits.
25	61 21S	32 30E	Occasional bergs and growlers.
26	58 48S	28 00E	One large berg.
	57 45S	26 25E	Several small bergs.
27	55 30S	24 10E	Several large bergs.
	54 41S	23 37E	Several bergs and bits.
28	50 35S	21 51E	Occasional bergs, the last to be sighted.
S.S. Southern Garden			
6	61 26S	32 22W	No ice.
	60 08S	33 12W	3 bergs.
7	58 45S	33 50W	No ice.
	58 04S	34 08W	1 berg
S.S. Southern Harvester			
1	62 25S	20 18W	3 bergs.
	62 44S	22 54W	4 bergs.
2	63 05S	23 07W	6 bergs.
	64 25S	25 29W	8 bergs, scattered drift ice.
3	64 13S	26 04W	7 bergs, scattered drift ice.
	62 53S	28 49W	4 bergs.
4	62 41S	29 15W	Scattered pack.
	62 54S	29 36W	Scattered pack.
6	64 26S	33 30W	3 bergs, loose pack.
	64 16S	34 18W	2 bergs, loose pack.
7	64 00S	35 10W	1 berg.
	63 57S	35 27W	1 berg.
8	63 54S	35 46W	2 bergs.
	63 58S	36 30W	2 bergs.
11	64 26S	38 12W	2 bergs.
12	64 06S	37 00W	4 bergs, scattered pack.
	64 00S	34 30W	4 bergs, scattered pack.
13	63 42S	35 38W	2 bergs, scattered pack.
	63 30S	35 02W	2 bergs, scattered pack.
14	62 42S	35 30W	1 berg.
15	62 18S	35 48W	2 bergs.
	62 24S	34 54W	2 bergs.
S.S. Southern Opal			
1	67 00S	162 07W	Few bergs.
2	66 48S	161 43W	Several bergs.
	66 28S	164 44W	Numerous bergs and growlers.
3	66 28S	166 03W	Hundreds of bergs and growlers.
	67 36S	169 35W	Several bergs and growlers.
4	67 59S	171 32W	Few bergs.
6	68 04S	173 20E	Few bergs and growlers.
	67 59S	172 27E	Few bergs and growlers.

DATE	POSITION		DESCRIPTION	DATE	POSITION		DESCRIPTION
	LAT.	LONG.			LAT.	LONG.	
	° ' "	° ' "			° ' "	° ' "	
7	67 43S	172 25E	Several bergs and growlers.	19	65 51S	133 00W	Numerous bergs, bergy bits and growlers.
	67 25S	171 43E	Few bergs and growlers.		65 48S	126 23W	Several bergs and growlers.
8	67 18S	170 50E	1 berg.				
9	67 08S	166 01E	Numerous bergs, heavy pack ice.	20	65 49S	125 00W	Several bergs.
10	67 08S	166 40E	Numerous bergs, heavy pack ice.	21	66 35S	119 20W	Few bergs and growlers.
	67 10S	164 44E	Numerous bergs, heavy pack ice.	22	66 26S	116 15W	Few bergs and growlers.
11	67 28S	165 50E	Numerous bergs, heavy pack ice.		66 00S	115 00W	Few bergs and growlers.
12	67 19S	167 17E	Several bergs.		65 51S	111 09W	Several bergs and growlers.
	66 11S	173 21E	Several bergs.	23	65 35S	106 50W	Several bergs and growlers.
14	66 12S	175 07W	Numerous bergs and growlers.		65 19S	99 37W	Few bergs and growlers.
15	65 56S	167 06W	Numerous bergs and growlers.	24	65 07S	98 02W	Several bergs and growlers.
	65 56S	162 42W	Several bergs and growlers.		65 01S	94 06W	Several bergs and growlers.
16	65 51S	159 53W	Several bergy bits.		64 58S	91 58W	2 bergs.
	65 51S	153 17W	Numerous bergs, growlers and bergy bits.	25	64 52S	90 34W	Several bergs and growlers.
17	65 51S	150 30W	Numerous bergs, growlers and bergy bits.		64 37S	86 29W	Few bergs.
					64 29S	84 34W	Few bergs and growlers.
				26	64 20S	82 36W	Few bergs and growlers.
					64 02S	78 28W	Few bergs and growlers.
					63 54S	76 27W	Few growlers.
				27	63 44S	73 46W	Few bergs.

Reports of ice for January, February and March previous to 1953 will be found in *The Marine Observer*, Vol. XXIII, No. 159, p. 43.

Whalers in the Antarctic

The following note consists of extracts from two letters received from Dr. Schumann, the Director of the South African Weather Bureau.

During the 1952-53 whaling season a grand total of 3,363 wireless weather reports were received from Norwegian, British and Dutch whaling factory ships, tankers, supply ships, etc. These were received from 22 ships as follows: *Abraham Larsen* 109, *Balaena** 46, *Biscoe** 64, *Bransfield** 113, *Kosmos IV* 360, *Lancing* 240, *Norhval* 207, *Papendrecht* 146, *Pelagos* 329, *Polar Maid** 42, *Polarbris* 20, *Powell** 80, *Sir James Clark Ross* 152, *Southern Collins** 118, *Southern Garden** 181, *Southern Harvester** 149, *Southern Opal** 31, *Southern Venturer** 92, *Suderooy* 285, *Thorshammer* 122, *Thule** 94, *Willem Barendsz* 383. (Those ships marked with an asterisk are British selected ships.)

This total of 3,363 wireless weather reports received compares with 2,706 for the 1951-52 season, 1,743 for the 1950-51 season and 1,139 for the 1949-50 season. This improvement is better than the figures indicate, since a smaller number of whaling factory ships were in operation in the Antarctic during the 1952-53 season than in any previous season.

For this season the co-operation that the South African Weather Bureau has had from British selected ships operating in Antarctic waters has been very much improved. About one-third of the total number of reports received by radio were from British selected ships, and when compared with the tonnage this was very gratifying. Special mention should be made of the mass of valuable information received from the tanker *Southern Garden*, which sent in over 180 reports, and the factory ship *Southern Harvester* (Chr. Salveson & Co.), which sent in at least 149 reports. The refrigerator ship *Bransfield* and the tanker *Thule* of Hector Whaling Ltd. both handed in extra logbooks comprising complete observations for the whole season, for which we were very grateful.

Weather Bureau prizes are to be awarded to *Southern Garden*, *Southern Harvester*, *Southern Collins*, *Bransfield*, *Thule* and *Southern Venturer*, but it is hoped that funds will suffice to include *Powell* which, in addition to the 80 reports received during the whaling season, sent in an additional 80 reports on the Cape-South America run during 1952.

Radar Echoes from Precipitation

By R. F. JONES

(Meteorological Office, East Hill, Dunstable)

Introduction

The increasing use at sea, in the air and on land of radars operating on wavelengths of 10 cm and 3 cm has made well known the fact that radar echoes can be received from precipitation. The meteorologist has therefore been given a new instrument which enables him to observe some part of the precipitation processes occurring at some point in the atmosphere, without the necessity of having a recording instrument at that particular position. He can, moreover, over a limited area get a detailed picture of the precipitation occurring such as cannot be obtained by any other means.

The use of radar for this purpose, however, is still in its infancy, and precisely what is the interpretation of the responses we receive from atmospheric precipitation is still under investigation.

Theoretical considerations

The theoretical treatment of radar echoes from waterdrops, ice crystals and snowflakes has been very thoroughly given by Ryde^{1*}, but the practical application of his results to the radar echoes received from precipitation at heights above the freezing level is handicapped by the meteorologists' lack of knowledge of the constitution of such precipitation—is it composed of ice crystals only, aggregates of ice crystals, water drops or mixtures of all three, and how does its constitution vary with height?

For water drops Ryde has shown that the radar echo power received from a volume containing n drops of diameter d is proportional to nd^6 . For rainfall, in which there is always a distribution of drop sizes, the radar echo power received is proportional to $\sum nd^6$ where the summation is taken over the whole range of drop sizes. It is clear, from the dependence on sixth power of the diameter, that the response from a raindrop is enormously greater than that from a cloud particle, and experience has shown that, with normal radars operating on a wavelength of 3 or 10 cm, the response from cloud particles is too small to be detected and that, at ranges beyond about 10 miles, drops of the size of raindrops—of diameter 1 mm or greater—must be present before a detectable echo from water drops in the atmosphere is received. Useful observations cannot usually be made at ranges less than 10 miles with normal ground based radars because of the existence of permanent echoes from ground obstructions.

Theory indicates that for snow composed of individual crystals, the crystals must be of a size corresponding to a mass of 1 to 2 mg before they give an echo of about the same intensity as from rain at the same precipitation rate. If the crystals were smaller the rain would give a stronger echo than the snow. In general this would imply that the crystals would have to be quite large—of the order of 2 or 3 mm diameter if the crystals were in the form of plates, or about $1\frac{1}{2}$ mm if they were spheres—before giving a detectable echo on normal 10 cm or 3 cm equipment. If, however, the ice crystals aggregate to form large snowflakes the radar echo will be greatly increased, even though the rate of precipitation does not change. An enhancement of the echo will also occur if the ice crystals acquire a wet skin by collision with water droplets or in the initial stages of melting.

It is clear therefore that normal radars operating on wavelengths of 10 cm or 3 cm will not see the whole of a cloud but only that part of the cloud in which either (a) there are water drops of raindrop size, or (b) ice crystals of the order of $1\frac{1}{2}$ mm diameter or more, or (c) aggregates of ice crystals, or (d) ice crystals with a wet surface. If there are aggregates, or if the crystals are wet, the individual ice

*The numbers refer to references on p. 35.

crystals need not be as large to give the same echo intensity as when the ice crystals are dry. The echo intensity falls off with the square of the range, if the echoing volume fills the beam, and with the fourth power of the range if the beam is not filled. Thus the limiting sizes for detection will increase as the range increases.

Radar observations

With the conventional radar used for plotting aircraft, useful measurements on weather echoes cannot be made within about 10 miles of the radar sets, because of the permanent echoes, but a large area outside this range can be searched. For observations at close range, vertically looking radar can be used, but one is then of course limited to the investigation of those echoes which choose to come overhead.

To try and find out how much radar can help the meteorologist, not only in investigating precipitation processes, the Meteorological Office has been operating a radar station at East Hill, near Dunstable, Bedfordshire, for the last five years.* The equipment used has been a high-power installation operating on a wavelength of 10 cm and providing two types of display—a P.P.I. display which gives a bird's-eye view of the surrounding area of the radar station up to a maximum range of about 130 miles, and hence the projection on an almost horizontal plane of the echo-producing regions of clouds, and a height-range display which gives a vertical cross-section on any desired bearing from the observing station up to an elevation of 19° . A height-range equipment operating on a wavelength of 3 cm is also used. Comparison of observations made of the same weather phenomena using 10 cm and 3 cm wavelength height-range presentations has shown that the responses obtained are very similar on the two equipments. In areas where the rainfall intensity is very high over long distances, however (e.g. 50 mm/hour over a distance of 20 km or more), a 3 cm radar beam would experience much greater attenuation by precipitation than a 10 cm beam and a 10 cm radar would be more efficient in detecting distant precipitation.

Other considerations, however, must also be taken into account when choosing a wavelength for use on ships. Radar is used on merchant ships principally for navigational purposes, and for such purposes it is essential that the beam width in the horizontal of the equipment used should be as narrow as possible to obtain better discrimination in bearing, e.g. to distinguish two ships at the same range close together in bearing or to identify a narrow channel between obstructions. The beam width in the horizontal is inversely proportional to the horizontal dimension of the aerial and directly proportional to the wavelength. Thus for a horizontal beam of $1\frac{1}{2}^\circ$ the aerial must be about 20 ft long horizontally for a wavelength of 10 cm but only 6 ft long for 3 cm wavelength. With the limited space available on board ship it is clear that the best navigational radar employs a short wavelength and 3 cm radar is normally used.

To an accuracy limited principally by the beam widths of the equipments, the radar at East Hill provides information concerning the three-dimensional structure of the echoes received from weather phenomena. From the P.P.I. picture can be obtained the horizontal area covered by the echo and its development and movement, while from the vertical cross-section can be measured the vertical extent of the echo and its changes with time. In many ways the examination of these vertical cross-sections has proved the more interesting and informative.

After quite a short experience of studying the radar displays in various kinds of weather it became clear that different weather types are associated with markedly different radar responses. Thus on the P.P.I. display the echo received from a cold front (Fig. 1) is different from that associated with a warm front (Fig. 2) or occlusion (Fig. 3), while all frontal cases differ from the display when echoes from showery precipitation are being received (Fig. 4).

*This article is the substance of a paper read before the British Association (Section A) at Edinburgh in August 1951.

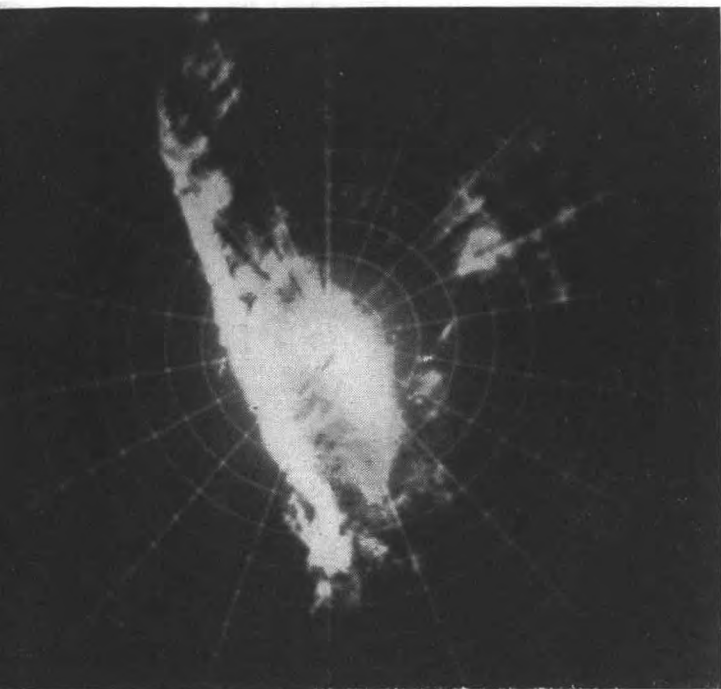


Fig. 1.
Echo from a cold front moving ENE.
Note clear-cut edge to echo, marking surface
position of front.

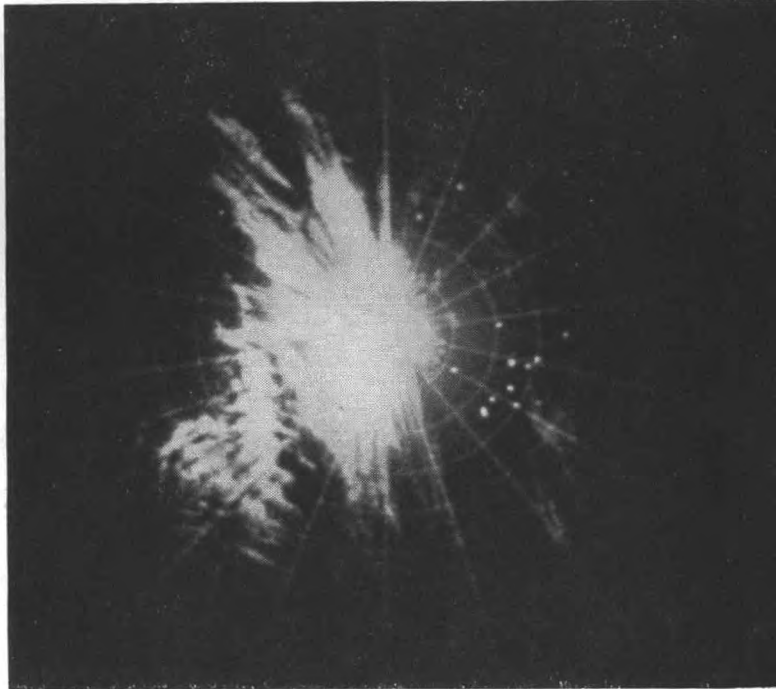


Fig. 2.
Echo from a warm front moving ENE.
Note diffuse nature of echo without clearly
defined surface position of front.

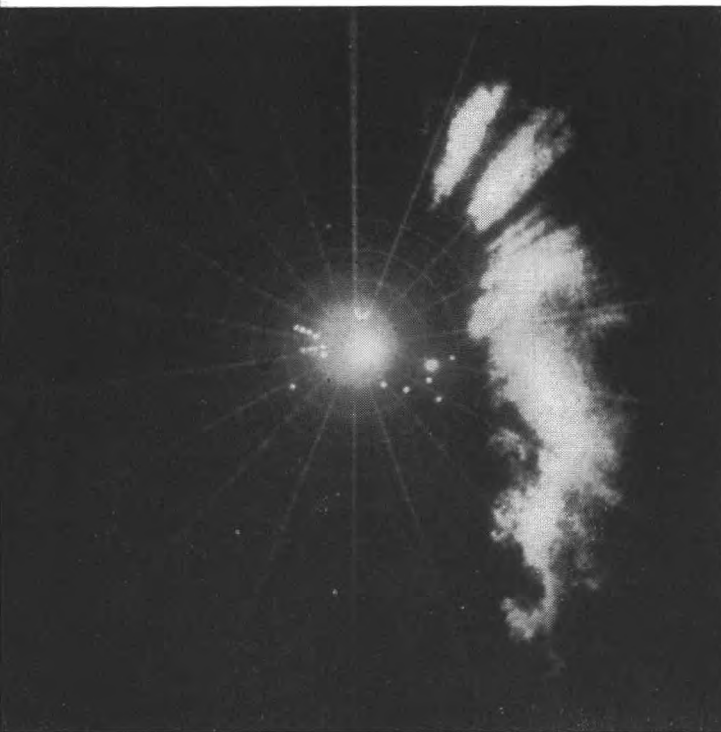


Fig. 3.
Echo from an occlusion moving E.
Note that rear edge is more clearly defined
than for the warm front.

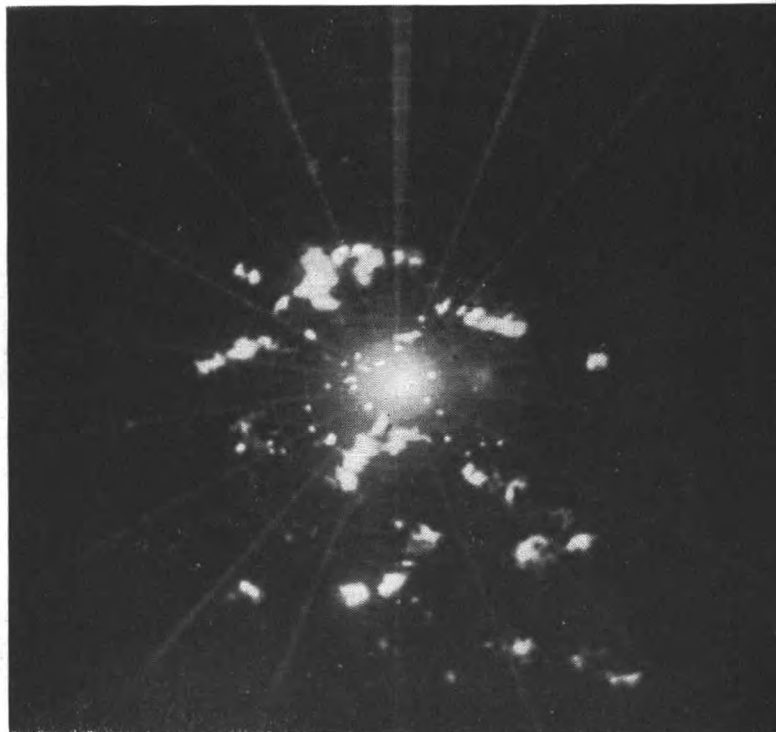


Fig. 4.
Echoes from showers.
Note isolated and clear-cut nature of echoes.
Diffuse echoes or parts of echo are from
decaying shower clouds.

P P I photographs in different types of weather (circular range markers are at 5-mile intervals).

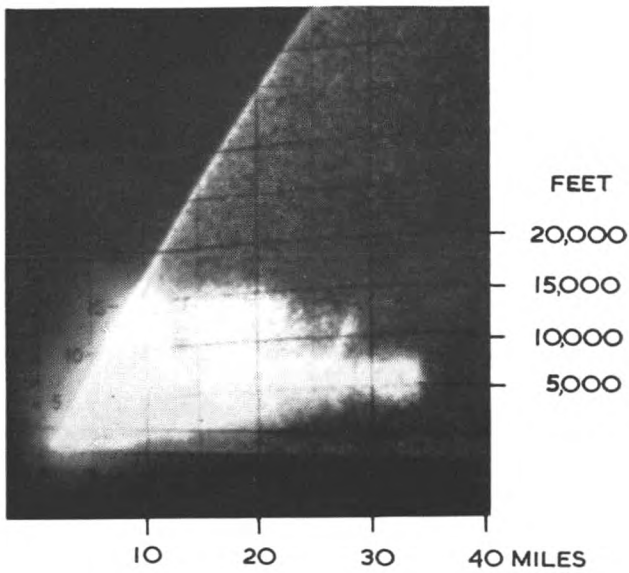


Fig. 5.
Echo from precipitation from a layer-type cloud
associated with an occlusion.
Note bright band centred at 6,000 ft.

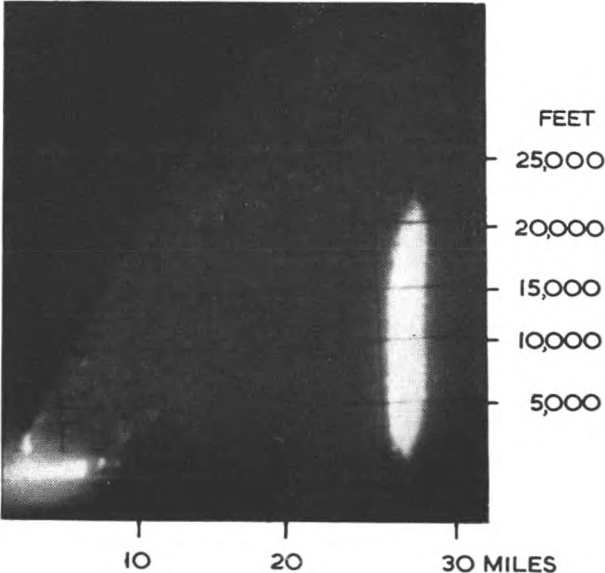


Fig. 6.
Single-column echo from isolated shower cloud.

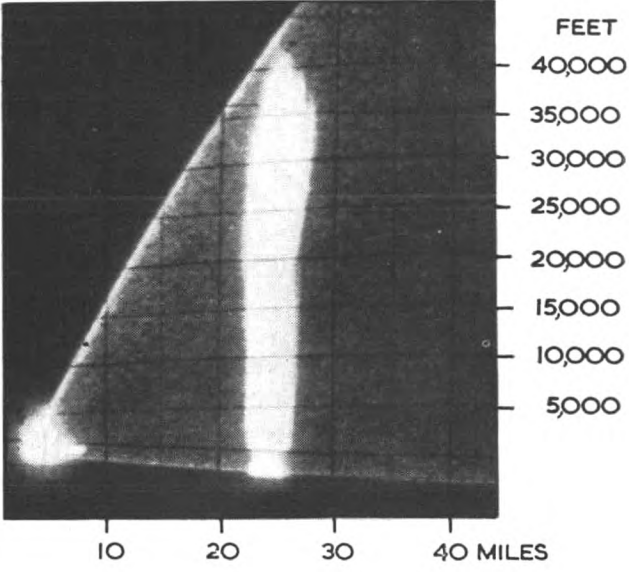


Fig. 7.
Single-column echo from isolated thunderstorm.

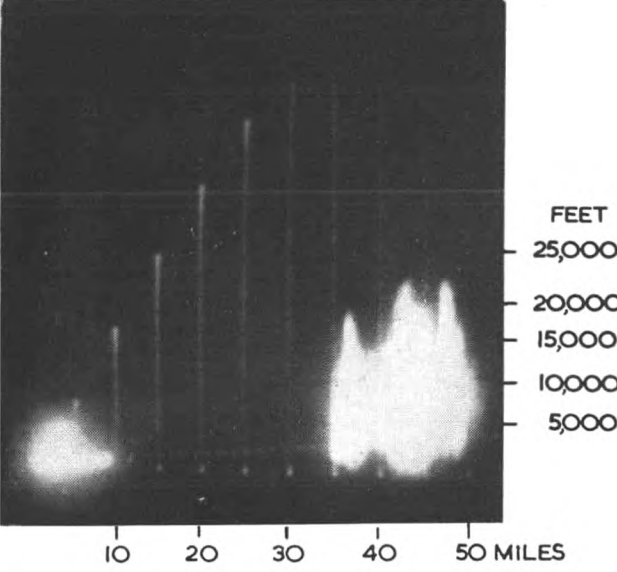


Fig. 8.
Multiple column echo from extensive showers.

Vertical cross-sections of radar echoes.

The differences in the appearance of the echo in the vertical cross-section are equally marked and have been discussed in detail elsewhere.² The most outstanding difference lies between the echoes from frontal or layer cloud and those from cumulonimbus clouds. Fig. 5 is a vertical cross-section of the radar echo received from an occlusion in which it will be seen that the echo is in the form of a horizontal band of echo of limited vertical extent and contains a narrow band of echo of greater intensity at a constant height. This band of echo—called the bright band—is characteristic of the responses from frontal and layer clouds and is received from the vicinity of the freezing level. It has been explained theoretically by Ryde¹ as being associated with the melting of ice crystals and snowflakes as they fall through the freezing level, and aircraft flights by the Meteorological Research Flight³ and others⁴ have confirmed this. Figs. 6, 7 and 8 on the other hand are vertical cross-sections through the radar responses from cumulonimbus clouds. The outstanding characteristic is the appearance of strong vertical columns of echo either singly (Figs. 6 and 7) or with two or more in close proximity (Fig. 8), and such columns have been observed to reach heights greater than 40,000 ft (Fig. 7).

By assessing the radar echoes received in many different weather situations according to the temperature at the top of the echo it was possible to arrive at a broad classification of the echoes to be expected in various types of weather. It is found that the temperature at the radar echo top decreases as the vertical currents within the cloud increase. Thus, for layer clouds, cold fronts have in general a colder echo top than warm fronts, and in cases of convection clouds the thunderstorm, in which the vertical currents are recognised to be the greatest, has the coldest top to the echo.

Interpretation of radar observations

The radar information tells us at what height in the cloud the reflecting particles are numerous and large enough for a detectable signal to be received. It tells us also that this height increases as the vertical currents increase. It does not, however, tell us whether the particles are water drops, ice crystals, aggregates of ice crystals or ice crystals with a wet skin. Some aircraft flights have been made, however, in an endeavour to decide these points and a partial answer has been obtained³.

Considering first the case of layer clouds in which the bright band is visible; the bright band is evidence that snow is melting at the freezing level and it is virtually certain that the echo from above the bright band is coming from ice crystals, either singly or in aggregates. The radar shows that growth of ice crystals to the minimum size or aggregation of the ice crystals takes place at a lower temperature as the vertical currents get stronger. Furthermore, Fig. 5 illustrates the fact that the echo top is frequently level over a considerable range, and this implies that the increase to beyond the minimum signal size takes place quite suddenly—since if the decrease of signal intensity with height were gradual it would be shown by a gradual decrease of echo-top height with range, owing to the decrease of echo intensity with range. A sudden increase in intensity at a fixed height can be brought about in three ways: (*a*) by sudden growth of the ice crystals, (*b*) by aggregation of the ice crystals at this height, and (*c*) by the ice crystals developing a wet surface at this height.

Aircraft investigations of situations such as these have indeed shown that the ice crystals are frequently much larger just below the top of the echo-producing region than just above; but occasionally, when size did not appear to be the governing factor, it would seem that the presence of supercooled water was also a necessary factor. Supercooled water, the presence of which was inferred from the reports of ice formation on the investigating aircraft, can operate in all three ways to increase the reflectivity of the ice crystals. It maintains supersaturation with respect to ice for rapid growth by condensation, it provides large numbers of cloud droplets so that growth by coalescence will occur with the additional possibility, if the rate of

collision is great enough, that the ice crystals acquire a wet surface and it increases the possibility of aggregation by providing the "cement"—in the form of small water droplets—to bind the crystals together.

It seems probable therefore that the growth of precipitation elements takes place in layer cloud conditions when small ice crystals fall into, or are formed in, the top of a cloud containing large numbers of supercooled water droplets. The up-currents in layer clouds are usually small and as the up-currents increase so the growth of precipitation elements takes place at greater heights—or lower temperatures. The growth to radar reflecting size does not normally take place at temperatures lower than about -09°F (-23°C) unless there is reason to believe that the much stronger up-currents of cumulonimbus clouds are present. This suggests that in normal frontal clouds the amount of free water present at temperatures lower than -09°F is too small for rapid growth of the ice crystals to be possible.

When we consider the processes going on in cumulonimbus clouds we have to take account of the apparent considerable difference in type of radar echo between echoes from cumulonimbus and those from layer clouds. The echo from an active cumulonimbus, as we have seen (Fig. 6) is in the form of a column of echo with clear-cut edges and top, and the temperature of the outside air at its top may be lower than -40°F on some occasions (e.g. Fig. 7). In fact in thunderstorms the echo-top very frequently reaches to the tropopause. Even when the gain of the radar receiver is reduced to allow assessment of the volume from which the maximum signal intensity is received, there is no sign of the bright band which is so characteristic of echoes from layer type clouds. We cannot be sure, therefore, that ice crystals or snowflakes play a leading or any part in reflecting the radar energy as they do in layer clouds, and many considerations lead to the suggestion that in the cumulonimbus the echo is received from water drops even at great heights and very low temperatures. Investigations of this type of echo have been made by single-seater aircraft, primarily with a view to relating the echo characteristics to the turbulence within the cloud, and observations of the weather by the pilot revealed that the echo at heights above the freezing level was associated with noticeable precipitation or with ice formation on the aircraft on 97% of all traverses. Furthermore, on more than half of the flights above the freezing level on which precipitation was reported, the precipitation was reported as rain even with environment temperatures below 20°F . There seems no doubt that many large water drops are present within the cumulonimbus cloud even in parts of the cloud where the temperature is well below the freezing point and that, if the cloud is big enough, particles large and numerous enough to give a detectable echo exist at temperatures right down to the tropopause temperature, which may be -50°F or lower. The amount of water vapour available for droplet or ice crystal growth at these very low temperatures is very small, unless there is a high degree of supersaturation, and it seems certain that the radar reflecting particles are carried upwards in the clouds by the vertical currents of the cumulonimbus. Considerations such as these have led to the suggestion that rain is produced in the cumulonimbus cloud by droplet growth in the rising air current by condensation and coalescence and that the ice crystal, which plays an essential part in the production of precipitation from layer clouds, is not essential to shower type precipitation. Striking confirmation of this suggestion has been obtained in Australia where observations of heavy showers from convection clouds, the tops of which did not reach to the freezing level, have been made.⁵

Conclusion

Radar observations therefore provide some evidence in favour of two different methods of forming rain in the atmosphere. One which is operative when the vertical currents are small, as in layer and frontal clouds, and for which the ice crystal is essential, as described by the Bergeron-Findeisen theory, and the other

when the vertical currents are large as in cumulus and cumulonimbus clouds, in which the growth of raindrops proceeds in the upward current by condensation and coalescence in the liquid state. On many occasions, for example, in frontal clouds when latent instability in the warm air being lifted is realised and in convection clouds, the two processes no doubt occur simultaneously in different parts of the cloud. This may especially be the case in thunderstorms, for the tops of thunder clouds frequently extend to heights at which large numbers of ice crystals are certain to form within the cloud. The possibility that the occurrence of the two precipitation processes simultaneously has some connection with the generation of thunderstorm electricity is outside the scope of this article but shows yet another of the interesting possibilities which arise from the study of precipitation processes with the aid of radar.

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Does Sea Fog Reflect Sound ?

By W. F. McDONALD
(United States Weather Bureau)

In an article on "Arctic Ice" (U.S. Hydrographic Office, *Supplement to North Atlantic Pilot Chart*, May 1952) the following statement appears:

Echo (Air). Echoes from the ship's whistle are not to be relied upon, both because the shape of the berg may prevent any echo and because fog banks often return echoes.

This statement came to the writer's attention while aboard the U.S. steamer *American Leader* in June 1952, en route from New York to London, to attend a Conference of the Commission for Maritime Meteorology (World Meteorological Organisation). On question as to whether the master of the ship, Capt. A. C. Smithies, had himself ever observed whistle echo "from fog banks" he replied in the negative, but remarked that he had heard reference by other mariners to such findings.

On 29th June, 1952, when the ship was on the Atlantic approach to the English Channel, fog was encountered, and at 1830 G.C.T. the automatic fog whistle was put in action. Shortly thereafter Capt. Smithies sent below to let me know that an echo effect was to be heard.

I joined the master and available deck officers in observing the sound effects reported herein. We agreed, on listening intently, that a clear sense of faint continuation of tone beyond the termination of the whistle blast was positively observable. This effect varied to some extent depending on listening point; it was

weakest when the listener was between the bridge deck and the hurricane deck but much stronger on the bridge deck abaft the edge of the overlying hurricane deck.

Amongst the passengers were two young people who were musically trained. One, Mr. Albert S. Ingalls III, of Cleveland, Ohio, became much interested in these observations of sound effects and he accompanied me to various listening stations from forecastle to stern of the ship, to test our sensations and reactions from the whistle blasts. The other musically trained observer, Miss Jeanne Saridaki, of Westfield, New Jersey, took careful note from the open bridge and cabin decks, and she later reported her impressions of the tone continuation and its characteristics. We were all in full agreement on the following points of observation:

- (a) A "carry-over" of tone was usually sensed following the whistle blast, and its average duration was remarkably uniform at approximately 2 sec.
- (b) In many cases there was a slight pulse in the continuation tone, with ascertainable build-up through about the first half-sec and fade-out thereafter.
- (c) In a few cases we agreed that there seemed to be a double pulse of this sort.
- (d) Occasionally there was a very slight interval of silence at close of the whistle blast, with "echo" tone picking up thereafter, but in most instances there was no such detectable interval between the main blast of sound and its faint continuation.
- (e) The continuation tone was damped out between decks.
- (f) The "echo" always seemed to come from aloft and never from the horizon.

Of those who joined in observing the phenomenon, Mr. Ingalls alone reported an impression that there was often a change of pitch in the continuation tone. In musical terms he described his sensations as identifying "a change in pitch of a flat major third" at maximum, and sometimes as little as "a sharp minor second". Miss Saridaki was not impressed, in her observations, with any similar sense of change of pitch, and I myself could not identify that effect on my own ear. Nor did any other observer report the sensation of change of pitch; hence considerable doubt must be entertained as to the reality of this aspect of the phenomenon.

These observations, with fog signal running automatically on 2-min setting, were made within the three hours before sunset on 29th June, 1952. Wind was light wsw; fog was continuous and not present in banks. The evidence is clear that the sound effect could not be associated with patchy fog, or fog banks. The question remained as to whether the pervading fog, as such, had anything to do with the phenomenon.

Another simple test of the points involved was therefore made, with full co-operation of Capt. Smithies, on 2nd July, 1952, after the ship left Cherbourg harbour *en route* to London. This was undertaken about 1500 G.C.T. in fine weather with wind NE force 4. The ship's whistle was sounded a few times for observation of any similar "carry-over" or "echo" effect. At some of these observations there was an unmistakable continuation tone, prolonged beyond anything observed on 29th June. At other moments and in different places of observation, there was real doubt as to whether the prolongation was observable. On at least one set of blasts Mr. Ingalls (who had joined again in testing the matter) declared that he observed change of pitch as he (and he only) had previously reported this effect. All agreed again in the judgment that the continuation tone, beyond the signal blast, seemed to return from above and not from the horizon.

The tests on 2nd July were discontinued after some half-dozen whistle blasts, because the scene of experiment in the English Channel precluded long-continued use of ship's whistle for non-signalling purposes.

In summary, the evidence shows the presence of what may be loosely described as "an echo" from ship's whistle, since a sound effect of that sort was definitely

observed on two separate occasions. The weather situations were markedly different on the two occasions tested, but strong stratification of air structure often exists over water, and probably is common to a variety of weather types. That a stratified air structure is capable of producing the observed continuation or "echo" tone from a ship's whistle signal seems dubious, but no other explanation of the observed effect would seem to be adequate. To attribute the effect to any complex of fog particles present in the air seems to be ruled out by the evidence gathered on the day without fog.

Note. The most probable interpretation of these interesting results is that the "carry over" of tone observed on 29th June, was due to a reflection of the sound waves from the siren by an inversion of temperature near the top of the fog bank. If the inversion had been at around 1,000 ft the sound would have taken approximately 2 sec to travel up to the inversion and back. Fog patches are known to exert a marked scattering effect on sound, and Knudsen established experimentally that moist air absorbed sound energy most effectively for relative humidities around 20 per cent. This makes it evident that sound from within a fog can be effectively reflected back into the fog at the fog-air boundary just as sound in clear air can be reflected back towards its source by a bank of fog. The sound will be reflected back into the fog both on account of the sharp change of humidity at the upper surface of the fog and the adjacent inversion of temperature.

It is worth recalling some peculiar features about the transmission of sound in the atmosphere. Several observers have found that the presence of fog favoured sound transmission because temperature gradients within fog are more homogeneous than in clear air where, according to Tyndall, fluctuations of temperature due to convection cells can be responsible for large-scale fluctuations in the range of audibility of fog signals. By listening to blasts from a siren on a cliff overlooking the South Foreland on a clear day with a smooth sea, Tyndall found that an echo of gradually diminishing intensity sometimes lasted for 15 sec. It is now generally agreed that sounds of high frequency are more rapidly attenuated than sounds of low frequency, since the dissipation of heat energy by conduction, which is mainly responsible for the attenuation, takes place more rapidly with sounds of higher frequency. According to Rice the lower frequencies survive because the atmosphere responds adiabatically to their propagation, while much of the energy of the lower frequency sounds is dissipated by the viscosity of the air and due to heat loss as described above. Further proof of this is afforded in the "mellowing" influence of sound by distance observed in mountainous countries, which is considered to be due to the elimination of the higher and harsher components of the sound by the processes described.

On 2nd July, when the observations were made in clear weather, the stratification of the air was undoubtedly stable, since small temperature inversions were observed on upper-air ascents at Larkhill and Camborne at 1500 G.M.T., near a weak cold front moving SE ahead of a strong ridge of high pressure moving in from the Atlantic. This would explain any abnormal audibility of other ships' sirens but it is rather surprising that a continuation tone should be observed aboard the ship originating the sound, because in this case the sound would be striking the inversion surface at a very small angle of incidence and the intensity of the sound reflected downwards would only be of the order of $\frac{1}{200,000}$ of the source, which is the ship's own siren.

R. F. M. H.

An Experiment in Bird Navigation

By G. V. T. MATTHEWS

(Department of Zoology, Cambridge University)

O.W.S. *Weather Recorder* left Greenock on 18th June, 1952, with some unusual supernumeraries aboard. In fibreboard containers stacked in a shady corner of the deck were 20 Manx shearwaters—the black-and-white, pigeon-sized petrels well known to sailors by their graceful, careening flight low over the waves. Two days earlier they had each been sitting on a single egg down burrows on Skokholm Island, off St. Ann's Head, Pembrokeshire. They would have remained there, taking no food, for about five days, so their present long journey was no particular hardship. They had been taken by boat to Dale Fort on the mainland, and then by road to Haverfordwest. Then by rail to London and thence up to Glasgow, where they had been met by the master (Captain A. W. Ford) in person and taken aboard his ship. On the morning of 20th June the ship had reached a position $56^{\circ} 40' \text{N}$, $10^{\circ} 42' \text{W}$, more than 100 miles from the nearest coast. One at a time the birds were taken from their boxes, the number on the aluminium leg ring checked and the bird tossed up into the air. As they flew off they were closely observed through binoculars and notes made of their behaviour.

This unusual, but not apparently altogether unwelcome break in the routine of life on a weather ship represented an experiment in a programme of research into the navigational abilities of birds. The homing capacities of pigeons have been used for hundreds of years, and in the last half-century similar abilities have been demonstrated in many species of wild, migratory birds. The learning and subsequent "map-reading" of landmarks could be the basis of homing from short distances or from areas previously visited on migration. But many cases were on record of birds returning after release in areas they could not have known, areas outside the range of birds from their neighbourhood or indeed of the species as a whole. Many ingenious theories had been advanced to explain these returns, for it was assumed that they must involve navigational ability. But the returns fell off with increasing distances, and the time between release and return was always many times that needed for the bird to cover the straight-line distance. This might have been due to the birds taking their own time about returning, but it left room for the possibility that they were wandering at random in the unknown area, coming across landmarks known to them by chance. Indeed it has been demonstrated mathematically that such an explanation *could* fit the previous results. More critical evidence was therefore required to decide whether birds were really able to navigate.

Attempts have been made to supply data on the actual tracks taken by homing birds, by following them from light aircraft. Some interesting results have been reported from America, but only relatively few data are available because of the time and expense involved. An ingenious device, incorporating a radio-active "counter", was devised to record the actual time spent in flight, but it met practical difficulties which so far have not been overcome. The comparatively simple technique of observing the behaviour of large numbers of birds released in unknown areas has, at last, given the answer. The main work was done with homing pigeons. With these it was shown that on release in any direction there was a strong tendency for the birds to be roughly orientated in the home direction. Moreover, a significant proportion of the birds reached home in so short a time that they could have deviated little from the straight line home. There was thus no doubt that these trained, domesticated birds, especially selected for their homing abilities, could truly navigate.

It was clearly necessary to find whether the homing of wild migratory birds had a similar navigational basis. Tests with seagulls gave strong indications of an initial homeward orientation, but return speeds were still well below the maximum

possible. Attention was therefore switched to the Manx shearwater which, apart from technical advantages such as ease of trapping and ability to withstand long forced journeys, spends most of its time in the open ocean, and yet returns again and again to the one small island to breed. Such habits would tend to encourage the development of any special navigational abilities. In 1951 and 1952 during the period when the birds were incubating their eggs (mid-May to early July), 338 shearwaters have been subjected to homing tests from Skokholm. The great majority were released at points well inland, Cambridge, London, Birmingham and Haydon Bridge (Northumberland), since these would be completely unknown to the birds which never come inland except rarely when storm blown. Very strong indications of navigation were given by marked homeward orientation and swift returns, such as one from Cambridge (235 miles) in $6\frac{3}{4}$ hours. Owing to foot-and-mouth restrictions it had not been possible to carry out planned releases in Ireland and so check that homeward orientation could be shown from a w'ly

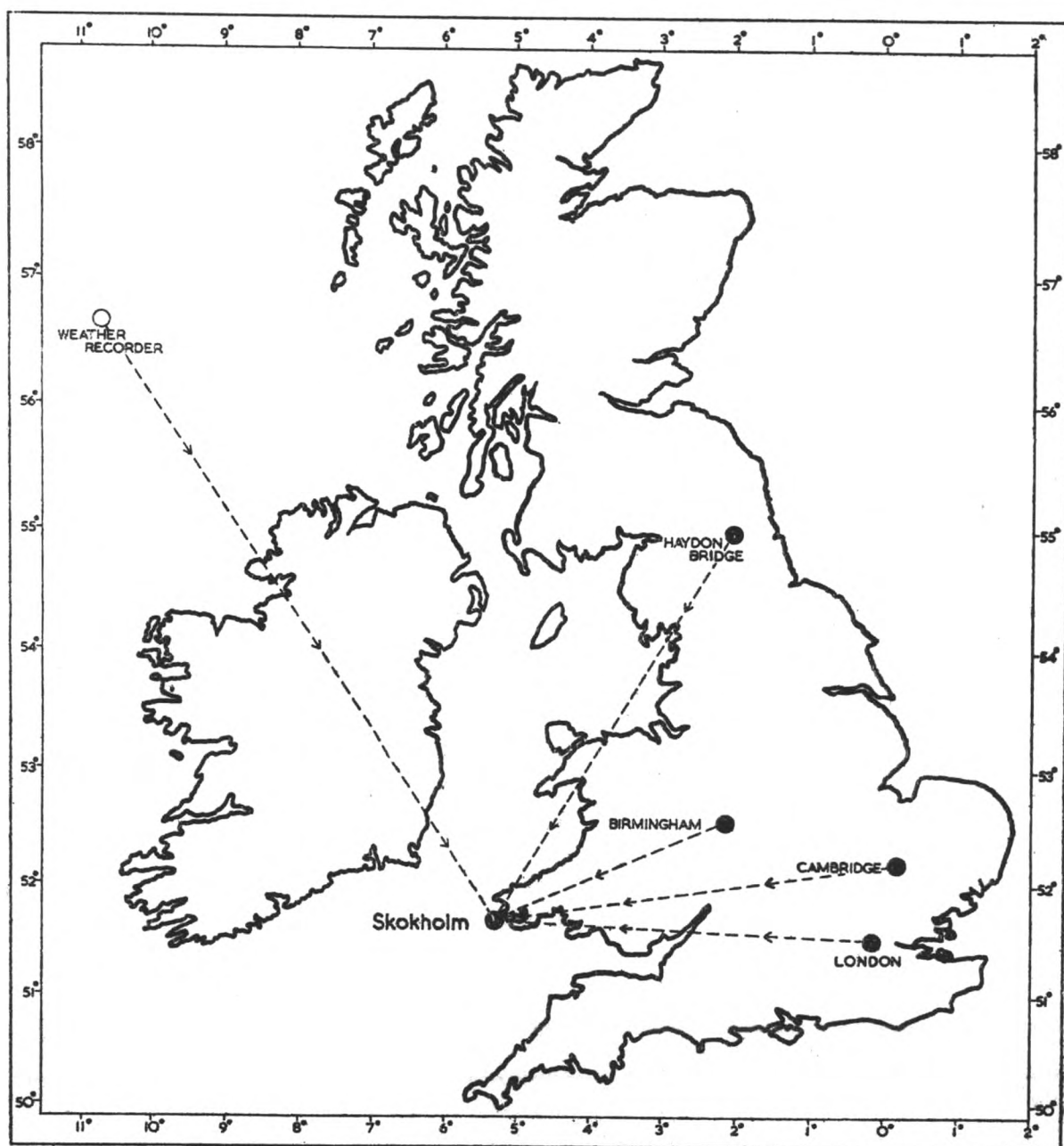


Fig. 1

Relation of the *Weather Recorder* and other main release points to the home colony of shearwaters on Skokholm Island. (N.B. These birds know only the coasts to the south of Skokholm.)

point as well as from the e'ly ones. In addition it was desirable to have a release in the absence not only of known landmarks, but of *any* landmarks whatsoever. The consignment on the *Weather Recorder* had been arranged to fulfil these two requirements.

Fig. 2 shows diagrammatically the bearings at which the individual shearwaters were lost to sight from the *Weather Recorder*. It will be seen that there is a concentration about the home direction. But this orientation is not so striking as in other releases over land. This may be due to the fact that it was not possible to hold the birds in view for more than a short period—nearly all birds were lost in less than two minutes. At sea they quickly drop to their usual height, just above the water, whereas over land, particularly when released from a tall tower, they fly higher and, seen against the sky, are easier to follow. In the present case the vanishing points may give a less true picture of the direction of flight adopted than is usual, and birds apparently off course may well have corrected their heading soon afterwards. Secondly, there was a good deal of cloud about at the release (7/8 Sc at 3,500 ft and 7/8 Cu at 1,800 ft), although it was thin and the sun was visible throughout. In each of the three species studied by this technique a correlation has been found between the degree of cloudiness of the sky and the accuracy of the birds' orientation. With clear skies, orientation has been excellent and fast returns have been obtained. With complete opaque cloud cover orientation has disappeared and the birds have scattered in random directions, followed by poor returns.

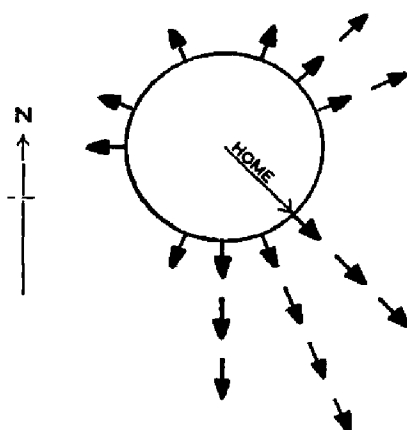


Fig. 2. Initial directions of flight of shearwaters released individually from *Weather Recorder*. Each arrow represents one bird lost to sight in that direction.

This relationship has led to the development of a hypothesis that birds are using a form of sun-navigation—that they are deriving their position relative to home by automatically comparing the sun's coordinates in altitude and azimuth at release with those at home. Since other tests have shown that birds cannot have an independent (magnetic) compass, and since they are able to orientate at times other than noon, it is further suggested that they can determine the highest point on the sun's arc by extrapolating from a small observed portion of that arc. The bird is also required to possess some form of internal, accurate "chronometer", probably based on physiological processes. The requirements of such a hypothesis are certainly exacting, to say the least, but unlike those of the many other theories which have been advanced, they are theoretically within the capacity of the organs likely to be concerned. Further, detailed experiments with pigeons, and to a lesser extent with shearwaters, tend to support the hypothesis, though it cannot be considered as finally proven as yet.



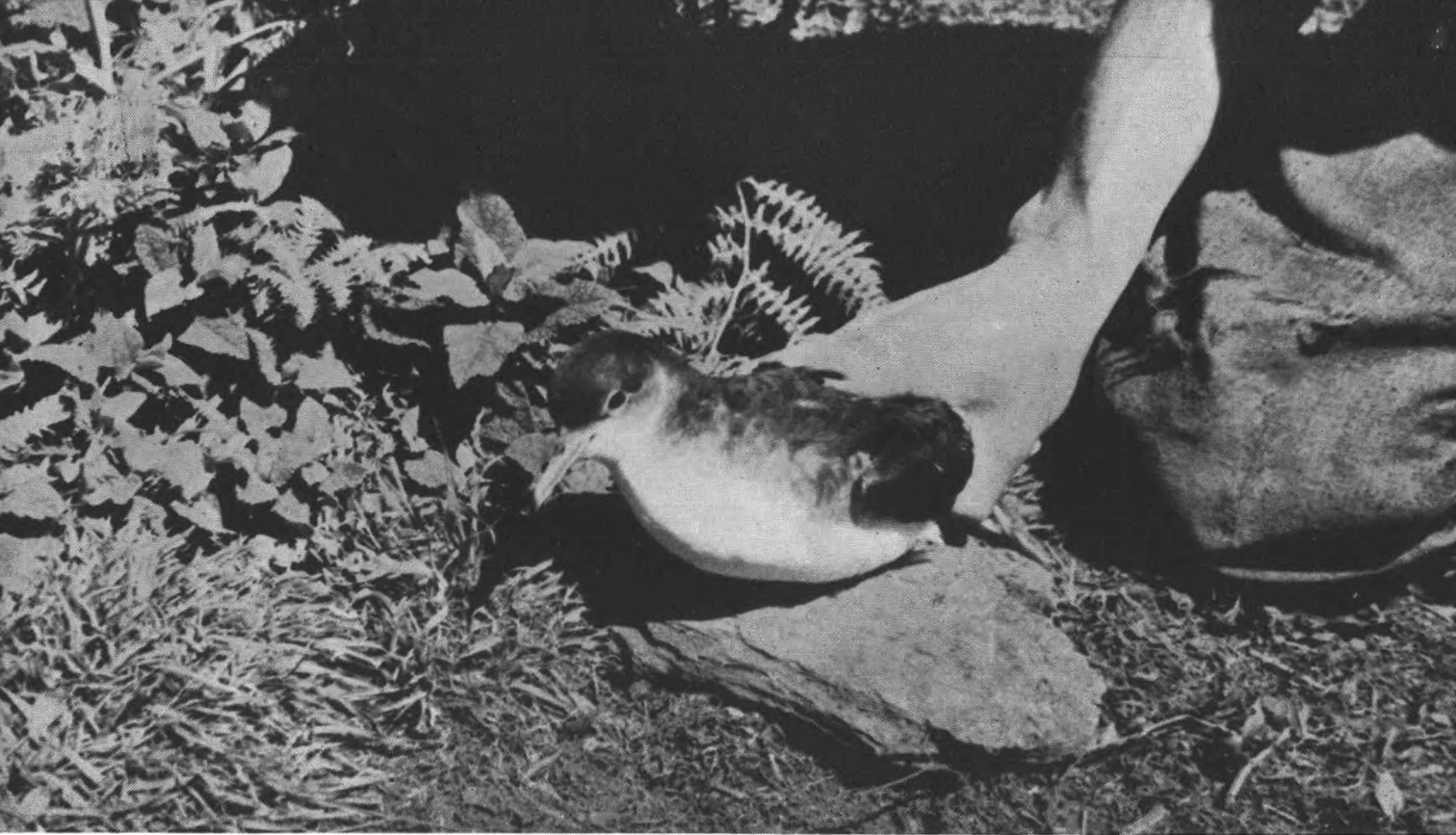
Skokholm Island from the air. Shearwaters nest in burrows on top of the cliffs.



The numbered ring carried by every bird, in this case by the transatlantic homer AX 6587.



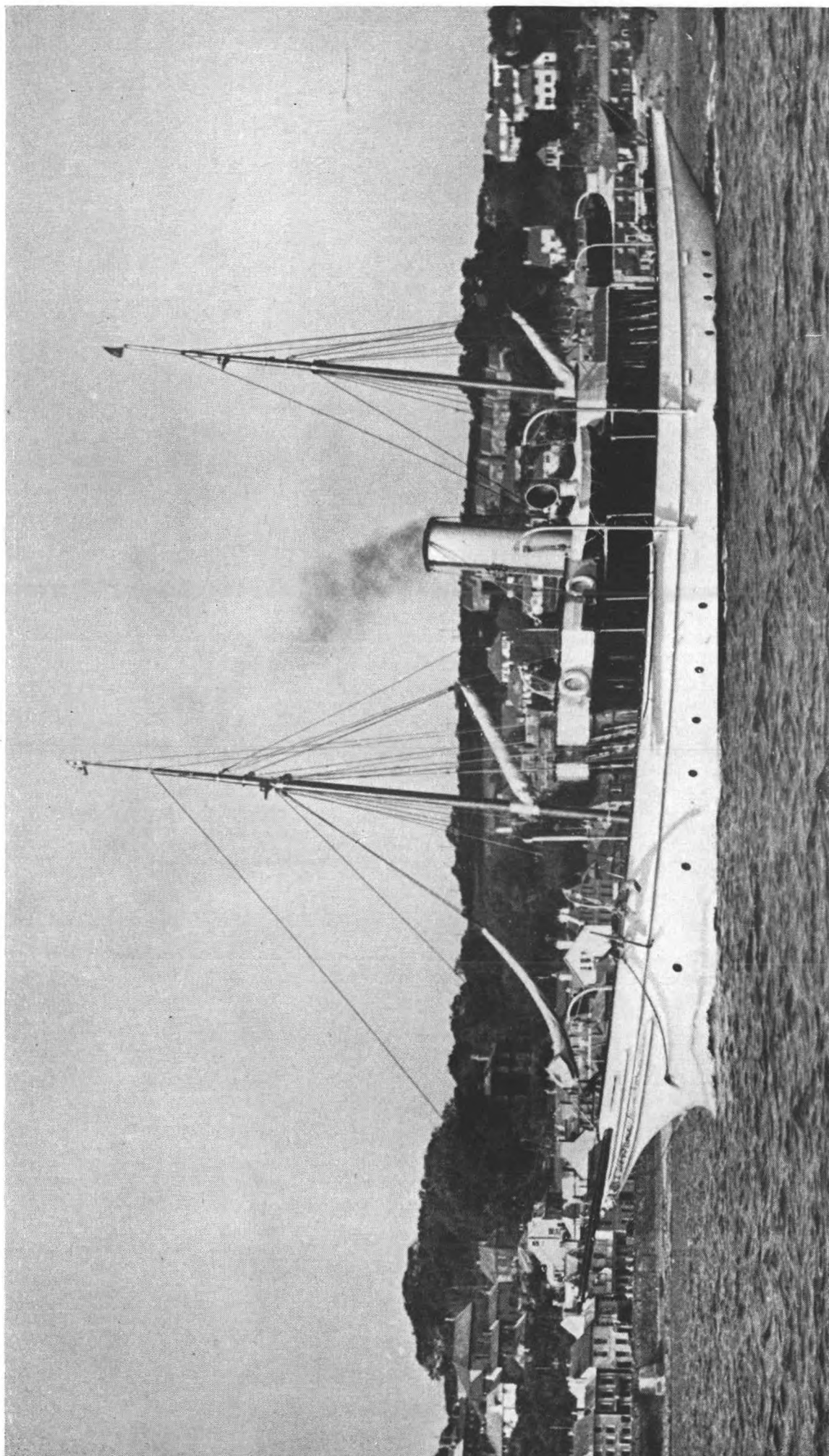
On board O.W.S. *Weather Recorder*. A shearwater is just about to be released. The gloves were more than adequate protection against beak and claws.



This bird has just returned at least 3,050 miles across the Atlantic in $12\frac{1}{2}$ days.



Back on Skokholm Island. The turf covers the inspection shaft down to the burrow nest of a homing shearwater.



Steam yacht *Wendorian*, of the King Edward VII Nautical College.

Shearwaters are poorly adapted for walking on land and in the open are easy prey for marauding gulls. Therefore, although they fly by day at sea, they do not come in to land at their burrows until after dark, when the gulls are sleeping. This means that they only return to Skokholm, and can be checked in, from about midnight to 0230 B.S.T. The birds from the *Weather Recorder* were released between 1033 and 1125, and had at the very minimum about 415 miles to cover. This would require some 14 hours continuous flying, and meant that none could reasonably be expected to be back that first night. But on the following night the first bird was back, and on the third five more returned. A week after release the total had risen to 15. Three more straggled in up to the twelfth night, so that all save two of the birds released were known to have returned safely.

The speed and completeness of these returns are certainly remarkable, but even so they are not as good as those from some of the inland release points. There, after release in good, sunny conditions, more than half the returns would arrive on the first and second nights. The present birds had, of course, getting on for twice as far to fly, and had had a journey involving four nights in the boxes, instead of the usual one. Then, being released at sea, the birds would be more tempted to dally and feed than those released over the inhospitable land. Certainly the *Weather Recorder* birds acquitted themselves nobly, and provided the details the experiment was designed to give.

This release in the Atlantic was the most distant from Skokholm in the present series, with one exception. The bird concerned (the only one released) had, oddly enough, returned to Skokholm only a few hours before the *Weather Recorder* birds left. AX 6587 had then completed the longest successful experimental homing flight on record, for 12½ days before it had been released at Boston, Mass., having been taken there by air. The great circle distance is 3,050 miles!

Full details of experiments with Manx shearwaters have been published in the *Journal of Experimental Biology*. A general review of the problems of bird navigation is given in the May 1953 issue of *Discovery*. I should like to express appreciation of the Air Ministry's ready acceptance of an unusual assignment; of the arrangements made by Cdr. C. E. N. Frankcom, and of the keen interest and efficiency of Capt. A. W. Ford and members of his crew.

Pre-Sea Training

A scheme has recently been put into operation by the King Edward VII Nautical College, London, for giving increased practical training to "pre-sea" cadets; lads who are on a one-year or three months' course at the College before going to sea as apprentices.

For this scheme Mr. G. E. Milligen, a Norfolk farmer, has very generously placed his schooner-rigged steam yacht *Wendorian* at the disposal of the College. She was built of steel by Hawthorn's at Leith in 1903 and is a vessel of 120 tons gross tonnage with a length (O.A.) of 124 ft, beam 18 ft and draft approximately 10 ft. She has recently been through a special survey and has been brought back to her original Lloyd's classification of 100 A1.

The present plan allows 12 cadets at a time to spend one week aboard the vessel each term. Thus from Monday to Thursday the cadets undergo normal schooling, but in the evenings they have sail, anchor, boat and fire drill, etc., to become familiar with the ship before undergoing the week-end cruise which is the main

feature of the training. The extent of the cruise is, of course, dependent upon the weather, but the normal programme is for the *Wendorian* to leave her moorings in the river or berth in the London Docks, proceeding downstream to Southend, Harwich or Margate. The cadets can thus experience the handling of a vessel among traffic and in narrow waters, follow her progress on the chart, note the buoys and other sea marks and generally get the "feel" of a ship at sea. They learn to steer, take compass bearing and also to carry out the numerous duties of a ship's crew.

In the open water, evolutions such as weighing and catting the anchor by hand and manœuvring under sail only can be carried out. Full use is also made of the two 16 ft centre board sailing and pulling dinghies, which are fitted with air tanks, etc., to Ministry of Transport requirements for life-saving appliances. Below the navigation bridge there is a deck saloon which is used as a chart room and in which is fitted the echo-sounding apparatus and radio telephone. It is hoped to have a radar set fitted in the near future which will serve the dual purpose of training while at the same time assisting in the safe navigation of the vessel. The *Wendorian* is a coal-burning steam vessel powered by a triple expansion engine of 250 I.H.P., which gives her a speed of 8 or 9 knots. She has a single boiler and bunker space for about 25 tons of coal. The layout of the machinery space with the boiler in the same compartment is ideal for explaining the principles of mechanical propulsion, but besides the theoretical instruction the cadets help in coaling ship and assist with the general maintenance of the engines.

The pre-sea training of these cadets includes a certain amount of marine meteorology, and no doubt many of the lads will become future officers of voluntary weather observing ships. In order to assist in this aspect of their training and thereby encourage the habit of carefully observing and recording the weather, a set of instruments has been lent by the Meteorological Office for use both in the college ashore and in the *Wendorian* during her training cruises.

During the summer vacation the vessel carried out three voluntary training cruises along the south coast, the coast of France and the Channel Islands, and while returning from the last of these she carried out a useful piece of rescue work in the Thames Estuary. During the evening of 15th August she was returning to London from Eastbourne, and had passed through the Princes Channel and was steaming up Sea Reach when, during a thunderstorm, distress signals were seen in the direction of Shoeburyness, evidently from a vessel near the Maplin Sands. The *Wendorian* closed the other vessel and found that she was a converted M.T.B., broken down and drifting having also lost an anchor and her dinghy. In rapidly shoaling water as the vessel neared the sands, the tow rope was passed and the *Wendorian* stood out into deeper water with the M.T.B. in tow, successfully bringing her to an anchorage off Southend at 2300 hours. The M.T.B. was the *Asangyo*, with a crew of two men.

Capt. H. F. Chase, B.Sc. (who has supplied the material for these notes), is the Principal of the College and Capt. A. G. W. Miller is the master of the *Wendorian*. There is a chief officer, engineer and cook-steward to complete the permanent crew.

Notices to Marine Observers

New Year Resolution

FOR VOLUNTARY OBSERVERS AT SEA

“Always place the thermometer screen to windward before reading the temperature and thus obtain accurate readings”

Postal Arrangements

The quarterly numbers of *The Marine Observer* are published on the last Wednesdays of December, March, June and September.

The Marine Observer is addressed to the Captain, S.S./M.V., c/o the owners, and captains are requested to make their own arrangements for forwarding.

Shipowners, Marine Superintendents and all concerned in the despatch of mails to ships are asked to kindly facilitate the despatch and delivery of mail received at their offices from the Meteorological Office and “Air Publications and Forms Stores” to their ships abroad. Addressed to the captains of ships, this contains information required for the conduct of meteorological work at sea, and is most effective if received by the captains at the earliest possible date.

Ice Observation

Drifting ice, derelicts and other floating dangers to navigation are reported by all means of communication at the disposal of the master.

See Chapter 12, pages 96–98 of the *Marine Observer's Handbook*, Seventh Edition.

It is also desirable that more detailed information than can be given in a TTT wireless message should be available to the Meteorological Office for the purpose of research, and for Admiralty Charts and Sailing Directions.

Marine observers will greatly assist by noting the conditions of ice, either drifting or fast, in the pages provided at the end of the logbook (Form 911), or on Form 912, which may be supplied to the captain of any British ship on application to a Port Meteorological Officer or Merchant Navy Agent.

Observing ships using the Trans-North Atlantic tracks are requested to record not only when ice is encountered, but also when they have passed through the ice region during the ice season without encountering ice. In this case a “nil” report should be returned, since it is desirable as far as possible to determine when tracks have been clear of ice.

Radio Weather Messages

The Master of any ship which experiences frequent difficulties in clearing radio weather messages to coast radio stations in any part of the world is requested to make a note in the ship's meteorological log book mentioning the time and date of the occurrence and to give any other information which it is thought might be helpful. The complaint will then be forwarded by the Meteorological Office to the director of the Meteorological Service to which the message was addressed, with a view to the circumstances being investigated and of improving if possible the reception conditions at the radio station concerned.

It is only by receiving reports of this nature that we are able to know of the difficulties the radio officers aboard the selected ships experience in this respect. In receipt of all such reports we will do our best to rectify matters. Generalised reports merely stating that difficulty was experienced from time to time in clearing a message to such-and-such a station are not sufficiently explicit to enable us to take remedial action.

Inspection of Instruments

Principal Observing Officers are requested to see that when the ship arrives in a home port all Meteorological Office instruments, books, atlases, stationery, etc., are readily available for muster by a Port Meteorological Officer or Agent. If the Observing Officer himself is unlikely to be aboard or free to attend the muster it would greatly help if he would leave a note as to the whereabouts of the various items (including the spare thermometer and remains of any broken instruments).

NAUTICAL OFFICERS AND AGENTS OF THE MARINE DIVISION OF THE METEOROLOGICAL OFFICE, GREAT BRITAIN

Headquarters—Commander C. E. N. Frankcom, O.B.E., R.D., R.N.R., Marine Superintendent, Meteorological Office, Air Ministry, Headstone Drive, Harrow, Middlesex. (Telephone : Harrow 4331, Ext. 324.)

Commander J. Hennessy, M.B.E., R.D., R.N.R., Deputy Marine Superintendent. (Telephone : Harrow 4331, Ext. 323.)

Lieut.-Commander L. B. Philpott, D.S.C., R.D., R.N.R., Nautical Officer. (Telephone : Harrow 4331, Ext. 31.)

Mersey.—Commander M. Cresswell, R.N.R., Port Meteorological Officer, Room 617, Royal Liver Building, Liverpool, 3. (Telephone : Central 6565.)

Thames.—Commander C. H. Williams, R.D., R.N.R., Port Meteorological Officer, Room 9, Ibex House, Minorities, London, E.C.3. (Telephone : Royal 1721.)

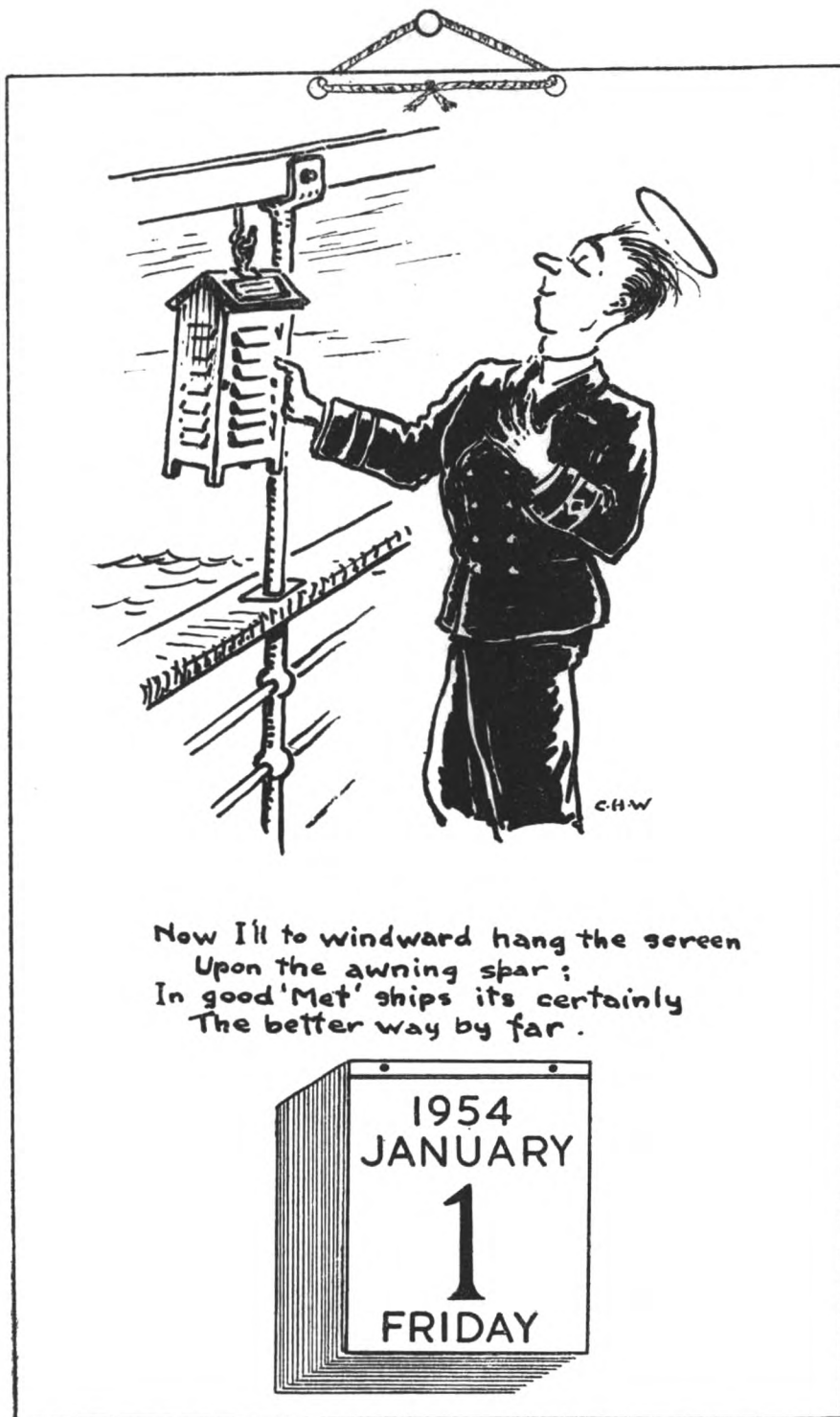
Bristol Channel.—Mr. J. C. Matheson, Port Meteorological Officer, 2 Bute Crescent, Cardiff. (Telephone : Cardiff 21423.)

Southampton.—Captain J. R. Radley, Port Meteorological Officer, 50 Berth, Old Docks, Southampton. (Telephone : Southampton 4295.)

Clyde.—Captain R. Reid, Port Meteorological Officer, 53 Bothwell Street, Glasgow. (Telephone : Glasgow Central 2558.)

Humber.—Captain R. E. Dunn, c/o Principal Officer, Ministry of Transport, Trinity House Yard, Hull. (Telephone : Hull 36813.)

Tyne.—Captain F. B. West, Custom House Chambers, Quayside, Newcastle upon Tyne. (Telephone : Newcastle 23203.)



Now I'll to windward hang the screen
Upon the awning spar ;
In good 'Met' ships its certainly
The better way by far .



**SOME ATLASES PREPARED IN THE MARINE BRANCH OF THE
METEOROLOGICAL OFFICE AND PUBLISHED BY HER MAJESTY'S
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VOLUNTARY OBSERVING SHIPS

The following is a list of British ships voluntarily co-operating with the Marine Branch 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 third column.
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 at the ports 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 in a special list 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 the appropriate Port Meteorological Officer or Merchant Navy Agent.
Captains are requested to point out any errors or omissions which may occur in the list.

Selected Ships

NAME OF VESSEL	CALL SIGN	LAST RETURN RECEIVED	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS
<i>Accra</i>	GJSW	17.7.53	H. Flowerdew	J. F. Murphy, R. Munroe, J. Bellamy	J. Stuart	Elder Dempster Lines, Ltd.
<i>Afghanistan</i>	GNVB	8.6.53	R. Connacher	N. H. Crawford, W. E. Thomas, C. J. Farrant	A. H. Ross	F. C. Strick & Co., Ltd.
<i>Ajana</i>	GKVV	13.7.53	F. W. Mould	S. T. Bass, —, McGrath, —, Hastings	A. Mulcahy	Trinder Anderson & Co.
<i>Aiaz</i>	GJXM	15.9.53	E. W. Studley	A. R. Davidson, K. T. Percy, J. B. Swindells	A. E. Holeman	A. Holt & Co.
<i>Akaroa</i>	GMLP	3.6.53	J. W. Hart	G. H. Lewis, J. Bakewell, A. R. Stephenson	J. Reynolds	Shaw, Savill & Albion Co., Ltd.
<i>Albistan</i>	MABT	15.10.53	M. M. Goldie	A. J. Seymour, R. J. Kane, E. S. Hewitt	W. Hawkins	Frank C. Strick & Co., Ltd.
<i>Alcantara</i>	GLQR	18.8.53	B. C. Dodds, O.B.E.	J. Craigie, G. Chamberlain, R. Luke	R. Hammond	Royal Mail Lines, Ltd.
<i>Alsatia</i>	MABL	21.5.53	J. Chapman, R.D., R.N.R.	G. Parry, R. McClymont, J. B. Clemenson, D. Rostrom	D. Grainger	Cunard Steamship Co., Ltd.
<i>Amakura</i>	MCPN	19.6.53	S. Armitage	R. J. Gray, F. Sanchez, J. H. Donaldson	E. Ash	Booker Bros. McConnell & Co., Ltd.
<i>Andes</i>	GQCV	24.9.53	H. D. Hooper	R. R. L. Williams, G. Burdern, B. Gothard, J. Milner	W. Smith	Royal Mail Lines, Ltd.
<i>Andria</i>	GDWM	9.7.53	A. G. Cuthill	H. T. Dove, T. R. Lidgely, E. D. Hall	G. C. Reed	Cunard Steamship, Co., Ltd.
<i>Apapa</i>	MACE	17.8.53	W. Munt	R. C. Abbott, W. W. Brown	G. Gilling	Elder Dempster Lines, Ltd.
<i>Arabia</i>	GLKF	27.3.53	W. B. Tanner, R.D., R.N.R.	J. L. Lecoustre, H. Parry-Williams, R. J. F. Nightingale	T. Sandham	Cunard Steamship Co., Ltd.
<i>Arabistan</i>	GCKK	5.8.53	J. E. Cooke	P. H. Alexander, D. Calvert, U. Eashy	A. Palmer	F. C. Strick & Co., Ltd.
<i>Araby</i>	GMZL	20.6.53	F. J. Swallow	J. Merson, P. Sykes, J. B. McKissack	A. Whitaker	Royal Mail Lines, Ltd.
<i>Arakaka</i>	GDVN	20.1.53	J. A. Carter	J. L. Anczykowski, W. Lane, W. H. Foster	J. Fraser	Booker Bros. McConnell & Co., Ltd.
<i>Arana</i>	GSMN	13.12.52	W. G. West	K. Billinghamurst, G. H. Lewis, J. Cousins, B. Irwin	P. W. Booth	Shaw, Savill & Albion Co., Ltd.
<i>Argentina Star</i>	GTKF	13.5.53	E. R. Pearce, O.B.E.	J. Bottwood, F. Blake, P. Franklin	D. Jacob	Blue Star Line, Ltd.
<i>Argyll</i>	GBWB	1.6.53	J. Dodds	T. R. Rowe, B. Woollet, A. Ladley	J. MacGillivray	B. J. Sutherland & Co., Ltd.
<i>Arguani</i>	GMBL	28.9.53	R. W. Lundy, O.B.E., R.D., R.N.R.	D. Boon, G. Heywood, R. Leech	A. N. Taylor	Elders & Fyffes, Ltd.

NAME OF VESSEL	CALL SIGN	LAST RETURN RECEIVED	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS
<i>Armada</i> ..	GMCR	13. 4. 53	J. MacLean	H. A. McGill, G. Giles, J. G. C. Campbell	E. W. Harle ..	Trinder Anderson & Co.
<i>Arundel Castle</i> ..	GCZL	14. 10. 53	D. D. MacKenzie	C. Markham, P. J. Stead, K. M. Dunning	E. Pitt, D.S.C.	Union Castle Mail S.S. Co., Ltd.
<i>Ascania</i> ..	GKNJ	9. 4. 53	J. Crosbie-Dawson, D.S.C., R.D., R.N.R.	M. J. C. Boyce, K. B. Wilkinson, A. Buckley, J. Finlay, H. Hurlley	P. Milligan ..	Cunard Steamship Co., Ltd.
<i>Ashburton</i> ..	GNJN	16. 4. 53	C. Parry ..	A. Robinson, — Pearson, J. M. Hunter	R. Brown ..	Trinder Anderson & Co.
<i>Asia</i> ..	GLJV	15. 11. 52	F. E. Patchett	P. Kendall, D. Howells, A. Thompson, F. Sergeant	J. Marshall ..	Cunard Steamship Co., Ltd.
<i>Assyria</i> ..	GGKX	27. 3. 53	J. G. Bradley	D. A. Davies, J. Gornall, E. Hamer	B. A. Long ..	Cunard Steamship Co., Ltd.
<i>Asturias</i> ..	GLQS	17. 9. 53	H. H. Treeweeks	B. G. Evans, J. Anderson, A. H. Aason, D. Lawson	R. T. Farrell	Royal Mail Lines, Ltd.
<i>Athelchief</i> ..	GCRG	6. 12. 52	W. A. Meneght	D. W. Owen, S. Waldron, J. O'Sullivan	T. Cronin ..	Tankers, Ltd.
<i>Athletic</i> ..	GBLS	4. 5. 53	J. Tierney ..	T. S. Hayward, J. G. Beck, A. Smythe	H. S. Knight	Shaw, Savill & Albion Co., Ltd.
<i>Athlone Castle</i> ..	GYTK	26. 8. 53	C. C. Page ..	A. Ashton, R. Tune, J. Trevarrow	J. H. Summers	Union Castle Mail S.S. Co., Ltd.
<i>Aureol</i> ..	GMGJ	3. 9. 53	J. J. Smith, O.B.E.	G. A. Foxcroft, G. Roberts, D. Dunn	F. W. J. Bloomfield ..	Elder Dempster Lines, Ltd.
<i>Auricula</i> ..	GKPV	1. 10. 53	J. H. J. Hamlin, O.B.E.	D. C. Howard, W. Williams, B. F. C. Cutting	C. H. S. Jordan	Anglo-Saxon Petroleum Co., Ltd.
<i>Australind</i> ..	GJKE	7. 8. 53	R. Willcocks	H. R. Coates, J. Kerslake, R. Brown	C. D. Oghourne	Trinder Anderson & Co.
<i>Aristone</i> ..	GBSV	17. 7. 53	C. K. Evans, O.B.E.	H. Heaps, J. H. S. Logie, C. P. W. White	L. R. Bradley	Purvis Shipping Co., Ltd.
<i>Avondene</i> ..	MAWG	2. 3. 53	F. Moorcraft	W. Williams, I. Daniel, E. T. Milford	C. Cowen ..	Dene Shipping Co., Ltd.
<i>Balanita</i> ..	GBNM	17. 8. 53	T. Fraser, D.S.C., R.D.	B. Thorne, J. Street, G. W. Boyce	W. Coclvrane	Royal Mail Lines, Ltd.
<i>Baron Fairlie</i> ..	GLCY	16. 7. 53	T. Scott ..	A. E. Stainthorpe, J. C. Gibb	P. E. Bowler	H. Hogarth & Sons
<i>Baron MacLay</i> ..	GKXW	31. 3. 53	D. MacGregor	E. Jones, C. R. Roy, M. L. McLaren	W. Bennett ..	H. Hogarth & Sons
<i>Baron Murray</i> ..	GIFB	18. 8. 53	T. G. Watson	W. Anderson, J. Budka, F. Forsythe	T. Durbidge	H. Hogarth & Sons
<i>Baron Renfrew</i> ..	GYDR	22. 9. 53	P. Dunsire ..	P. Turnbull, R. Potter, I. Mackay	M. Barry ..	H. Hogarth & Sons
<i>Basano</i> ..	GNXK	16. 6. 53	B. Waldie ..	B. Wright, F. Barnes, J. Holmes	A. Leary ..	Ellerman's Wilson Line, Ltd.
<i>Beaverburn</i> ..	MAGB	5. 12. 52	J. Soame ..	M. H. Scott, A. H. R. Peace, M. J. Mayes, H. L. Kinns	A. E. S. Thompson ..	Canadian Pacific S.S., Ltd.
<i>Beaverford</i> ..	MQJG	21. 4. 53	W. J. P. Roberts, R.D.	J. Mayes, —, Cuthbertson, R. N. Stewart	T. Herriots ..	Canadian Pacific S.S., Ltd.
<i>Beaverglen</i> ..	GBCP	4. 9. 53	E. F. Aikman	P. C. Lovell-Smith, J. Walker, D. Rae, D. Jeabous	R. J. Cumming	Canadian Pacific S.S., Ltd.
<i>Beaverlake</i> ..	GBCQ	13. 10. 53	C. L. De H. Bell, D.S.C., R.D., R.N.R.	R. N. Walker, A. L. Gwynne-Harrison, R. Savage	H. Thompson	Canadian Pacific S.S., Ltd.
<i>Beaverlodge</i> ..	MAGI	26. 8. 53	F. W. S. Roberts	N. Saddington, R. Holmes, J. Brooks	E. R. LeGear	Canadian Pacific S.S., Ltd.
<i>Bellerophon</i> ..	GGCM	31. 8. 53	H. C. Large	J. D. Lott, L. H. A. Bainton, P. D. Lane	J. C. Wilson	Alfred Holt & Co., Ltd.
<i>Benarity</i> ..	GCZZ	23. 7. 53	T. Sutherland	J. Mann, J. Fyffe, N. Mackie, T. Fyffe	R. Dixon ..	W. Thomson & Co.
<i>Bennetts</i> ..	MAGG	9. 5. 53	J. L. Chalmers	A. McKenzie, G. S. Cairns, J. B. Forrest	F. G. Hayes	W. Thomson & Co.
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<i>Bentyvis</i> ..	MYPW	8. 9. 53	R. L. Arkley	I. Welsh, E. A. McKinnon, W. Spencer, C. Fleming-Miller	D. Milne ..	W. Thomson & Co.
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<i>Brasil Star</i> ..	GTLF	19. 9. 53	G. E. Barnard	J. Slessor, R. G. Taylor, B. Abbott	P. McConnell	Blue Star Line, Ltd.
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<i>Bristol City</i> ..	GUAY	11. 4. 53	A. L. Webb, O.B.E.	N. Childs, W. H. Stoodley, F. Gilmore	A. V. Chappel	Charles Hill & Sons
<i>Britannic</i> ..	GDXF	5. 8. 53	J. W. Caunce, R.D., R.N.R.	M. T. Dodds, M. H. Blackman, —, Attwater ..	J. Kidson ..	Cunard Steamship Co., Ltd.

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<i>British Endavour</i>	GFCN	5.9.53	J. N. Williams	A. W. Henderson, W. Young, W. Disson	A. W. Henderson, W. Young, W. Disson	H. Thompson	British Tanker Co., Ltd.
<i>British Escort</i>	GCRB	25.6.53	L. V. Potts, M.B.E.	K. May, R. Hartley, J. Brown	K. May, R. Hartley, J. Brown	P. Jordan	British Tanker Co., Ltd.
<i>British General</i>	GCDJ	5.5.53	G. E. Hodgson	D. W. Evans, F. G. Ball, J. Taylor	D. W. Evans, F. G. Ball, J. Taylor	K. Mackay	British Tanker Co., Ltd.
<i>British Marquis</i>	GWVL	1.4.53	C. W. Uridge	N. Rutherford, F. S. White, S. May	N. Rutherford, F. S. White, S. May	H. McColl	British Tanker Co., Ltd.
<i>British Patience</i>	GUFF	17.2.53	A. D. Millar	C. G. W. Tyler, W. H. Bruford, D. M. Burley	C. G. W. Tyler, W. H. Bruford, D. M. Burley	T. Tulloch	British Tanker Co., Ltd.
<i>British Piper</i>	GDNN	18.5.53	G. Calder	P. R. Newton, R. McInnes, M. C. A. Horn	P. R. Newton, R. McInnes, M. C. A. Horn	G. C. Campleman	British Tanker Co., Ltd.
<i>British Power</i>	GZGG	14.7.53	D. R. Dockwrey	J. Baird, J. H. Morgan, P. Alderton	J. Baird, J. H. Morgan, P. Alderton	M. Strathern	British Tanker Co., Ltd.
<i>British Resource</i>	GFCD	9.4.53	B. N. Naylor	J. H. G. Tapscott, A. B. C. Browne, J. H. Easdon	J. H. G. Tapscott, A. B. C. Browne, J. H. Easdon	P. Wragg	British Tanker Co., Ltd.
<i>British Swordfish</i>	GCQV	31.7.53	A. J. Lawson	P. S. Lucas, G. Symons, P. B. Goudie	P. S. Lucas, G. Symons, P. B. Goudie	S. Caughie	British Tanker Co., Ltd.
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<i>Cairndhu</i>	GPBB	26.9.53	J. W. Scott	J. Hogg, D. Aitchison, J. Fairley	J. Hogg, D. Aitchison, J. Fairley	T. W. Lawson	Cairns, Noble & Co.
<i>Cairnesh</i>	GMKR	6.7.53	J. G. Norvell	D. W. Staddon, L. Edwards, G. Partison	D. W. Staddon, L. Edwards, G. Partison	W. Greaves	Cairns, Noble & Co.
<i>Cairngowan</i>	CNZZ	4.6.53	J. G. Foster	I. Gault, J. E. Potter, N. Shell	I. Gault, J. E. Potter, N. Shell	E. Johnston	Cairns, Noble & Co.
<i>Calchas</i>	GMISS	23.7.53	D. Jones	J. Main, J. Chapman, H. Coleman	J. Main, J. Chapman, H. Coleman	— Watson	Alfred Holt & Co.
<i>Caledonia</i>	GCKR	23.7.53	D. Blair	D. Lamont, J. George, D. F. Storey	D. Lamont, J. George, D. F. Storey	J. Cragg	Anchor Line, Ltd.
<i>Canton</i>	GDDT	29.9.53	J. C. W. Last, O.B.E.	J. G. Clark, G. Howe, F. Ewell, D. Johnstone	J. G. Clark, G. Howe, F. Ewell, D. Johnstone	M. J. Murphy	P. & O. Steam Navigation Co.
<i>Cape Clear</i>	GCKN	14.3.51	J. R. McIntyre	J. S. Taylor, A. M. Fraser, D. Fox	J. S. Taylor, A. M. Fraser, D. Fox	D. G. Lang	Lytle Shipping Co., Ltd.
<i>Cape Grafton</i>	MAIF	26.3.53	P. A. Wallace	F. Saunders, E. Rebane, F. O. Ridley	F. Saunders, E. Rebane, F. O. Ridley	R. Atkin	Lytle Shipping Co., Ltd.
<i>Cape St. Mary</i>	GKGM	17.12.51	J. A. Robson	J. McCarthy, S. Barnes, J. White	J. McCarthy, S. Barnes, J. White	P. P. Williams	W. African Fisheries Research Strn.
<i>Capetown Castle</i>	GLBN	25.9.53	H. A. Deiler	I. Downey, A. Maclean, N. Dalziel, I. McLundie	I. Downey, A. Maclean, N. Dalziel, I. McLundie	L. W. Hooper	Union Castle Mail S.S. Co., Ltd.
<i>Captain Cook</i>		25.9.53	J. Cook	D. Witty, J. Voss, J. P. Baines	D. Witty, J. Voss, J. P. Baines	H. G. Liggins	Donaldson Bros. & Black, Ltd.
<i>Carnarvon Castle</i>	GJSL	5.9.53	J. F. Oakley	P. J. Mullin, K. I. Jones, W. G. Smith	P. J. Mullin, K. I. Jones, W. G. Smith	R. Hartley	Union Castle Mail S.S. Co., Ltd.
<i>Caronia</i>	GYKS	29.8.53	A. B. Fastang, R.D., R.N.R.	K. P. Wilkinson, H. Hurtle	K. P. Wilkinson, H. Hurtle		Cunard Steamship Co., Ltd.
<i>Carthage</i>	GRNX	28.5.53	C. K. Cummins	G. W. John, P. Lawrence, B. B. Jones	G. W. John, P. Lawrence, B. B. Jones	D. O'Leary	P. & O. Steam Navigation Co.
<i>Caslon</i>	MCJR	14.5.53	J. M. Cherry	D. Hansing, A. Arrowsmith	D. Hansing, A. Arrowsmith	C. D. Grimster	Runciman (London), Ltd.
<i>Cavina</i>	GKPV	3.9.53	T. H. Bull	R. C. Scroggins, W. Coull, R. Rawlings	R. C. Scroggins, W. Coull, R. Rawlings	I. Humphrey	Elders & Fyffes, Ltd.
<i>Caxton</i>	GCDN	10.2.53	F. J. Hamilton	C. F. Stray, R. Burns	C. F. Stray, R. Burns	W. Edmunds	Runciman (London), Ltd.
<i>Ceramic</i>	GFLM	29.6.53	H. C. Smith	R. Goodfellow, W. Hendry, B. A. King	R. Goodfellow, W. Hendry, B. A. King	M. Palmer	Shaw, Savill & Albion Co., Ltd.
<i>Chantala</i>	GQMR	25.4.53	H. F. Collinson	R. R. Johnson, R. Frisby, D. Wright, P. Marsland	R. R. Johnson, R. Frisby, D. Wright, P. Marsland	G. J. Fyffe	British India Steam Nav. Co., Ltd.
<i>Chepman</i>	GFVR	17.9.53	G. Blacklock	W. M. Coult, — Turk, — Popplewell	W. M. Coult, — Turk, — Popplewell	J. Pattison	Runciman (London), Ltd.
<i>Cheshire</i>	GLXV	5.8.53	N. F. Fitch	J. S. Glen, P. R. Robinson, E. Peers	J. S. Glen, P. R. Robinson, E. Peers	C. Beyer	Bibby Bros. & Co.
<i>Chindwara</i>	GFRT	8.8.53	B. A. Rogers, D.S.C., R.D., R.N.R.	J. J. Mullins, J. J. Butterworth, R. T. Stoneley	J. J. Mullins, J. J. Butterworth, R. T. Stoneley	R. C. Law	British India Steam Nav. Co., Ltd.
<i>Cilicia</i>	GDGL	16.5.53	J. L. Gibson	F. Bell, B. Brooking, A. S. Bolles, H. B. Chambers, P. H. Ireland	F. Bell, B. Brooking, A. S. Bolles, H. B. Chambers, P. H. Ireland	F. Alcock	Anchor Line, Ltd.
<i>Cingalese Prince</i>	GFRC	14.9.53	J. D. Frazer	D. McLeod, W. Sawyers, H. P. Woodburn, J. McFarlane	D. McLeod, W. Sawyers, H. P. Woodburn, J. McFarlane	T. Coffey	Prince Line, Ltd.
<i>City of Barcelona</i>	GTKR	3.2.53	— Ramsay	H. E. Jennings, P. Dorwood, R. Marcus, D. Lewis	H. E. Jennings, P. Dorwood, R. Marcus, D. Lewis	W. Fryer	Ellerman Lines, Ltd.
<i>City of Birmingham</i>	GZLR	25.4.53	W. S. Dodge	C. A. Quinn, W. James, M. S. Lewis	C. A. Quinn, W. James, M. S. Lewis	A. Hannon	Ellerman Lines, Ltd.
<i>City of Brisbane</i>	GZLM		E. G. Chapman	H. M. Farquhar, R. Tyrell	H. M. Farquhar, R. Tyrell	H. B. Smith	Ellerman Lines, Ltd.
<i>City of Bristol</i>	GCPN	6.3.53	W. Nimmo, M.B.E.	D. McIntosh, J. Grinnell, W. H. Wilson, B. D. Biggle	D. McIntosh, J. Grinnell, W. H. Wilson, B. D. Biggle	H. J. Bartlett	Ellerman Lines, Ltd.
<i>City of Calcutta</i>	GLYN	19.10.53	D. C. Hamilton	J. Tattersall, G. Francis, J. B. Waugh, T. Spengler	J. Tattersall, G. Francis, J. B. Waugh, T. Spengler	J. J. Sheehy	Ellerman Lines, Ltd.
<i>City of Cape Town</i>	GBBQ	20.7.53	H. G. White	R. Cullen, J. A. McIntyre, D. Lamb	R. Cullen, J. A. McIntyre, D. Lamb	J. T. James	Ellerman & Bucknall S.S. Co., Ltd.
<i>City of Carlisle</i>	GBJK	31.8.53	W. A. Hannah, O.B.E.	D. Stenhouse, L. Boundy, D. Campbell	D. Stenhouse, L. Boundy, D. Campbell	P. Everett	

NAME OF VESSEL	CALL SIGN	LAST RETURN RECEIVED	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS
<i>City of Chester</i>	MAHN	10.3.53	R. L. Stewart	I. G. Lumley, E. G. A. Smith, E. Kay	A. R. Childe	Ellerman Lines, Ltd.
<i>City of Delhi</i>	GLBW	3.10.52	W. Lowe	J. J. Strong, W. Johnson	F. Cullen	Ellerman Lines, Ltd.
<i>City of Derby</i>	GFWC	9.9.52	F. M. Womersley	L. B. Morley, R. Clark, J. McLeod	I. O'Donoghue	Ellerman Lines, Ltd.
<i>City of Dieppe</i>	GSVQ	11.6.53	G. J. Law, O.B.E.	M. J. Bird, J. Webster, I. B. Taylor	M. McDuffie	Ellerman Lines, Ltd.
<i>City of Durham</i>	GBIM	28.9.53	T. G. Mathias	A. G. Hine, D. Wardlaw, R. White	P. B. Healy	Ellerman Lines, Ltd.
<i>City of Evansville</i>	GJNF	26.3.53	A. M. Westlake	Houghton, Heywood, Coutts	T. Berry	Ellerman Lines, Ltd.
<i>City of Johannesburg</i>	GBKW	4.5.53	T. H. S. Speakman	R. Halcrow, J. Somerville, D. N. Macdonald	A. R. Henderson	Ellerman Lines, Ltd.
<i>City of Khartoum</i>	GBZC	19.10.53	J. L. Robertson	I. Butcher, N. Paskin, R. Walker	J. Carroll	Ellerman Lines, Ltd.
<i>City of Khos</i>	GKXB	10.3.53	W. Dick	J. A. Parsons, R. J. Thurbrun, F. C. Bowen	J. A. Dunlop	Ellerman Lines, Ltd.
<i>City of Lichfield</i>	GCXL	1.7.53	B. E. Hooper	D. Russell, D. Quinn, A. M. Brewer	J. P. Curran	Ellerman Lines, Ltd.
<i>City of Lille</i>	GSLN	2.9.53	H. Mackie	F. W. More, D. Wright, G. H. Watkins	— Brosman	Ellerman Lines, Ltd.
<i>City of Lyons</i>	GMCN	28.9.53	J. S. Mackie	J. B. Jones, A. Ledger, R. P. Wakefield	G. Cockburn	Ellerman Lines, Ltd.
<i>City of New York</i>	GLYQ	4.9.53	T. F. Labey	J. L. Blanche, R. G. Binnie, A. Forrest	T. Gaffney	Hall Line, Ltd.
<i>City of Paris</i>	GFQM	14.4.53	J. Armstrong-White	F. B. Stewart, N. M. Fletcher, K. J. K. Barrow	B. J. Holyoake	Ellerman Lines, Ltd.
<i>City of Pretoria</i>	GBLN	17.7.53	A. G. Freeman	J. A. Buchanan, C. Grant, P. W. Clarke	K. G. Arthur	Ellerman & Bucknall S.S. Co., Ltd.
<i>City of Swansea</i>	GBZT	15.9.53	F. J. H. T. Vizer	M. J. Swan, S. Hider, D. Lloyd, F. Gurney	F. L. O'Dea	Ellerman Lines, Ltd.
<i>City of Sydney</i>	GSFM	19.3.53	G. F. Sumpton	R. F. Moon, J. Waddleton, E. E. Cooper	— Roberts	Ellerman Lines, Ltd.
<i>Clan Brodie</i>	GKPD	23.9.53	B. Vernon-Browne	A. Crawford, E. Harvey, B. Abbott	V. S. Stevin	Cayzer Irvine & Co., Ltd.
<i>Clan Buchanan</i>	GKNM	29.8.53	J. Forster	H. White, J. Nutt, J. Burgoyne, P. Hoblyn	J. Brown	Cayzer Irvine & Co., Ltd.
<i>Clan Campbell</i>	GDZK	4.9.53	H. C. Simpson, O.B.E.	I. S. Cumming, G. Gibson, A. Mair	R. F. Cole	Cayzer Irvine & Co., Ltd.
<i>Clan Chattan</i>	GBFX	16.6.53	J. McCrone	W. S. Clarke, N. Wallace, J. A. Brown, O. Ross	E. J. Shillabeer	Cayzer Irvine & Co., Ltd.
<i>Clan Chisholm</i>	GBFY	8.9.53	G. Vernon-Greene	A. Young, J. Wilkie, N. Williams	H. G. P. Macnamara	Cayzer Irvine & Co., Ltd.
<i>Clan Davidson</i>	MAWU	18.6.53	T. A. Watkinson	S. R. Davidson, J. Molyneux, J. Walker	J. E. Appleton	Cayzer Irvine & Co., Ltd.
<i>Clan Forbes</i>	GPGB	18.6.53	W. R. Woodruffe	J. H. Grant, B. C. Peat, T. M. Graham	I. M. Humphries	Cayzer Irvine & Co., Ltd.
<i>Clan Macaulay</i>	GZCS	7.4.53	J. Aukland	K. Kerr, R. Baxter, G. Potter	M. Plews	Cayzer Irvine & Co., Ltd.
<i>Clan MacDonall</i>	GCPG	24.9.53	A. J. Hogg	J. A. S. Rendell, G. S. Gann, R. Grey, P. Deslandes	G. Martyn	Cayzer Irvine & Co., Ltd.
<i>Clan MacDougall</i>	GFBQ	17.9.53	P. MacMillan	J. Besley, G. R. Thomas, J. Duncan, G. Dennison	F. Crew	Cayzer Irvine & Co., Ltd.
<i>Clan MacKinnon</i>	GK LX	8.10.53	B. Jonks	D. W. Thomas, J. Currie, L. Harvey	A. Halcrow	Cayzer Irvine & Co., Ltd.
<i>Clan MacLaren</i>	GSSC	12.8.53	A. G. McPherson	F. R. Usher, S. K. Young, C. Marshall	R. Moore	Cayzer Irvine & Co., Ltd.
<i>Clan MacLean</i>	GSWX	18.6.53	H. Whitehead	W. D. B. Davidson, J. H. Beavan, J. G. Smith	W. G. Peddie	Cayzer Irvine & Co., Ltd.
<i>Clan Macrae</i>	MAHP	1.10.53	W. R. Woodruffe	R. S. Schooling, R. J. Scott, C. K. Rawnsley	N. Dalzell	Cayzer Irvine & Co., Ltd.
<i>Clan MacTavish</i>	GUBB	3.2.53	E. Gough, O.B.E.	M. R. Learner, C. C. Atkinson, T. R. Parsons, J. Hogg	W. Ellmers	Cayzer Irvine & Co., Ltd.
<i>Clan Shaw</i>	GBYW	8.1.53	F. J. E. Houghton	G. G. Greenfield, A. M. Kennedy, E. M. Phelps, D. Hindle	G. H. Hudd	Cayzer Irvine & Co., Ltd.
<i>Clan Sutherland</i>	GFWZ	2.5.53	R. B. Lindsley	W. O. M. Cathero, T. R. Halliday, T. Connelly	W. Gay	Cayzer Irvine & Co., Ltd.
<i>Clan Urquhart</i>	GFBK	9.9.53	T. W. Inman, O.B.E.	L. S. Jones, K. Morton, E. Chase, J. A. Cowie, J. F. I. David	T. D. Sullivan	Cayzer Irvine & Co., Ltd.
<i>Clearpool</i>	MAHQ	25.3.53	J. H. Atkinson	K. Forrester, N. B. Smith, T. Newton	F. Mullen	Sir R. Ropner & Co., Ltd.
<i>Clydebank</i>	GKLM	26.11.52	F. Hale	D. Halliday, L. Wigham, R. Grainger	G. Murphy	Andrew Weir & Co., Ltd.

Condesa	..	MAHU	10.3.53	H. Heal	..	..	N. H. England, J. Gilmore, G. Boothby, R. Tinnmouth	..	M. Prior	..	Furness-Houlder Argentine Lines, Ltd.
Consuelo	..	GCGQ	8.8.53	H. Greenhill	..	..	D. Brackenbury, A. Skelton, G. Atkinson	..	D. Withers	..	Ellerman's Wilson Line, Ltd.
Corfu	..	GRNW	4.9.53	E. F. Ferraby	..	..	J. D. Cobb, R. Elenor, P. Wiseman, J. B. Latham	..	R. V. Gregory	..	P. & O. Steam Navigation Co.
Corinthic	..	GZYL	17.8.53	A. C. Jones	..	..	H. Faulkner, D. H. Clarke, D. Aberdeen, J. Wooler	..	S. Rickards	..	Shaw Savill & Albion Co., Ltd.
Corrales	..	GSIL	26.6.53	F. T. Barber	..	..	R. B. Fleke, E. Whitehouse, H. Mackinnon	..	N. W. Wilding	..	Elders & Fyffes, Ltd.
Corrientes	..	GFPT	25.9.53	K. McLeod	..	..	H. F. Thompson, C. Waddell, I. Hood	..	J. B. Jardine	..	Donaldson Bros. & Black, Ltd.
Craftsman	..	GPZT	5.5.53	T. B. Littlechild	..	..	F. R. Robinson, C. B. Thomson, E. J. Cassell	..	P. B. Healy	..	T. & J. Harrison, Ltd.
Crofter	..	MNGX	10.3.53	S. Diamond	..	..	W. D. Aitken, D. R. Carden	..	F. Jones	..	T. & J. Harrison, Ltd.
Cumberland	..	GPY	8.10.53	J. S. Oxnard	..	..	J. R. Gair, O. Springett, P. Sedgwick	..	G. S. Ross	..	Federal Steam Nav. Co., Ltd.
Cusco	..	GKPF	28.7.53	R. D. S. Eckford	..	..	M. I. Eardley, G. Pattison, W. Holmes	..	A. Evans	..	Pacific Steam Navigation Co.
Dalbey	..	MFVB	21.4.53	I. Kenny	..	..	R. A. Vance, E. A. Snaith, P. Robinson	..	M. R. Carney	..	Ropner Shipping Co., Ltd.
Dallas City	..	GCLS	18.6.53	D. W. Boutcher	..	..	W. Andral, W. Cross	..	J. M. Robson	..	Sir Wm. Reardon Smith & Sons, Ltd.
Darro	..	MAID	30.7.53	T. Powell	..	..	G. Rogers, P. G. Driver, T. Challis	..	J. Heaney	..	Royal Mail Lines, Ltd.
Debreit	..	GRPR	19.1.53	T. J. Sweeney	..	..	I. C. Jernyn, I. Owen, V. Charters	..	B. Thompson	..	Lampport & Holt Line, Ltd.
Deerpool	..	GKDY	1.9.53	C. H. Churchill	..	..	D. M. Small, E. M. Stewart, K. B. Dines	..	A. Owen	..	Sir R. Ropner & Co., Ltd.
Defoe	..	GNWF	25.7.53	E. L. Jernyn	..	..	J. W. Pratt, J. W. Cwore, J. A. Russell	..	J. Brown	..	Lampport & Holt Line, Ltd.
Delane	..	MMNW	29.9.53	A. Penrice	..	..	D. S. Leicester, M. H. Garvey, R. E. Wildgoose	..	J. Brown	..	Lampport & Holt Line, Ltd.
Delilian	..	GJSQ	16.5.53	J. S. MacMillan	..	..	J. McCormick, P. Ewing, J. Hall	..	S. J. Read	..	Donaldson Bros. & Black, Ltd.
Delius	..	GZSY	26.3.53	A. W. Mitchell	..	..	I. B. Owen, H. Smith, D. S. Sapp	..	S. Bolderston	..	Lampport & Holt Line, Ltd.
Delphic	..	MBLQ	13.4.53	C. L. Carroll, D. S. C., R.D., R.N.R.	..	..	B. Hammond, P. G. Morgan, J. Hurst	..	A. Morris	..	Shaw, Savill & Albion Co., Ltd.
Desecado	..	MAIH	9.4.53	C. R. S. Woolley	..	..	M. W. Robinson	..	J. S. Forest	..	Royal Mail Lines, Ltd.
Devins	..	GFKT	26.2.52	W. Gillespie	..	..	I. Bailey, W. J. Neill, B. W. Bevic	..	C. Francis	..	Lampport & Holt Line, Ltd.
Devon	..	GDRF	6.8.53	R. G. Hollingdale	..	..	D. Layard, B. Linklater, D. Sywers, J. Boss	..	J. Tomlinson	..	Federal Steam Nav. Co., Ltd.
Diliwara	..	GYQV	25.9.53	M. Williams	..	..	D. M. Taylor, I. K. Bowerman, E. C. Plowman	..	S. J. Taylor, M.B.E.	..	British India Steam Nav. Co., Ltd.
Domination Monarch	..	GRGG	23.9.53	B. Forbes Moffatt	..	..	G. Perry, K. Murry-Brown, —, Sheldon, C. A. Brodie, R. L. Reid	..	F. V. Harford	..	Shaw, Savill & Albion Co., Ltd.
Dorelian	..	GJTL	8.9.53	G. Clarke	..	..	D. J. Butterworth, E. Anderson, I. Connell	..	T. W. Moody	..	Donaldson Bros. & Black, Ltd.
Dorset	..	GZFO	16.4.53	A. E. Williams	..	..	B. Whybrow, W. Dan, A. Marsh	..	A. Calder	..	Federal Steam Nav. Co., Ltd.
Drina	..	MAIL	30.9.53	E. N. Giller, M.B.E.	..	..	R. Brockbank, J. E. Flood, R. B. Hill	..	D. Franklin	..	Royal Mail Lines, Ltd.
Dryden	..	GQGT	5.6.53	W. J. M. Ankers	..	..	R. Jackson, K. J. McGuire, B. Ridgough	..	M. W. Guy	..	Lampport & Holt Line, Ltd.
Duke of Athens	..	GMYS	11.6.52	T. Walton	..	..	G. W. Sutcliffe, T. Owen, D. Montague	..	R. B. Read	..	Trent Maritime Co., Ltd.
Dunedin Star	..	GKKT	6.5.53	J. D. W. Davis	..	..	J. Greenwood, L. Franklin, O. Edwards	..	T. F. Holden	..	Blue Star Line, Ltd.
Dunera	..	GBBR	15.4.53	A. Kay	..	..	C. R. S. Monk, F. Hills, J. A. Stanton	..	G. Delahoy	..	British India Steam Nav. Co., Ltd.
Dunkery Beacon	..	GUFF	22.5.53	G. E. Towill	..	..	G. Atkinson	..	H. Davis	..	Ph. Van Ommeren (London), Ltd.
Durango	..	MAIM	7.10.53	H. Wright	..	..	B. Y. Harrison, J. D. S. Salt, J. W. Thwaites	..	D. Drover	..	Royal Mail Lines, Ltd.
Durban Castle	..	GPGP	5.12.52	J. A. Sowden	..	..	D. Robson, A. Deal, R. Kerr, S. Beaumont	..	—, Bell	..	Union Castle Mail S.S. Co., Ltd.
Durenda	..	GFSL	18.11.52	T. Washbrook	..	..	J. Cole, J. D. Edwards, —, Allenby	..	J. F. McNeil	..	British India Steam Nav. Co., Ltd.
Durham	..	GWWK	21.5.53	J. D. Bennett	..	..	S. H. Sparrow, A. S. Collins, D. E. Moran, C. H. Hill	..	A. J. Dunn	..	Federal Steam Nav. Co., Ltd.
Eastbank	..	GFKR	29.9.53	C. S. Holbrook	..	..	J. Scott, C. G. Watterson, C. M. Banks	..	M. Wilson	..	Hunting & Sons, Ltd.
Edenfield	..	GFJF	20.8.53	M. Manthorpe	..	..	D. Johnson, H. Underhill, F. Fay	..	J. Hodgson	..	Union Castle Mail S.S. Co., Ltd.
Edinburgh Castle	..	GOHN	23.7.53	T. W. McAllen	..	..	J. Spence, J. Rea, B. R. Oliver	..	P. MacBride	..	Anchor Line, Ltd.
Egidia	..	GIZD	6.5.53	D. Morrison, O.B.E.	..	..	R. Jones, W. Sawyers, R. L. Richards	..	W. Hier	..	Anchor Line, Ltd.
Elysia	..	GJZK	29.8.53	A. J. F. Colquhoun	..	..	H. Thoms, J. McLarty, A. McLean	..	D. Thompson	..	Anchor Line, Ltd.
Empire Clyde	..	GDXS	8.9.53	A. Johnson	..	..	A. Ramage, J. Scrimgeour, G. Murdoch, W. Hallum	..		..

NAME OF VESSEL	CALL SIGN	LAST RETURN RECEIVED	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS
<i>Empire Forewy</i>	GMFW	10.9.53	W. T. C. Lethbridge	M. N. Eltrington, J. Vale, J. F. Bannister, R. A. Gane	P. Maloney	P. & O. Steam Nav. Co.
<i>Empire Ken</i>	GKZJ	22.6.53	P. M. Burrell	J. Martin, E. D. Long, B. Sugden, A. McKelvie	E. Winslow	Royal Mail Lines, Ltd.
<i>Empire Orwell</i>	GRCB	19.10.53	C. Blake, O.B.E.	C. A. Howard, J. R. English, D. R. Carroll	A. C. Shippam	Orient Steam Nav. Co., Ltd.
<i>Empire Pride</i>	MAJB	13.4.53	G. Dobson, R.D., R.N.R.	R. Hammond, R. Pennington, B. Wilcock	D. Alcock	Bibby Bros. & Co.
<i>Empire Star</i>	GCDP	1.4.53	D. J. Stratta	E. A. Davies, —, McGregor, G. C. Jones, G. J. Austin	W. J. Fitzgerald	Blue Star Line, Ltd.
<i>Empire Viceroy</i>	MAJN	6.4.51	J. B. S. Bland	A. M. Brockwell, C. D. Mason, J. W. Abbott	W. Clarke	Pandelis Shipping Co., Ltd.
<i>Empire Windrush</i>	GYSF	15.9.53	W. Wilson, O.B.E.	B. Baggot, P. M. Michael, A. Ford	F. Fowler	New Zealand Shipping Co., Ltd.
<i>Empress of Australia</i>	GQMQ		J. P. Dobson, D.S.C., R.D., R.N.R.	D. Bottomley, L. McDowell, T. Worthington	J. Butterworth	Canadian Pacific Steamships, Ltd.
<i>Empress of France</i>	GNTV	5.10.53	C. L. De H. Bell, D.S.C., R.D., R.N.R.	J. C. Moffat, W. Williams, R. A. Jones	E. Murphy	Canadian Pacific Steamships Ltd.
<i>Empress of Scotland</i>	GMLV	9.7.53	W. S. Main	C. Hutchinson, J. Waling, A. Ewing	W. Campbell	Canadian Pacific Steamships, Ltd.
<i>English Star</i>	MFSS	6.8.53	L. Vernon, M.B.E.	E. S. Neave, G. Seaye, L. Graham, D. Newlin	J. Allen	Blue Star Line, Ltd.
<i>Enton</i>	GNLF	6.8.53	R. F. Hellings	F. N. Dalzell, J. Blake, F. Wray, P. C. Manson	E. Ingham	Birt, Potter & Hughes
<i>Esperance Bay</i>	GSMP	13.5.53	V. Vizor	J. Scott, —, Durell, —, Thornton	H. H. Lyon	Shaw, Savill & Albion Co., Ltd.
<i>Essequibo</i>	GKPK		T. W. F. Bolland	R. C. C. Frizell, —, Park, M. Larrive	M. O'Riordan	Royal Mail Lines, Ltd.
<i>Essex Trader</i>	GCMS	12.9.53	D. G. Evans	E. Whislay, E. E. Atkinson, D. A. Owen	T. Milne	Trader Navigation Co., Ltd.
<i>Esso Bedford</i>	GGJL	14.10.53	H. Shears	I. Baskerville, H. Hood, R. Sorley	G. Christie	Esso Transportation Co., Ltd.
<i>Esso Edinburgh</i>	GCOM	17.10.53	W. Davies	K. MacKenzie, J. Doyle, W. Whiteford	D. Henderson	Esso Transportation Co., Ltd.
<i>Esso Glasgow</i>	GTXC	14.6.53	A. M. Canner	I. Thain, J. Armstrong, T. Powers	A. W. Hutchinson	Esso Transportation Co., Ltd.
<i>Esso Manchester</i>	GWCD	23.1.50	R. Drummond	D. Ledingham, J. McCarthy	V. I. Davies	Esso Transportation Co., Ltd.
<i>Esso Plymouth</i>	GYRX	18.6.53	—, Pugsley	J. Godden, J. L. Watson, S. H. Moffitt	D. Sproat	Andrew Weir & Co., Ltd.
<i>Etivebank</i>	GDMK	1.12.52	D. Gillies	E. N. Jolly	—, McCartney	Anchor Line, Ltd.
<i>Eucadia</i>	GJZL	7.5.53	W. MacVicar, M.B.E.	D. Barclay, A. MacAdam, G. J. Robertson	J. G. Timmons	T. & J. Harrison, Ltd.
<i>Explorer</i>	GYJX	20.7.53	I. I. Jones	I. Mitchell, E. J. Maxwell, R. H. Douglas	J. McCarthy	G. Heyn & Sons, Ltd.
<i>Factor</i>	GPZV	23.9.53	E. B. Stephens	R. Bell, G. Stock, L. Sharmar	L. A. Riccoboni	Pacific Steam Nav. Co.
<i>Fanad Head</i>	GNOQ	2.9.53	W. J. Leinster	R. A. Maxwell, E. McIntosh, D. Graig	J. Crosbie	Cunard Steamship Co., Ltd.
<i>Flamenco</i>	GCBV	25.4.53	A. G. Litherland	C. Pringle, F. J. Leicester, O. A. Baker	F. L. Stewart	Blue Star Line, Ltd.
<i>Franconia</i>	GBRQ	4.8.53	W. M. Stewart, O.B.E.	B. Newcomb, F. E. Pollitt, Q. K. Paul	J. M. Robson	Sir William Reardon Smith & Sons, Ltd.
<i>Fremantle Star</i>	MQFT	10.8.53	C. R. Horton, D.S.C.	J. C. Farmer, E. W. Jenkins, H. O. T. Fuller	H. G. Sparkes	T. & J. Harrison, Ltd.
<i>Fresno City</i>	GBYD	27.8.53	D. L. Beynon	J. S. Randall, I. C. Hughes, D. James	A. G. Hill	Cunard Steamship Co., Ltd.
<i>Geologist</i>	GJMR	7.10.53	A. E. Jackson	S. W. Gamble, A. G. Nicholson, J. Bean	P. Kinderman	A. Holt & Co.
<i>Georgic</i>	GRLJ	5.8.53	G. H. Morris	J. Easton, O. Elson, M. Ridge, N. Douglas	A. G. Foster	Glen Line, Ltd.
<i>Glaucus</i>	G DYZ	11.5.53	H. S. Wood	R. A. Golsby, N. N. Robertson, C. S. Mackinnon	G. Ricard	Andrew Weir & Co., Ltd.
<i>Glenartney</i>	GBLG	4.9.53	H. Readshaw	H. K. Timbrell, D. Pettigrew, A. W. E. Johnson, R. D. Astell	R. Bradshaw	Glen Line, Ltd.
<i>Glenbank</i>	GKLC	24.9.53	J. W. Greig	F. B. Rodgers, D. C. Broome, A. F. Wigham		
<i>Glenorchy</i>	GBLL	17.8.53	R. Hanney	C. B. Hook, J. Illif, —, Willis		

<i>Gloucester</i>	..	MANK	20. 6. 53	J. E. Bury ..	K. A. Murray, N. I. Collett, R. S. Hales, M. Field ..	R. Oliver ..	Federal Steam Nav. Co., Ltd.
<i>Golfio</i>	..	GBYL	15. 4. 53	S. A. Sapsworth	E. R. Williams, E. T. Griffiths ..	J. Griffith ..	Elders & Fyffes, Ltd.
<i>Gracia</i>	..	MANN	7. 7. 53	I. McInnes	N. Eadie, J. Hunter, J. Johnston ..	W. Duguid ..	Donaldson Bros. & Black, Ltd.
<i>Graig</i>	..	MFDS	20. 5. 53	S. Glynn-Woods	G. Nish, B. Cawson, D. Owen ..	E. Taylor ..	Idwal Williams & Co., Ltd.
<i>Granford</i>	..	MQGC	13. 7. 53	E. C. J. Morgan	J. Brown, L. T. Edwards, T. Robinson ..	T. G. Jones ..	Goulandris Bros., Ltd.
<i>Great City</i>	..	GBYS	23. 9. 53	T. Dixon ..	M. T. Davies, E. A. Tickner, P. V. Beatty ..	L. Mills ..	Sir William Reardon Smith & Sons, Ltd.
<i>Haparangi</i>	..	GJYX	8. 10. 53	D. Chadwick	A. Cripps, S. Bridgeford, G. Gelson ..	E. Grahame ..	New Zealand Shipping Co., Ltd.
<i>Harpalycus</i>	..	GYNB	16. 4. 53	R. Stott, O.B.E.	B. O'Sullivan, J. G. Neilson, W. Mills ..	J. I. Waddell ..	J. & C. Harrison, Ltd.
<i>Harington</i>	..	GFCZ	27. 2. 53	G. Jones, M.B.E.	J. C. Castle, W. R. Vickers, G. D. Judd ..	H. T. Hamer ..	J. & C. Harrison, Ltd.
<i>Hauraki</i>	..	GJLV	25. 7. 53	H. D. Horwood	R. E. Donald, R. S. Luly, M. R. Forcer, M. J. Charlesworth ..	R. Robinson ..	New Zealand Shipping Co., Ltd.
<i>Helcina</i>	..	GKBC	24. 8. 53	S. Thomson	E. S. Brown, F. Braid, D. H. G. Mortimer ..	S. Oake ..	Anglo-Saxon Petroleum Co., Ltd.
<i>Herdman</i>	..	GPZX	7. 5. 53	T. E. Steele	W. E. Owen, G. Penston, J. A. Roberts ..	F. M. Berry ..	T. & J. Harrison, Ltd.
<i>Herefordshire</i>	..	GOFG	14. 1. 53	H. B. Peate, D.S.C., R.D., R.N.R.	—, McKinley, J. F. Beckett, A. Moore, J. Hale ..	A. G. Johnson ..	Bibby Bros. & Co.
<i>Hertford</i>	..	GKNW	28. 8. 53	E. Burton ..	P. Weston, J. Varney, J. Manson ..	T. M. Ready ..	Federal Steam Nav. Co., Ltd.
<i>Highland Brigade</i>	..	GJKN	17. 7. 53	J. Smith, R.D., R.N.R.	J. T. Jones, H. Lloyd, R. D. H. Manley, —, Walker ..	J. Desborough ..	Royal Mail Lines, Ltd.
<i>Highland Chieftain</i>	..	GCTY	20. 8. 53	W. H. Grimshaw, O.B.E.	C. Cowley, A. Whittle, C. Oxborough ..	W. Rollason ..	Royal Mail Lines, Ltd.
<i>Highland Monarch</i>	..	GMZF	2. 10. 53	D. R. Miller	R. R. Thompson, J. Evans, W. B. Baxter, J. T. Duff ..	F. Dunk ..	Royal Mail Lines, Ltd.
<i>Highland Princess</i>	..	GFMN	5. 7. 52	S. J. G. Hill	D. Stratton, P. B. Cairns, R. B. Dales, C. B. Lambert ..	F. Goodall ..	Royal Mail Lines, Ltd.
<i>Hilary</i>	..	GQVM	11. 7. 53	J. H. Stoker	J. Croft, G. Calvert, D. J. Taylor ..	A. Newcombe ..	Booth S.S. Co., Ltd.
<i>Hildebrand</i>	..	GKTK	15. 6. 53	J. Whayman, D.S.C., R.D., R.N.R.	T. W. McMullan, G. Davis, I. Robinson ..	D. Douglas ..	Booth Steamship Co., Ltd.
<i>Himalaya</i>	..	MCDY	12. 2. 53	E. E. Bailie	J. Chester, G. C. Barrett, J. F. T. Houghton ..	J. F. Clark ..	P. & O. Steam Nav. Co.
<i>Hinakura</i>	..	GDVS	17. 8. 53	N. L. Warren	J. H. Burn, C. E. Miller, T. W. Lane, S. W. Lambrick ..	G. Miller ..	New Zealand Shipping Co., Ltd.
<i>Hororata</i>	..	MANZ	16. 6. 53	E. H. Hopkins	B. Meads, K. Fields, J. Waller ..	T. Green ..	New Zealand Shipping Co., Ltd.
<i>Huntingdon</i>	..	GFCT	11. 11. 52	P. S. Calcutt	D. B. Gaskell, G. Simpson, G. Caulfield ..	A. Wallace ..	New Zealand Shipping Co., Ltd.
<i>Hurunui</i>	..	GJZF	8. 6. 53	F. Pover ..	G. Cauldwell, H. Sladen, D. Gaskell, M. Ewens ..	A. H. Sandilands ..	Federal Steam Nav. Co., Ltd.
<i>Hycaria</i>	..	MADE	30. 6. 52	E. W. V. Garrett	J. Wilson, P. G. Mason, T. J. Jones ..	G. Hicks ..	New Zealand Shipping Co., Ltd.
<i>Imperial Star</i>	..	GIAC	22. 8. 53	G. C. Goudie	C. P. Davy, R. Bayley, —, McPhail ..	N. Henderson ..	Baltic Trading Co., Ltd.
<i>Inishowen Head</i>	..	MAOC	2. 10. 53	R. A. Ferguson	A. Fee, R. Crawford, W. Cooper ..	A. E. Adams ..	Blue Star Line, Ltd.
<i>Interpreter</i>	..	GPZY	22. 5. 53	H. Coates ..	A. Baxendale, A. H. Hughes, G. Harvey ..	W. Bennett ..	G. Heyn & Sons, Ltd.
<i>Inverbank</i>	..	GKML	23. 7. 53	R. A. Lorrains	D. Bennett, P. N. Etherington, J. Aldiss ..	D. Murphy ..	T. & J. Harrison, Ltd.
<i>Jamaica Producer</i>	..	VP LM	29. 11. 52	G. E. M. Jenkins	J. A. Whitehouse, T. A. Kidd, T. B. Bird, J. Crone ..	E. Brown ..	Andrew Weir & Co., Ltd.
<i>Jersey City</i>	..	GIGA	17. 10. 52	T. Dodds ..	S. Gallagher, E. Prior, C. Davidson ..	L. Butcher ..	Kaye Son & Co., Ltd.
<i>John Biscoe</i>	..	VPNE	18. 6. 53	W. Johnston	P. Brown, H. Preece, N. Brown ..	R. Lenton ..	Sir William Reardon Smith & Sons, Ltd.
<i>Yessmore</i>	..	MAOF	8. 7. 53	G. Cook ..	J. P. Blenkinsop, R. Gibson, P. Frodsham ..	J. Mathieson ..	Government of the Falkland Islands
<i>John Holt</i>	..	GNFD	27. 3. 53	R. Atkinson	R. J. Griffiths, A. D. Farrell, F. G. Hardy ..	J. H. Sheary ..	Furness Withy & Co., Ltd.
<i>Kaipara</i>	..	GOCJ	8. 7. 53	N. Fraser ..	H. A. Walters, H. Adler, J. Bryon ..	A. Hudson ..	John Holt Line, Ltd.
<i>Kaipara</i>	..	GZPY	1. 10. 52	E. J. Ridout	R. O. T. Fuller, J. Sey, M. Foster ..	E. Carver ..	Trinder Anderson & Co.
<i>Katuna</i>	..	GQGG	2. 7. 53	J. F. Wood	I. Cameron, T. Wilson, P. Johnson ..	S. Woodward ..	Trinder Anderson & Co.
<i>Kentworth Castle</i>	..	MQLP	17. 4. 53	T. H. Whitley	—, Hatcher, A. Lewis, —, Fellow ..	S. N. Crabtree ..	Trinder Anderson & Co.
<i>Kent</i>	..	GPDC	6. 1. 52	J. Harrison	B. P. Whelan, —, Mayhew, C. D. Fuller ..	T. G. Terrell ..	Union Castle Mail S.S. Co., Ltd.
<i>Kenuta</i>	..	GCBW	16. 3. 53	J. D. Richards	W. Washington, G. E. Turner, A. B. Powell ..	J. Murray ..	Federal Steam Nav. Co., Ltd.
<i>King Robert</i>	..	MAON	11. 7. 52	G. Craze ..	G. Dando, P. W. Kidd, A. D. Terras ..	J. P. Murphy ..	Pacific Steam Nav. Co.
<i>King William</i>	..	GNVF	17. 7. 53	J. C. Davies	C. Hunter, G. Ruse, D. Henderson ..	C. Marsh ..	King Line, Ltd.

NAME OF VESSEL	CALL SIGN	LAST RETURN RECEIVED	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS
<i>Kohistan</i> ..	GSFZ	30. 9. 53	A. N. Henderson ..	A. K. Grey, G. Grindrod, J. Jacques ..	W. C. Matthews ..	F. C. Strick & Co., Ltd.
<i>Koyan</i> ..	GKST	12. 6. 53	W. McIntosh ..	J. M. Farnier, A. MacDonald, N. Robinson, R. W. Reddie ..	A. N. Gilbert ..	P. Henderson & Co.
<i>Lanarkshire</i> ..	GCTC	4. 6. 53	H. J. Anchor, O.B.E., R.D., R.N.R. ..	A. D. Haydon, G. Spiller, R. J. Bews ..	D. Edmans ..	Turnbull Martin & Co., Ltd.
<i>Lancashire</i> ..	GLZC	9. 7. 53	A. M. Williamson ..	J. W. Waldie, D. Hine, T. G. Hughes, J. F. Code ..	A. Jones ..	Bibby Bros. & Co.
<i>Langton Grange</i> ..	MAOT	8. 9. 53	J. R. Faulkner ..	H. Jenkins, M. Ditchburn, K. Walker ..	J. J. Cameron ..	Houlder Bros. & Co., Ltd.
<i>Lassell</i> ..	GFND	2. 10. 53	J. King ..	A. Corlett, C. Stangroom ..	J. J. Kennedy ..	Lampport & Holt Line, Ltd.
<i>Latia</i> ..	GLOF	16. 10. 53	G. E. Hunt ..	A. B. Calvert, A. J. King, W. Clark, J. D. Westley ..	P. McBride ..	Anglo-Saxon Petroleum Co., Ltd.
<i>Laurentia</i> ..	GNDY	30. 6. 52	A. Bankier ..	T. Scott, W. F. Joyce, A. McCallum, J. McCully ..	D. Murray ..	Donaldson Bros. & Black, Ltd.
<i>Leverbank</i> ..	GLPZ	4. 9. 53	A. T. Stansfield ..	F. G. Howard, A. Dorkins, J. Scobbie ..	J. Simpson ..	Andrew Weir & Co., Ltd.
<i>Lingvist</i> ..	GWBC	4. 7. 53	W. Weatherall ..	I. M. Ritchie, C. Boan, G. Barton ..	J. McHugh ..	T. & J. Harrison, Ltd.
<i>Livorno</i> ..	GPWF	22. 8. 53	W. White ..	A. Telfer, F. Tognola, S. Mitchell ..	F. Thornborough ..	Ellerman's Wilson Line, Ltd.
<i>Lloydcrest</i> ..	MAOY	6. 8. 53	L. Barwell ..	R. Thompson, S. J. Gawlik, M. Muncie ..	M. Littlejohn ..	Crest Shipping Co., Ltd.
<i>Loch Avon</i> ..	GMZT	25. 4. 53	H. E. Sang ..	G. S. Varney, J. F. Scales, A. Howard-Tripp ..	N. T. Roberts ..	Royal Mail Lines, Ltd.
<i>Loch Garth</i> ..	GMZY	9. 4. 53	T. W. Stevens, R.D., R.N.R. ..	D. Hatton, P. F. R. Hawkey, D. B. Cairns ..	C. Kelly ..	Royal Mail Lines, Ltd.
<i>Loch Ryan</i> ..	MAOZ	14. 5. 53	H. V. Todd, R.D., R.N.R. ..	H. Nixon, A. E. Crebbin, J. L. Frain ..	L. Barnett ..	Royal Mail Lines, Ltd.
<i>London Pride</i> ..	GKJT	14. 8. 53	A. W. Wilson ..	I. A. G. Lewis, R. Puit, D. Evans ..	L. Dixon ..	London Overseas Freighters, Ltd.
<i>Lotorium</i> ..	GBLP	27. 8. 53	N. Clarke ..	D. S. Evans, D. Martin, J. Behring ..	B. I. Smith, M.B.E. ..	Anglo-Saxon Petroleum Co., Ltd.
<i>Macharda</i> ..	GKKF	15. 6. 53	R. A. Penston ..	I. A. MacLaren, W. E. Kirkbride, G. Sinclair, J. W. S. Dunn ..	T. Williams ..	T. & J. Brocklebank, Ltd.
<i>Magdatur</i> ..	GBIX	27. 7. 53	A. Hill, O.B.E. ..	R. E. Allen, R. Floyd, T. Parry ..	P. Y. Wright ..	T. & J. Brocklebank, Ltd.
<i>Mahamada</i> ..	GOFM	18. 6. 53	H. C. Kinley ..	D. L. DesLandes, W. Coles, A. Davies ..	R. Burton ..	T. & J. Brocklebank, Ltd.
<i>Mahout</i> ..	GDZN	9. 4. 53	W. Gibson ..	G. D. Symonds, J. Lyle, D. M. Wolfenden ..	H. D. Kirk ..	T. & J. Brocklebank, Ltd.
<i>Mahseer</i> ..	GZSV	10. 9. 52	A. Bain ..	J. S. Emberton, — O'Byrne, S. Turner, — Stewart ..	A. Holstead ..	T. & J. Brocklebank, Ltd.
<i>Mahsud</i> ..	GSCP	21. 4. 53	L. F. Dodson ..	D. G. Wild, A. B. Davies, P. Briscoe ..	A. Halstead ..	T. & J. Brocklebank, Ltd.
<i>Mather</i> ..	GSCL	2. 10. 53	I. C. Nuttall ..	R. V. K. Robbins, J. S. Saxty, L. Fletcher ..	A. Goodwin ..	Houlder Bros. & Co., Ltd.
<i>Makalla</i> ..	GOFN	23. 9. 53	H. Simpson ..	J. A. Kerbyson, A. Guthrie, E. Watson ..	W. Dawson ..	P. & O. Steam Nav. Co.
<i>Malancha</i> ..	GZRD	7. 9. 53	S. Broughton ..	J. C. Pears, A. Miller, P. Marsden ..	S. Sumner ..	Manchester Liners, Ltd.
<i>Malmesbury</i> ..	MAQE	3. 11. 52	S. W. Howell ..	L. Zabel, R. Hedger, N. J. Roberts ..	A. Broadbent ..	Manchester Liners, Ltd.
<i>Maloja</i> ..	GFBF	23. 2. 53	A. Jenkins ..	W. A. Read, C. B. Cooke, G. Miskin, R. Hubbard ..	J. Buchanan ..	Manchester Liners, Ltd.
<i>Manchester City</i> ..	GBBP	13. 4. 53	E. W. Espley ..	T. Hancock, A. Cookson, — Talbot ..	W. Critchley ..	Manchester Liners, Ltd.
<i>Manchester Explorer</i> ..	GNBK	13. 5. 53	I. L. McLaren ..	G. K. Booker, T. H. Lynn, J. Bone ..	W. B. MacPherson ..	Manchester Liners, Ltd.
<i>Manchester Merchant</i> ..	MGZQ	17. 9. 53	W. Oliver ..	G. A. Cowell, D. S. Millard, J. Illingworth ..	J. Reid ..	Manchester Liners, Ltd.
<i>Manchester Pioneer</i> ..	GNVG	28. 11. 52	A. Starmier ..	J. Rushworth, T. W. Field, K. W. Rourke ..	S. F. Woodward ..	Manchester Liners, Ltd.
<i>Manchester Port</i> ..	GYNF	8. 4. 53	M. E. Bewley ..	E. R. Clayton, A. G. Rowlands, A. Swan ..	P. B. McNab ..	Manchester Liners, Ltd.
<i>Manchester Progress</i> ..	GPGD	6. 1. 53	J. E. Askew ..	C. J. Harfoot, P. B. Webster, J. A. Mackay ..		
<i>Manchester Prospector</i> ..	GQKV	2. 10. 53	W. Hine, R.D., R.N.R. ..	J. M. Clarke, D. C. Woodall, D. G. Thomas ..		
<i>Manchester Regiment</i> ..	GBRD	9. 5. 53	F. L. Osborne ..	F. LeMessurier, J. E. Jones, G. R. Davies ..		
<i>Manchester Shipper</i> ..	MAPC		W. H. Downing ..	N. W. Cockshoot, A. H. Varley, P. N. Fielding ..		
<i>Manchester Spinner</i> ..	GNVB		F. D. Struss, O.B.E., D.S.C. ..	J. L. McCartney, W. Quirk, P. Cullen ..		

<i>Mandator</i>	..	GBNY	20.7.53	G. A. Jackson, M.B.E.	R. H. Wills, C. Gray, J. K. Cooper	K. Fawcett	T. & J. Brocklebank, Ltd.
<i>Manistee</i>	..	GRXC	10.10.53	J. Kinsley, R.D., R.N.R.	H. Beyer, B. Hodges, D. Downing	R. Bailey	Elders & Fyffes, Ltd.
<i>Marengo</i>	..	GLFW	5.10.53	F. Ellison	W. Skinner, J. K. Marrow, M. Robinson	S. Coldray	Ellerman's Wilson Line, Ltd.
<i>Marjay</i>	..	GFTY	22.9.53	A. E. Prentice	M. H. S. Salter, H. Tittle, M. E. Jones	E. Leigh	Kaye, Son & Co., Ltd.
<i>Markhor</i>	..	GTFF	15.9.52	J. B. Newman	W. Adam, J. Morris, P. S. Munro	D. C. Brown	T. & J. Brocklebank, Ltd.
<i>Martand</i>	..	GTGG	25.7.53	H. Fosbrooke	J. M. Coles, D. Moore, R. Holland	B. J. Guy	T. & J. Brocklebank, Ltd.
<i>Martita</i>	..	GNOT	4.9.53	H. Bunn	K. Patterson, H. Bovill, N. H. Corkill	J. Manderson	Kaye Son & Co., Ltd.
<i>Mataroa</i>	..	GCSV	20.8.53	R. James, R.D., R.N.R.	J. P. Miller, C. Beck, J. Mason, —, Talbot Pennington	E. Boyce	Shaw, Savill & Albion Co., Ltd.
<i>Matheran</i>	..	GOFQ	27.1.53	R. Humble	W. J. Milne, O. Pritchard, D. Groves, C. N. F. Deighton, W. Thompson, D. A. Hamilton, J. Morgan	G. Caddy	T. & J. Brocklebank, Ltd.
<i>Matina</i>	..	GSZX	24.9.53	W. Dodd	N. F. Deighton, W. Thompson, D. A. Hamilton, J. Morgan	A. C. Knight	Elders & Fyffes, Ltd.
<i>Mauretania</i>	..	GTTM	14.9.53	C. S. Williams	R. Jones, A. Leyland, J. P. Martin, P. King	A. Cannock	Cunard Steamship Co., Ltd.
<i>Media</i>	..	GSWR	2.10.53	W. T. Fitzgerald, R.D., R.N.R.	T. P. Jones, T. Grindrod, G. Armitage	F. J. S. Alcock	Cunard Steamship Co., Ltd.
<i>Melbourne Star</i>	..	GDFZ	3.7.53	C. Aldridge	D. Ortnier, J. Davies, D. Murray	T. Archer	Blue Star Line, Ltd.
<i>Mirror</i>	..	GDFL	7.4.53	A. J. Gales	J. S. Deane, A. Miller, J. H. Killick	N. R. Iden	Cable & Wireless, Ltd.
<i>Modasa</i>	..	GFDZ	14.9.53	L. W. Smith	F. Beal, P. W. R. Smith, W. Robson	P. Sargent	British India Steam Nav. Co., Ltd.
<i>Monarch</i>	..	GBDF	29.9.53	J. Betson	J. Pattison, M. Landes, P. V. Flynn	T. Tilly	H.M. Postmaster-General
<i>Mooltan</i>	..	GBFC	28.5.53	I. M. Peter	A. I. Whitehead, J. Jenkins, B. G. M. Tuck	J. Ormiston	P. & O. Steam Nav. Co.
<i>Mulbana</i>	..	GFTM	19.10.53	E. G. Baines	L. R. Holt, G. Guman, W. Pinder	D. Don	British India Steam Nav. Co., Ltd.
<i>Muristan</i>	..	MABB	..	T. H. Farrar, O.B.E.	S. L. R. Simpson, F. Bowley, W. Mackenzie	D. N. Todd	Frank C. Strick & Co., Ltd.
<i>Myrtlebank</i>	..	GLQB	15.5.53	L. F. Holden	C. T. Lewis, A. Tavendale, A. Szimczak	F. McGuinness	Andrew Weir & Co., Ltd.
<i>Napier Star</i>	..	MAPN	7.9.53	J. B. Kennedy	K. S. Mann, D. B. Gaffney, G. H. Stubblings	C. J. Higginson	Blue Star Line, Ltd.
<i>Naticina</i>	..	GIGH	3.6.53	J. M. Davidson	J. C. Taylor, R. Timmuth, J. Sydenham	R. Prole	Anglo-Saxon Petroleum Co., Ltd.
<i>Nector</i>	..	GNGZ	11.8.53	J. M. Anderson	C. L. Pielow, D. S. Moreby, J. R. Whitley	H. Roberts	A. Holt & Co.
<i>New Australia</i>	..	GZKD	4.8.53	K. D. G. Fisher	I. S. McEwan, W. W. Scott, W. Siddall	H. Matthews	Shaw, Savill & Albion Co., Ltd.
<i>New York City</i>	..	MATR	10.4.53	F. R. Neil	A. N. Couch, —, Rogers	T. Jenkins, M.B.E.	Charles Hill & Sons, Ltd.
<i>New Zealand Star</i>	..	GYCR	8.10.53	W. H. Bowie	A. G. Hocking, J. Hewson, S. Tompsett	A. Ewart	Blue Star Line, Ltd.
<i>Newfoundland</i>	..	GNMC	9.9.53	C. H. Kenyon	N. R. Land, P. Warne, D. Smith	T. Cahill	Furness Withy & Co., Ltd.
<i>Nordic</i>	..	GDJC	24.4.53	E. G. Jones	A. Uden, A. Adams, H. Gates, H. White	W. L. Stone	Prince Line, Ltd.
<i>Norwegian</i>	..	GDMC	4.2.52	H. Wylie	A. Buchan, J. Short, A. Miller	C. Carpenter	Donaldson Bros. & Black, Ltd.
<i>Nottingham</i>	..	GCNC	12.10.53	L. W. Fulcher	L. H. Bridges, H. Burton, P. Fletcher, T. Metcalfe	J. Clarke	Federal Steam Nav. Co., Ltd.
<i>Nova Scotia</i>	..	GNNK	13.4.53	J. E. Wilson, O.B.E.	J. D. D. Williamson, C. Hollinshead, G. Stanford	W. J. Peat	Furness Withy & Co., Ltd.
<i>Novelist</i>	..	GMLG	23.9.53	R. H. Longster	J. F. Adams, R. H. Douglas, D. W. Baxendale	J. Blackwell	T. & J. Harrison, Ltd.
<i>Orari</i>	..	GJKX	21.4.53	J. R. M. Ramsey	C. S. Single, A. Stokoe, J. Loveridge, P. Holloway	J. Robinson	New Zealand Shipping Co., Ltd.
<i>Orcades</i>	..	MABA	2.5.53	N. A. Whinfield	V. Webster, B. Campbell, J. A. Bensley	F. Miller	Orient Steam Nav. Co., Ltd.
<i>Oregon Star</i>	..	MAPH	2.10.53	I. E. G. Goldsworthy, R.D., R.N.R.	J. A. Holloway, —, Trehearne, J. L. Mate	F. Guerin	Blue Star Line, Ltd.
<i>Orion</i>	..	GYKL	2.9.53	A. G. Hawker, O.B.E., R.D., R.N.R.	K. Howard, P. Watts, P. O. Anthony	P. Parish	Orient Steam Nav. Co., Ltd.
<i>Oronsay</i>	..	GCNB	11.6.53	A. G. Hawker, O.B.E., R.D., R.N.R.	C. Walker, R. D. Cookman, D. Hays	R. Oakley	Orient Steam Nav. Co., Ltd.
<i>Orontes</i>	..	GBXM	8.10.53	A. Hocken	J. W. Jackson, H. Champneys	A. Quinton	Orient Steam Nav. Co., Ltd.
<i>Otaki</i>	..	GPBV	23.9.53	N. W. Smith	W. A. French, A. Faulkner, E. Leech	—, Heath	New Zealand Shipping Co., Ltd.
<i>Otranto</i>	..	GFKV	30.4.53	F. H. Perry	E. J. Dinutti, J. A. Hughes, J. K. Thornton, C. W. Greavson, —, Charlesworth	C. Seaton	Orient Steam Nav. Co., Ltd.
<i>Pacific Fortune</i>	..	GBFM	22.8.53	G. Brown	S. Barlow, M. J. Brown, T. Monkton	I. R. Thomas	Furness Withy & Co., Ltd.
<i>Pacific Importer</i>	..	GDKV	8.9.53	W. F. Swann	W. Howard, W. Brown, D. Macdonald	P. Hollis	Furness Withy & Co., Ltd.
<i>Pacific Liberty</i>	..	GDFQ	20.8.53	..	R. Clothier, —, Williamson, P. R. Farthing	E. D. MacPherson	Furness Withy & Co., Ltd.

NAME OF VESSEL	CALL SIGN	LAST RETURN RECEIVED	'CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS
<i>Pacific Nomad</i>	GCRZ	17.6.53	R. E. Holland	D. Marton, A. R. Dyason, E. H. Gregson	G. Barling	Furness Withy & Co., Ltd.
<i>Pacific Reliance</i>	GMIK	26.5.53	P. F. Owens	V. C. Jackson, R. L. Heyes, A. Voss	W. Jennings	Furness Withy & Co., Ltd.
<i>Pacific Stronghold</i>	GNSQ	14.8.53	A. H. Cooke	J. Cockburn, E. Hall, D. J. Mander	M. McNaughton	Furness Withy & Co., Ltd.
<i>Pacific Umy</i>	GUAN	9.7.53	E. A. Kemp	A. W. B. Chalmers, W. G. Webb, J. T. Sheffield	W. McGrath	Furness Withy & Co., Ltd.
<i>Pacure</i>	GCNX	17.9.53	J. Purvess	K. J. Leslie, H. G. Penny, G. Evans	R. Haskayne	Elders & Fyffes, Ltd.
<i>Palama</i>	MMBF	23.4.53	I. M. Sinclair	A. K. Langley, P. C. Reed, K. W. Farr, D. C. Barnett	W. C. Mathews	P. & O. Steam Nav. Co.
<i>Pampas</i>	GCDL	23.7.53	H. Davies	K. Harper, F. Dickinson, N. Smith	R. Cole	Royal Mail Lines, Ltd.
<i>Papamui</i>	GDJW	7.7.53	R. Dell	D. J. Cauldwell, K. J. Field, P. Cresswell	M. Hookaway	New Zealand Shipping Co., Ltd.
<i>Paparoa</i>	GBCZ	21.9.53	D. Brittain	G. McCathie, J. Reid, R. A. Wilson	L. Carter	New Zealand Shipping Co., Ltd.
<i>Paraguay</i>	MAQS	8.7.53	W. S. Thomas	J. Scates, R. Phillips, P. R. Brown	G. Christie	Royal Mail Lines, Ltd.
<i>Paraguay Star</i>	GTNC	1.4.53	D. R. Macfarlane, D.S.O., O.B.E.	E. A. Davies, I. Haldane, I. Hay	T. Murdoch	Blue Star Line, Ltd.
<i>Pardo</i>	GMNZ	28.9.53	W. Williams	R. J. Kistler, A. F. Knottage, R. E. Fairley	K. Hogan	Royal Mail Lines, Ltd.
<i>Parina</i>	GCLQ	28.10.53	G. S. Grant, R.D., R.N.R.	I. Escolme, M. Wardle, M. Thompson	A. Thompson	Royal Mail Lines, Ltd.
<i>Paringa</i>	MIMBD	14.5.53	E. J. Kerridge	M. R. Prowse, J. M. Jones, M. O'Connell, P. Everatt	G. Soames	P. & O. Steam Nav. Co.
<i>Parthia</i>	GSWQ	26.8.52	J. D. Armstrong, D.S.C., R.D., R.N.R.	J. C. Nicholson, J. King, P. A. A. James	F. Markham	Cunard Steamship Co., Ltd.
<i>Perim</i>	GCGB	27.5.53	E. J. Spurling	H. Toon, F. N. Eagle, C. B. Thompson, G. V. Dobbin	F. Groves	P. & O. Steam Nav. Co.
<i>Pertshire</i>	GYWK	24.7.53	T. N. Soane	S. M. Thompson, J. D. Richards, R. Simmons	L. C. Cooper	Turnbull Martin & Co., Ltd.
<i>Petula</i>	MFQM	29.8.53	F. Evans	C. N. Dickson, R. E. Sharma	C. N. Dickson	The Captain
<i>Philomel</i>	GYPV	18.4.52	H. M. Selmer	K. Phelps, G. Baron, J. Everett	J. Tuttle	General Steam Nav. Co., Ltd.
<i>Pilcomayo</i>	GBZX	16.10.53	F. A. C. Thacker	R. J. Turner, P. C. Davies, J. Arnott	P. Goulden	Royal Mail Lines, Ltd.
<i>Pipiriki</i>	GDRQ	16.10.53	K. Barnett, R.N.R.	D. Handley, W. Sewell, E. Mallett, G. Hudson	M. Dutton	New Zealand Shipping Co., Ltd.
<i>Planter</i>	GZSS	19.5.53	A. Robertson	W. C. Johnston, M. Watson, G. F. Smith	R. J. McNeil	T. & J. Harrison, Ltd.
<i>Polar Maid</i>	MAQX	20.4.53	W. Spence	J. B. Kerr, D. McLean, P. Forsyth	J. Williams	Chr. Salvesen & Co.
<i>Port Adelaide</i>	MGGC	16.6.53	C. R. Townshend	A. J. Braund, T. Stowell, L. Garnham, P. P. Crumpton	O. Livermore	Port Line, Ltd.
<i>Port Auckland</i>	GWRB	29.4.53	J. G. Lewis, O.B.E.	R. Bostock, P. Heneker, B. Collier	J. Skinner	Port Line, Ltd.
<i>Port Brisbane</i>	GWRC	25.4.53	F. W. Bailey, M.B.E.	K. W. Jayne, D. J. Evans, P. S. Packwood	W. H. Parrott	Port Line, Ltd.
<i>Port Hobart</i>	GKGC	8.10.53	P. S. Ball	J. F. Lester, W. T. Stevens, J. Leachery	P. Byrnes	Port Line, Ltd.
<i>Port Jackson</i>	GZKR	11.6.53	G. G. Langford	E. Willis, J. Newbury, G. Cooke, J. Dalton	G. Sharnan	Port Line, Ltd.
<i>Port Lincoln</i>	GFZK	18.9.53	J. L. Porter	P. R. Jones, E. Newstead, T. J. Stowell, J. B. S. Farmer	P. J. McKeon	Port Line, Ltd.
<i>Port Macquarie</i>	MAQY	21.7.53	W. Eastoe	M. Lee, —, Kensett, C. Gordon, B. C. Crabb	B. C. McCorrie	Port Line, Ltd.
<i>Port Napier</i>	GPKD	20.8.53	L. J. Skalles	G. L. Danton, R. V. McKee, D. E. Kemp, P. Guest	T. Hargraves	Port Line, Ltd.
<i>Port Phillip</i>	MAQZ	9.4.53	L. Copeland	D. Burgess, J. Peck, J. F. O'Dowd, P. Holloway	B. McGovern	Port Line, Ltd.
<i>Port Pirie</i>	GLVQ	24.9.53	P. H. Pedrick	K. M. Nicol, T. A. Fairbairn, I. Munro	W. Sharkey	Port Line, Ltd.
<i>Port Townsville</i>	MGCY	9.9.53	E. W. R. Young	R. C. W. Marr, J. R. King, J. P. Hatchley	D. Byrne	Port Line, Ltd.
<i>Port Victor</i>	MSWK	23.7.53	E. T. N. Lawrey	W. Dutlie, G. K. Morris, A. Wardell, P. Hannan	D. McNeil	Port Line, Ltd.

Port Vindex ..	MAUW	29.5.53	E. E. Roswell	..	C. A. Lancaster, J. Curtis, J. C. Naylor	F. Sharman ..	Port Line, Ltd.
Port Wellington	GDNJ	27.5.53	G. W. Lovegrove	..	I. H. Stewart, G. G. Mooney, W. P. Russell	J. B. French	Port Line, Ltd.
Port Wyndham	GYCW	16.7.53	D. F. Morgan	..	E. E. Chapman, J. T. Owen, —, Gilling, K. Millar	J. N. Coutts	Port Line, Ltd.
Potaro	GNLJ	3.9.53	W. Tennent	..	P. Campbell, J. Postill, D. H. McCree	J. Lawrence	Royal Mail Lines, Ltd.
Powell	GKJL	31.7.53	D. Cornwell	..	J. S. Heptinstall, —, Baker	A. G. Cope	Hector Whaling, Ltd.
Pretoria Castle	GOAE	17.10.53	G. H. Mayhew	..	J. B. Langley, G. Dadds, M. Llewellyn	J. Gilbart	Union Castle Mail S.S. Co., Ltd.
Prospector	GIMS	27.6.53	H. T. Wells	..	E. Sherlock, A. Greer, T. A. Beecroft	P. G. Weston	T. & J. Harrison, Ltd.
Radley	GZZG	20.10.53	H. W. White, O.B.E.	..	N. F. Lloyd, H. Blair, T. A. Gill	A. Wilkinson	Stephens, Sutton, Ltd.
Rakata	GFGW	7.10.53	C. J. Cordran, R.N.R.	..	J. Hannah, M. Heron, I. Christall, J. Evans	P. Broome	New Zealand Shipping Co., Ltd.
Ramore Head	MAXX	15.6.53	W. A. Haddock, O.B.E.	..	J. E. Willison, C. E. Pringle, R. Harris	F. Murrant	G. Heyn & Sons, Ltd.
Rangitane	GDBV	7.7.53	T. L. Maltby	..	D. Burdett, J. Newing, D. Cooper, P. Egan	E. Saunders	New Zealand Shipping Co., Ltd.
Rangitata	GSZN	6.7.53	E. A. Burton	..	J. Masson, G. Pool, L. B. West, R.N.R., R. Michael	J. Grant	New Zealand Shipping Co., Ltd.
Rangitiki	GSXW	18.9.53	A. E. Lettington, O.B.E., D.F.C.	..	A. W. S. Cripps, J. Young, R. Kinlock, B. Saster	D. Charter	New Zealand Shipping Co., Ltd.
Rangitoto	GLMV	11.6.53	C. R. Pilcher, O.B.E.	..	A. Finch, F. Williamson, P. Lay, K. Mayhew, B. Anstey	G. A. Parker	New Zealand Shipping Co., Ltd.
Regent Hawk	GMND	3.9.53	G. H. Hobson	..	Z. Wojewodski, R. Armstrong, T. W. Walker	R. W. Jones	Regent Petroleum Tankship Co. Ltd.
Reina del Pacifico	GMPS	15.6.53	J. Whitehouse	..	T. J. Riley, R. Lewis, A. Maclean, J. Hyland	J. Butler	Pacific Steam Nav. Co.
Retriever	MRYW	..	C. C. R. Evans	..	W. T. Goodall, G. H. C. Reynolds, K. Matheson, J. K. Cook	J. Grant	Cable & Wireless, Ltd.
Reynolds	GONC	8.6.53	J. Burns	..	G. Leith, J. C. Pratt, R. Skinner	W. Roe	Bolton Steam Shipping Co., Ltd.
Rhodesta Star	GUAX	5.9.53	F. Hambridge	..	J. Hurton, P. Thornton, J. Jenkins	C. Child	Blue Star Line, Ltd.
Rialto	GBLV	13.4.53	A. E. F. Payne	..	A. England, R. Cudbertson, J. A. Pettinger	—, Burnett	Ellerman's Wilson Line, Ltd.
Richmond Castle	GCSP	2.3.53	R. Owen	..	P. Eckford, R. K. Highley, J. Francis	J. Waddell	Union Castle Mail S.S. Co., Ltd.
Ripplingham Grange	GIGP	23.7.53	W. R. Andrews	..	G. Spong, P. Walper, H. Keeble	S. Gobbi	Houlder Bros. & Co., Ltd.
Rochester Castle	GZQF	23.7.53	E. W. Black, O.B.E.	..	P. M. Pollard, T. Mayo, D. Bird	B. P. Lewis	Union Castle Mail S.S. Co., Ltd.
Roonagh Head	GNTN	2.10.53	C. E. Lorrains	..	J. McCormick, A. F. James, F. Best	—, Kerr	G. Heyn & Sons, Ltd.
Roslin Castle	GYIZ	25.2.53	J. P. Aplin	..	J. P. Muir, —, MacKinley, —, Oates	J. Hilton	Union Castle Mail S.S. Co., Ltd.
Roxburgh Castle	GDFT	17.9.53	G. E. Stephenson	..	J. M. Archbold, T. Jones, J. D. McMillan	F. Broadhurst	Union Castle Mail S.S. Co., Ltd.
Royal Star	GBGS	18.7.52	A. H. Dare	..	G. W. John, Q. Beadon, M. Oates	J. Stewart	Union Castle Mail S.S. Co., Ltd.
Rualthine	MARI	12.8.53	B. Evans	..	D. A. Clulow, J. Owen, M. Pheby	J. Heath	Blue Star Line, Ltd.
Runic	GKSY	14.8.53	L. H. Edmeads	..	J. F. J. Mason, J. F. Hollier, —, Thomas	A. McMurray	New Zealand Shipping Co., Ltd.
	GGCS	22.9.53	..	..	P. Morgan, J. Wyles, W. Hutchison, K. F. Brown	A. L. Hall	Shaw, Savill & Albion Co., Ltd.
Sacramento	GKCN	16.4.53	T. G. Mussared	..	L. Gibson, P. W. Lawson, T. Fugill	W. Churchman	Ellerman's Wilson Line, Ltd.
Salacia	GZRN	28.9.53	R. McNie	..	J. McCully, G. Manson, W. G. McKean	B. E. Bewley	Donaldson Bros. & Black, Ltd.
Salamanca	GLSG	27.1.53	D. W. Hutchinson	..	J. E. Pepper, G. R. Dewarap, R. B. Bryant	C. Weekes	Pacific Steam Nav. Co.
Salaverry	GBLQ	15.7.53	A. Lyall	..	A. C. Gordon, J. H. Allenby, T. Wilcockson	T. Tynan	Pacific Steam Nav. Co.
Salinas	GLLK	19.6.53	T. J. Naylor	..	G. McC. Hunter, R. K. Thomas, —, Whittaker	J. Brown	P. Henderson & Co.
Salween	GFFN	23.7.53	H. V. V. Poole	..	T. F. Fields, J. Morgan, K. Brooks, D. McKillop	J. P. Sugrue	Pacific Steam Nav. Co.
Samanco	MARQ	13.6.53	P. Ray	..	H. T. Cunliffe, R. G. Pass, P. Dugguid	E. Bishop	Cunard Steamship Co., Ltd.
Samaria	GJCF	18.8.53	F. G. Watts, R.D., R.N.R.	..	P. Miller, W. M. Roberts, D. Calvert	N. Clarke	Eagle Oil & Shipping Co., Ltd.
San Adolfo	GYKK	23.9.53	J. H. Gray	..	W. F. Povey, T. Bowlerwell, J. E. Buck	G. M. Leighton	Eagle Oil & Shipping Co., Ltd.
San Cirilo	GZNR	5.11.52	C. R. Pearson	..	D. J. Powell, R. Errington	A. McGillivray	Eagle Oil & Shipping Co., Ltd.
San Felix	GFIJZ	6.11.52	G. A. Shaw	..	B. V. Orange, R. Auric, J. Batey	P. Scanlan	Eagle Oil & Shipping Co., Ltd.
San Velino	GCNY	31.8.53	L. Mays	..	G. I. Hughes, T. J. Magee, P. Kirtan	P. M. Matley	Eagle Oil & Shipping Co., Ltd.
San Veronica	MASQ	17.6.53	W. W. Wigham	..	L. F. Lawrence, S. J. Goldsworthy, P. Hay-Smith	..	..

NAME OF VESSEL	CALL SIGN	LAST RETURN RECEIVED	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS
<i>San Vulfrano</i> ..	MASR	25.3.53	L. Mays ..	J. G. Hughes, K. Spenser, J. E. Buck ..	V. Rowe ..	Eagle Oil & Shipping Co., Ltd.
<i>Sansu</i> ..	GOQN	29.6.53	J. A. Cleaton ..	— Doran, — Oates, — Rolands ..	— Wilson ..	Elder Dempster Lines, Ltd.
<i>Sarmiento</i> ..	GBNR	9.4.53	C. H. Rice ..	W. J. Campbell, A. Lang, J. B. Farrell ..	W. Williams ..	Pacific Steam Nav. Co.
<i>Saxon Star</i> ..	MARW	26.6.53	J. E. Evans, D.S.C., R.D., R.N.R.	F. Nuttall, J. Hyland, J. T. Bruce ..	J. Foye ..	Pacific Steam Nav. Co.
<i>Scythia</i> ..	MARX	17.7.53	R. J. C. McDonald ..	J. King, R. Gibb, E. Dyer ..	R. Bennett ..	Blue Star Line, Ltd.
<i>Selector</i> ..	GDYP	19.9.53	D. M. MacKellar, R.D., R.N.R.	N. M. Johnson, T. Ridley, B. V. Mercer ..	S. W. Brown ..	Cunard Steamship Co., Ltd.
<i>Settler</i> ..	MARZ	25.4.53	R. L. Williams ..	R. Patmore, J. A. Edwards, E. Ashdown ..	G. Prow ..	T. & J. Harrison, Ltd.
<i>Shelbank</i> ..	GTTX	3.7.53	R. F. Phillips ..	Wilde ..	J. J. Blake ..	T. & J. Harrison, Ltd.
<i>Shielbank</i> ..	GDPZ	28.9.53	D. A. Reid ..	G. A. D. Govan, D. Campbell, S. F. Bowditch ..	W. H. Edginton ..	Andrew Weir & Co., Ltd.
<i>Silveroak</i> ..	GCQR	14.5.53	J. Leask ..	M. H. F. Smith, M. Perry, P. Seymour ..	— Connolly ..	Silver Line, Ltd.
<i>Silversandal</i> ..	GSFQ	16.4.53	C. J. Metcalf ..	R. F. McNamara, D. Morrison, N. Tud-denham ..	E. Williams ..	Silver Line, Ltd.
<i>Silverwalnut</i> ..	GSFT	3.6.53	E. Stark ..	M. Bingham, M. H. F. Smith, J. Bowman ..	W. Dobbie ..	Headlam & Son
<i>Sneaton</i> ..	GDBS	17.9.53	W. Armstrong ..	E. Wilson, M. Turton, W. Atkinson ..	I. Nicholson ..	P. & O. Steam Nav. Co.
<i>Socotra</i> ..	MASC	8.4.53	W. T. Banks ..	D. O. Williams, C. B. Cooke, — Norris, D. M. Reynolds ..	H. J. Camp ..	Federal Steam Nav. Co., Ltd.
<i>Somerset</i> ..	GJMN	19.10.53	W. J. T. Stevens ..	R. Holdsworth, D. Swyres, D. Fanthum ..	T. Mason ..	Blue Star Line, Ltd.
<i>South Africa Star</i> ..	GUAU	29.8.53	R. M. T. Jones ..	F. P. McGuicken, P. W. Hunt, H. A. Sproul-Cran ..	P. M. Hacker ..	Chr. Salvesen & Co.
<i>Southern Atlantic</i> ..	GBLY	7.7.53	J. O. Bowie ..	G. A. Waterson, L. M. Smith, G. A. D. Govan ..	P. Curson ..	Chr. Salvesen & Co.
<i>Southern Garden</i> ..	MASF	5.5.53	W. J. Swanson ..	S. McGillivray, W. Scott, A. Smith ..	J. Christie ..	Chr. Salvesen & Co.
<i>Southern Opal</i> ..	MASG	20.5.53	A. F. Baikie ..	J. Thomson, J. MacLean, R. Glasbam ..	C. Houston ..	Chr. Salvesen & Co.
<i>Southern Venture</i> ..	GNNM	14.5.53	H. Myhre ..	F. Jho, Hansen, A. Harkness, J. Holtan ..	I. MacMorran ..	T. & J. Harrison, Ltd.
<i>Specialist</i> ..	GCYF	25.7.53	D. Wolstenholme ..	W. Tinkler, W. E. Hinde, T. S. Maddox ..	F. Hickey ..	Union Castle Mail S.S. Co., Ltd.
<i>Stirling Castle</i> ..	GYPX	19.9.53	J. Trayner ..	K. J. Barry, R. Goddard, P. Redford ..	W. Brown ..	Turnbull Martin & Co.
<i>Stirlingshire</i> ..	GCQD	1.5.53	E. W. Jenkins ..	E. Prothero, W. A. Cuthill, C. D. Hedges ..	N. J. Braddon ..	P. & O. Steam Nav. Co.
<i>Strathaird</i> ..	GRSX	24.2.53	G. H. Jenkins ..	C. R. Hearnshaw, J. F. T. Houghton, G. Iatham ..	H. Jardine ..	P. & O. Steam Nav. Co.
<i>Stratheden</i> ..	GDGT	6.5.53	R. G. Freeman ..	G. V. Dobbin, E. Aikman, G. E. Harris, H. M. Wright ..	H. Horne ..	P. & O. Steam Nav. Co.
<i>Strathmore</i> ..	GYMS	11.7.52	R. E. Cowell, R.D., R.N.R.	D. Shipp, M. D. Penny, J. P. Crighton, — Blackburn ..	J. P. Carey ..	P. & O. Steam Nav. Co.
<i>Strathnaver</i> ..	GRPZ	12.3.53	C. E. Pollitt ..	P. J. Passmore, P. Aspinall, P. Jackson, D. W. Stock ..	W. Miller ..	P. & O. Steam Nav. Co.
<i>Struan</i> ..	MASI	28.5.53	W. Scott ..	J. Clark, J. Lough, J. D. Pollack ..	J. Edmund ..	Chr. Salvesen & Co.
<i>Suffolk</i> ..	GQOS	6.6.53	F. Pover ..	C. T. Rowlands, P. Field, K. Murray ..	H. Hare ..	Federal Steam Nav. Co., Ltd.
<i>Sunover</i> ..	MSLB	25.7.53	A. MacLellan ..	T. Horne, J. Boyter, D. McBain, M. Birchall ..	J. Davison ..	Clunies Shipping Co., Ltd.
<i>Sussex</i> ..	MAEF	31.7.53	F. Loughheed ..	R. T. Youngman, J. Witchell, S. H. Sparrow ..	E. Howarth ..	Federal Steam Nav. Co., Ltd.
<i>Sussex Trader</i> ..	GNQC	19.1.53	H. Young ..	D. Barbour, H. P. Ellison, L. Steele ..	T. Goodrum ..	Trader Navigation Co., Ltd.
<i>Sutherland</i> ..	GBYG	10.8.53	R. W. Nicolson ..	E. F. Smith, D. Campbell, F. Bourne, K. Patrick ..	C. A. W. Milne ..	B. J. Sutherland & Co., Ltd.
<i>Sydney Star</i> ..	MKSM	8.7.53	J. B. Kennedy ..	F. E. Thomas, G. Stanley, K. Kelly ..	W. Wade ..	Blue Star Line, Ltd.

<i>Tabaristan</i>	..	GZDR	26. 9. 53	W. J. Ellis ..	..	W. Rutherford, G. L. Andrews, R. Goudie	H. J. Roberts	..	Frank C. Strick & Co., Ltd.
<i>Tagelus</i>	..	GBMG	..	T. Green ..	..	D. H. White, —, McCabe, —, Phillips,	F. E. Page ..	..	Anglo-Saxon Petroleum Co., Ltd.
<i>Tamaroa</i>	..	GFWX	3. 6. 53	T. H. Davies	..	A. F. Morrison ..	D. MacCrae	..	Shaw, Savill & Albion Co., Ltd.
<i>Tamele</i>	..	GCBF	20. 1. 53	H. Flowerdew	..	C. D. Craig, W. Newport, I. Cameron,	A. Allen	..	Elder Dempster Lines, Ltd.
<i>Tarkua</i>	..	MASU	22. 5. 53	W. Rowlands	..	S. Carr ..	V. R. Ferrand	..	Elder Dempster Lines, Ltd.
<i>Tasmania Star</i>	..	GKPC	17. 12. 52	G. Owen, O.B.E., R.D.,	..	R. S. Elliott, J. Stott, R. M. L. Munroe,	S. Roberts	..	Anglo-Saxon Petroleum Co., Ltd.
<i>Tasso</i>	..	GLMR	11. 6. 53	H. Hill ..	..	C. J. Ball ..	J. Lawrie	..	Blue Star Line, Ltd.
<i>Tetooa</i>	..	GJFO	27. 1. 53	I. Budgett ..	..	A. Morrison, E. Dyer, W. Andrew	D. Brandham	..	Ellerman & Wilson Line, Ltd.
<i>Telemachus</i>	..	GBLB	25. 9. 53	W. J. Moore	..	J. Mitchell, A. M. Robertson, J. Ledger	D. Noble	..	New Zealand Shipping Co., Ltd.
<i>Temple Head</i>	..	MAHZ	20. 5. 53	J. C. Skears	..	A. Mash, J. Milner, B. Pussey	A. Jones	..	A. Holt & Co.
<i>Tenagodus</i>	..	GDLZ	19. 9. 53	R. F. Garrod	..	N. Welden, P. Hopper, D. Main, J. Jones	W. W. Kay ..	..	Lambert Bros., Ltd.
<i>Teviot</i>	..	MASX	29. 8. 53	H. Davies ..	..	H. Young, C. Hardy, P. Guerrier	W. Tomlinson	..	Anglo-Saxon Petroleum Co., Ltd.
<i>Thalamus</i>	..	GDSV	8. 10. 53	J. Kell, M.B.E.	..	W. Irvine, E. Bennett, G. T. Sowter,	G. P. Shickle	..	Royal Mail Lines, Ltd.
<i>Theliconus</i>	..	GBMT	14. 7. 53	G. N. Jenkins	..	A. M. Riddell	W. Holbrook	..	Anglo-Saxon Petroleum Co., Ltd.
<i>Timaru Star</i>	..	GKKM	31. 7. 53	H. W. McNeil	..	K. Bolland, W. M. Wheatley, G. Chamber-	G. Sangster	..	Blue Star Line, Ltd.
<i>Tinto ..</i>	..	GBYT	31. 3. 53	S. H. Bennett, M.B.E.	..	lain	D. J. James	..	Ellerman's Wilson Line, Ltd.
<i>Tongariro</i>	..	GIFZ	11. 2. 53	J. D. Guyler	..	J. Forbes, S. W. Dean, A. Rousson, W.	P. Stokes	..	New Zealand Shipping Co., Ltd.
<i>Torr Head</i>	..	GZPW	14. 8. 53	S. Stark	..	Hunter ..	G. Stocks	..	G. Heyn & Sons, Ltd.
<i>Tregenna</i>	..	GBPM	1. 1. 53	C. Lloyd Collings, O.B.E.	..	S. F. Darroch, R. C. Adams, H. F.	L. W. Ellis ..	..	Hain S.S. Co., Ltd.
<i>Trevelan</i>	..	GBPQ	19. 6. 53	M. Price ..	..	Woolston ..	T. H. Murrin	..	Hain Steamship Co., Ltd.
<i>Trebyon</i>	..	GBPP	23. 7. 53	F. I. Cornish, M.B.E.	..	T. E. Harris, W. Pitcher, T. Ripley,	H. L. McKean	..	Anglo-Saxon Petroleum Co., Ltd.
<i>Tribulus</i>	..	GFJS	11. 7. 53	G. Robson ..	..	C. Leatham	W. H. Major	..	T. & J. Harrison, Ltd.
<i>Trevaylor</i>	..	GCKG	15. 1. 53	I. M. Price	..	J. Pettinger, G. Marrow, J. W. Guiliat	J. Sterry ..	..	Anglo-Saxon Petroleum Co., Ltd.
<i>Trochiscus</i>	..	GBNZ	9. 7. 53	W. Baker ..	..	R. Loveridge, M. Forster	C. D. Boudren	..	Royal Mail Lines, Ltd.
<i>Tweed</i>	..	GFKB	1. 10. 53	J. R. Petrie	..	W. Greig, L. L. Seaton, K. S. Kelly	R. Lach	..	Watts, Watts & Co., Ltd.
<i>Twickenham</i>	..	GBRP	24. 1. 52	A. J. C. Barff	..	P. T. Dennison, A. Millar, D. Ball	W. Gaires	..	Bullard King & Co., Ltd.
<i>Umitata</i>	..	GNDC	10. 7. 53	J. A. Tully ..	..	J. M. Downard, B. W. George, M. F.	C. V. James ..	..	Bullard, King & Co., Ltd.
<i>Umzinto</i>	..	GDQF	30. 9. 53	R. L. Weston	..	Kennet ..	G. Stacey	..	Cunard Steamship Co., Ltd.
<i>Umrzinto</i>	..	GIFQ	15. 6. 53	R. Harber ..	..	H. Gravell, L. Edwards, D. Alavoine	—, McTurk ..	..	Cunard Steamship Co., Ltd.
<i>Vandalia</i>	..	GCRQ	11. 4. 53	G. S. Evans	..	B. J. Vallette, P. G. Marking, E. L.	D. C. White	..	Anglo-Saxon Petroleum Co., Ltd.
<i>Vardulia</i>	..	GCFW	17. 5. 52	A. N. Sargent, O.B.E., R.D.,	..	Petherbridge	G. Williams	..	Ellerman's Wilson Line, Ltd.
<i>Velletia</i>	..	MGGD	26. 8. 53	D. T. Keddie	..	V. Wise, F. Coleman, L. J. Cooper	J. Houghney	..	Shaw, Savill & Albion Co., Ltd.
<i>Vestra</i>	..	MINB	18. 6. 53	D. S. Archibald	..	E. Williams, D. Bloom	J. Sargent	..	Shaw, Savill & Albion Co., Ltd.
<i>Volo ..</i>	..	GPCJ	30. 3. 53	A. Morrell	..	J. Roberts, F. Botham	J. Downie	..	Sir R. Ropner & Co., Ltd.
<i>Waipawa</i>	..	GWXQ	3. 9. 53	J. L. Stobbs, R.D., R.N.R.	..	R. J. Howlett, R. Box, G. S. Bonnar	H. Wilson	..	
<i>Wairangi</i>	..	MATX	21. 8. 53	R. A. Barns	..	R. T. Brown, S. E. Hooper, R. H. Arnott		..	
<i>Waivera</i>	..	GBJB	4. 7. 53	L. J. Hopkins	..	R. Paterson, J. Parker, R. F. Batchelor		..	
<i>Walvis Bay</i>	..	GKBZ	4. 8. 53	R. E. Kenton	..	J. G. Campbell, J. H. Palmer, J. Aldous,		..	

NAME OF VESSEL	CALL SIGN	LAST RETURN RECEIVED	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS
<i>Wanstead</i> ..	GFLS	28.7.53	J. D. Mackenzie ..	A. L. Rigden, M. F. Diggins, L. Crump, H. Anderson ..	K. F. Lax ..	Watts, Watts & Co., Ltd.
<i>Warkworth</i> ..	MALF	17.9.53	N. Thompson, M.B.E.	H. Gunton, G. B. Bell, C. Harron ..	G. B. Holyoake ..	R. S. Dalgliesh, Ltd.
<i>Warwick Castle</i> ..	GRRJ	25.10.52	L. H. Farrow ..	J. E. Rawlins, A. A. Freer, D. P. Beckett, A. George ..	R. C. Cullen ..	Union Castle Mail S.S. Co., Ltd.
<i>Wendover</i> ..	GFML	31.7.52	W. Donald ..	J. Shearer, D. J. Vincent, W. Miller, M. Court ..	N. Ridley ..	Watts, Watts & Co., Ltd.
<i>Winchester Castle</i> ..	GTPZ	24.9.53	G. W. B. Lloyd ..	A. D. Mildren, P. Truman, M. J. Bowyer ..	R. Brew ..	Union Castle Mail S.S. Co., Ltd.
<i>Windsor</i> ..	GPOG		D. V. Cameron ..	E. Pearce, — Griffin ..	G. Wallis ..	Watts, Watts & Co., Ltd.
<i>Worcestershire</i> ..	GFZM	20.8.53	F. C. Brooks ..	R. Weir, R. M. Bessant, G. W. Waugh ..	W. Fletcher ..	Bibby Bros. & Co.
<i>Woodford</i> ..	GFMM	13.4.53	A. J. Cox ..	H. Treasurer, J. C. Lewis, R. Beaumont ..	D. Carr ..	Watts, Watts, & Co., Ltd.
<i>Yoma</i> ..	GLPN	29.7.53	S. Thomson ..	S. B. Hamilton, M. Szeperawicz, F. O. Ridley ..	W. Allen ..	P. Henderson & Co.

Supplementary Ships

NAME OF VESSEL	CALL SIGN	LAST RETURN RECEIVED	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS
<i>Alert</i> ..	GCBM	5.9.53	R. H. J. Wallis ..	R. M. Tuckwell, D. Cussor, O. A. Alford ..	W. Morrison ..	H.M. Postmaster-General
<i>Ariel</i> ..	GMDY		C. M. G. Evans, M.B.E.	E. J. Evans, F. Gernett, A. V. Paines, — Chisholm ..	—, Cunningham ..	H.M. Postmaster-General
<i>Bellerby</i> ..	MQJF	29.7.53	F. Lloyd ..	A. G. Garland, T. H. Turner ..	J. Isherwood ..	Ropner Shipping Co., Ltd.
<i>Blairdona</i> ..	GILG	24.6.53	J. MacVean ..	K. Muir, H. Towers, A. Findlay ..	E. Yard ..	Geo. Nisbet & Co.
<i>Cape Breton</i> ..	GLXG	2.2.53	J. Smith ..	—, Miller, W. R. Pilling, A. D. Chappell ..	V. Dalton ..	C. T. Bowring & Co., Ltd.
<i>Cape Howe</i> ..	GCYP	9.5.53	C. M. Mortimer ..	T. R. Baker, W. J. Clarke, M. Symon ..	J. McDonald ..	Lyle Shipping Co., Ltd.
<i>Circassia</i> ..	GZMD	28.9.53	J. McG. Brown ..	J. Ballantyne, A. McKendrick, R. L. Crawford, D. B. Watt ..	C. A. Ritchie ..	Anchor Line, Ltd.
<i>Clan Alpine</i> ..	GIFF	7.9.53	T. O. Marr ..	B. W. Hollman, M. P. R. Turner, R. W. I. Kenyon ..	R. G. Davies ..	Cayzer Irvine & Co., Ltd.
<i>Clan Lamont</i> ..	GTYD	15.10.53	J. E. Townrow ..	G. B. Charleson, N. F. Stewart, G. B. Helm, J. J. Grigor, D. Stobart ..	D. Munroe ..	Cayzer Irvine & Co., Ltd.
<i>Clan Macbrayne</i> ..	MAQA	9.4.53	J. P. Dunphy ..	G. W. Wilson, D. L. Muir, G. S. Gowans ..	G. Reid ..	Shaw, Savill & Albion Co., Ltd.
<i>Coptic</i> ..	GSND	25.9.53	A. E. Smith, R.D., R.N.R.	C. Brodie, J. Campbell, T. S. Hayward, I. Pugh ..	E. G. McKay ..	Walter Runciman & Co., Ltd.
<i>Dartmoor</i> ..	GFQT	22.4.53	I. O. Roberts ..	D. Allen, R. B. Crosbie, D. Wilson ..	J. Phillips ..	Sir William Reardon Smith & Sons, Ltd.
<i>Devon City</i> ..	MBKL	3.10.52	S. Leebetter ..	D. Jones, A. Passmore, D. Baker ..	D. W. Ayliffe ..	Sir William Reardon Smith & Sons, Ltd.
<i>Eastern City</i> ..	GBRB	23.3.53	J. H. Thornhill ..	J. R. Harris, A. H. Davies, T. C. Rooney ..	D. Sutton ..	Cable & Wireless, Ltd.
<i>Edward Wilshaw</i> ..	MBMP		H. Milne ..	R. Riddle, J. M. Rutherford, J. Reilly, J. Orr ..	J. Reardon ..	Mungo Campbell & Co., Ltd.
<i>Empire Nene</i> ..	GDBQ	1.9.53	A. Harkness ..	L. Lumley, J. Wall, A. Macleod ..		British India Steam Nav. Co., Ltd.
<i>Empire Trooper</i> ..	GLXJ		R. H. A. Bond, O.B.E.	E. Pickles, F. G. Hill, D. Calvert ..		

<i>Greenland</i>	..	GCLJ	6.2.53	—, Milligan	..	—, Ross, G. Buist, J. Duguid	..	J. Sherston	..	Currie Line, Ltd.
<i>Harpakon</i>	..	GFFX	13.5.53	A. R. Phelps	..	C. C. McCarthy, G. F. B. Pannett, A. P.	..	J. Niabet	..	Messrs. J. & C. Harrison & Co., Ltd.
<i>Hendonhall</i>	..	GBTX	24.9.53	H. W. Smith	..	J. Prefect, M. Proctor, J. Gay	..	G. Rushton	..	West Hartlepool Steam Nav. Co.
<i>Hestone</i>	..	GUGJ	6.8.53	J. DeCaris	..	J. S. Catterall, J. A. Lionett, B. H. Bowen	..	N. Burnitt	..	Houston Line (London), Ltd.
<i>Hudson Deep</i>	..	MPCR	16.4.53	J. Gibbons, D.S.C.	..	T. Thomas, K. R. Mackenzie, S. F. Baron	..	J. G. Murray	..	Hudson S.S. Co., Ltd.
<i>Hudson Firth</i>	..	GDKM	..	E. W. Pybus	..	M. R. Urninski, L. Thompson, K. W. Keithley	..	—, Francis	..	Hudson S.S. Co., Ltd.
<i>Iceland</i>	..	GFFT	1.8.52	J. Hawk-Shaw	..	A. Smith, —, Piper, T. Archibald, D. Foster	..	P. McGowan	..	Currie Line, Ltd.
<i>Kirriemoor</i>	..	GYJW	15.6.53	J. Howie	..	J. Ross, F. Graham	..	R. Pilkington	..	W. Runciman & Co., Ltd.
<i>Leicestershire</i>	..	GDBL	12.8.53	T. J. A. Thomson	..	P. Crossley, J. Harwood, J. A. Robinson	..	I. E. Unsworth	..	British India Steam Nav. Co., Ltd.
<i>Letchworth</i>	..	MAOV	..	W. F. Graves	..	T. L. Groves, R. H. Smith, B. Kahill	..	R. Plantagnet-Dacre	..	R. S. Dalgleish, Ltd.
<i>Linga</i>	..	GLCK	10.8.53	A. G. E. Short, O.B.E.	..	E. J. Davis, F. H. Walton, P. Shawyer	..	A. Cochrane	..	Anglo-Saxon Petroleum Co., Ltd.
<i>Lingula</i>	..	GKDT	14.8.53	T. N. Richardson	..	R. F. Weller, C. H. Howarth, C. B. Leggett	..	S. E. Jones	..	Anglo-Saxon Petroleum Co., Ltd.
<i>Llangibby Castle</i>	..	GPLV	29.6.53	F. R. Pope, R.D., R.N.R.	..	G. D. Atwood	..	T. Peake	..	Union Castle Mail S.S. Co., Ltd.
<i>Marie Louise Mackay</i>	..	GDNP	2.9.53	T. N. Heap	..	L. P. Denny, W. D. Harper, L. R. Cook, T. Wilson	..	K. Kenny	..	Commercial Cable Co.
<i>Markab</i>	..	GCVT	9.10.52	C. Christensen	..	F. Wilkins, H. Kurth, P. Essman	..	A. Cochrane	..	Phocean Ship Agency, Ltd.
<i>Marna</i>	..	MLPK	18.6.53	J. C. Macdonald	..	J. Carney, J. A. MacLean	..	P. Power	..	Chr. Salvesen & Co.
<i>Meta</i>	..	MPWB	..	A. D. McNab	..	I. Milligan, R. S. McLachlan, S. Sloan	..	..	..	Glen & Co., Ltd.
<i>Mulberry Hill</i>	..	MAKQ	27.2.53	J. Campbell	..	K. G. Carten, W. E. R. Whiting, D. W. T. Bird, M. Anderson	..	..	..	Countries Ship Management Co., Ltd.
<i>Nicania</i>	..	GIGJ	30.4.53	A. E. Price	..	D. S. Nicol, R. E. P. Morgan, R. A. Wyncott	..	F. McEwan	..	Anglo-Saxon Petroleum Co., Ltd.
<i>Northia</i>	..	GDQK	21.1.53	C. McKellar-Young	..	A. Alexander, —, Pearce, J. C. Wilson	..	R. J. McNeil	..	Anglo-Saxon Petroleum Co., Ltd.
<i>Port Dunedin</i>	..	GLCJ	13.3.53	L. J. Skales	..	B. B. Skrimshire, G. A. Blundell, C. Rhodes, —, Johnson	..	A. Webster	..	Port Line, Ltd.
<i>Port Fairy</i>	..	GSTP	14.9.53	C. A. Hodson	..	J. M. Evans, S. W. Lunn, R. W. Leslie-Makeig	..	L. Sutton	..	Port Line, Ltd.
<i>Queen Maud</i>	..	MAJM	29.8.53	I. Adam	..	G. Pirie, D. Finlayson, P. Austin	..	D. Humble	..	Thos. Dunlop & Sons, Ltd.
<i>Rembrandt</i>	..	GPFJ	7.7.53	E. E. Roberts	..	J. Lewis, G. D. Leith, J. S. Jackson, D. Brown	..	H. Doherty	..	Bolton Steam Shipping Co., Ltd.
<i>Rookwood</i>	..	GPSN	5.9.53	A. Dover	..	W. Deadman, E. D. Rae, F. Turnbull	..	P. L. Lytton	..	Wm. France, Fenwick & Co., Ltd.
<i>Royal Emblem</i>	..	GDSC	..	S. Moorhead	..	J. N. Meeks	..	H. Moore	..	Hull Bros.
<i>Sibito</i>	..	GSVC	..	S. F. Williams, M.B.E.	..	J. Squire, M. D. Evans, J. Campion	..	K. Coteching	..	Ellerman's Wilson Line, Ltd.
<i>Table Bay</i>	..	MFTV	10.9.53	A. N. Cabot	..	A. Macdonald, J. Parry, H. Hansen	..	H. Williams	..	Lyle Shipping Co., Ltd.
<i>Tarantia</i>	..	GIGS	13.4.53	A. J. F. Colquhoun, M.B.E.	..	J. S. Watson, T. L. Langlands, G. Davidson	..	H. Hicks	..	Anchor Line, Ltd.
<i>Thelma</i>	..	MBKK	..	T. A. W. Fairweather	..	J. D. McIntosh, J. McColi, D. McDonald	..	G. G. Williamson	..	Glen & Co., Ltd.
<i>Trelisick</i>	..	GBPR	1.9.53	D. I. Spencer	..	G. W. Streeter, G. M. Lloyd, B. O. Martin	..	B. R. Reid	..	Hain Steamship Co., Ltd.
<i>Trevetlan</i>	..	MATE	..	H. Gravell	..	D. V. Tattoo, E. D. Stewart, M. Marchant	..	R. Crawley	..	Hain Steamship Co., Ltd.
<i>Trevice</i>	..	MATH	13.4.53	R. B. Oliver	..	E. F. Boyd, E. Sprunks	..	W. Davitt	..	Hain Steamship Co., Ltd.
<i>Trenorlas</i>	..	MATL	19.3.53	W. T. Evans	..	P. M. Sadler, L. Watson, —, Griffiths	..	..	..	Hain Steamship Co., Ltd.
<i>Tronda</i>	..	MMLX	15.10.51	R. J. Sinclair	..	R. Angus, K. Chow	..	..	..	Chr. Salvesen & Co.
<i>Truro</i>	..	GJTO	..	D. A. Stokes	..	C. R. Tutty, E. J. Agar, J. N. Pickering	..	..	..	Ellerman's Wilson Line, Ltd.
<i>Woodland</i>	..	MTCT	17.5.52	R. Borthwick	..	G. R. Dyke, G. W. Cruickshank, J. Morgan	..	..	..	Currie Line, Ltd.

Marid Ships

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

NAME OF VESSEL	CALL SIGN	CAPTAIN	OWNERS/MANAGERS
<i>Actuality</i>	GPPF	D. O'Leary	F. T. Everard & Sons, Ltd.
<i>Amsterdam</i>	MFBP	C. R. Baxter, D.S.C. ..	British Railways (Eastern Region)
<i>Angelo</i>	GQFY	S. N. Stokes	Ellerman's Wilson Line, Ltd.
<i>Ariosto</i>	GKPW	W. C. Gill	Ellerman's Wilson Line, Ltd.
<i>Atlantic Coast</i> ..	GWSY	C. A. Hopkins	Coast Lines, Ltd.
<i>Barra Head</i>	MPQZ	W. Flett	A. F. Henry & MacGregor
<i>Beaully</i>	MLZK	J. McGugan	William Sloan & Co.
<i>Belhaven</i>	MNXZ	P. L. Irvine	London & Edinburgh Shipping Co., Ltd.
<i>Belravock</i>	MKGV	T. Wallace	London & Edinburgh Shipping Co., Ltd.
<i>Belvina</i>	MLZF	W. Fisher	London & Edinburgh Shipping Co., Ltd.
<i>British Coast</i> ..	GWQX	R. E. Holt	Coast Lines, Ltd.
<i>British Scout</i> ..	GJKD	T. S. Rawlingson ..	British Tanker Co., Ltd.
<i>Brora</i>	MLVY	M. MacIver	William Sloan & Co.
<i>Caledonian Coast</i>	GKXF	J. Webber, M.B.E. ..	Coast Lines, Ltd.
<i>Cambria</i>	GBKT	N. Lloyd-Williams ..	British Railways (L.M. Region)
<i>Cato</i>	GUAK	F. Dudgeon	Bristol Steam Navigation Co., Ltd.
<i>Clupea</i>	GOAJ	J. Jappy	Scottish Home Department (Fishery Division)
<i>Corfen</i>	GDJX	F. S. Granger	Wm. Cory & Son, Ltd.
<i>Corfleet</i>	GWTD	A. G. Waller	Wm. Cory & Son, Ltd.
<i>Corfoss</i>	MAHZ	T. Ellis	Wm. Cory & Son, Ltd.
<i>Cormain</i>	MAHT	J. T. Collin	Wm. Cory & Son, Ltd.
<i>Cormead</i>	GDBX	T. Slack	Wm. Cory & Son, Ltd.
<i>Cormist</i>	GDTV	R. J. Barrow	Wm. Cory & Son, Ltd.
<i>Cormoat</i>	GLKV	R. B. Armstrong ..	Wm. Cory & Son, Ltd.
<i>Cornmull</i>	MAHS	E. R. W. Allen	Wm. Cory & Son, Ltd.
<i>Corncrake</i>	MJKL	W. S. Dunlop	General Steam Nav. Co., Ltd.
<i>Crane</i>	MMCS	J. S. Lickis	General Steam Nav. Co., Ltd.
<i>Drake</i>	MMYC	R. Langley	General Steam Nav. Co., Ltd.
<i>Duke of Argyll</i> ..	GNVX	A. E. Willmott, D.S.C., R.D., R.N.R.	British Railways (L.M. Region)
<i>Duke of Lancaster</i>	GCPQ	E. B. Serjeant	British Railways (L.M. Region)
<i>Duke of Rothesay</i>	GNVL	J. Irwin	British Railways (L.M. Region)
<i>Eildon</i>	MLZL	J. Little	G. Gibson & Co., Ltd.
<i>Empire Cedric</i> ..	GRSC	W. H. Laws, R.D., R.N.R.	Atlantic Steam Navigation Co., Ltd.
<i>Empire Doric</i> ..	MAVQ	W. Close	Atlantic Steam Navigation Co., Ltd.
<i>Empire Gaelic</i> ..	MAVR	H. T. Green	Atlantic Steam Navigation Co., Ltd.
<i>Explorer (F/C)</i> ..	MRCZ	G. B. McLaren	Scottish Home Department (Fishery Division)
<i>Falcon</i>	MNXL	S. W. Develin	General Steam Nav. Co., Ltd.
<i>Golden Dawn</i> ..	MLZV	Lt. A. Adamson, M.B.E., R.D., R.N.R.	The Captain
<i>Great Western</i> ..	GWRD	B. H. Mendus	British Railways (Western Region)
<i>Grebe</i>	MAEY	W. S. Lockhart	General Steam Nav. Co., Ltd.
<i>Guernsey Coast</i> ..	MANS	H. Keilit	British Channel Islands Shipping Co., Ltd.
<i>Harrogate</i>	MNDB	J. H. Walters	Associated Humber Lines
<i>Hibernia</i>	MBMT	W. E. Meade	British Railways (L.M. Region)
<i>Hibernian Coast</i>	GKXC	G. H. Clark, M.B.E. ..	Coast Lines, Ltd.
<i>Highwood</i>	MLQQ	J. Copeland	E. R. Newbigin Ltd.
<i>Horsa</i>	MPFJ	D. Dickson	Currie Line, Ltd.
<i>Isle of Guernsey</i> ..	GQYJ	F. Breudlay	British Railways (Southern Region)
<i>Isle of Jersey</i> ..	GRBQ	A. Light	British Railways (Southern Region)
<i>Isle of Sark</i> ..	GTSR	G. Pierce	British Railways (Southern Region)
<i>Jura</i>	MARU	L. J. Blanche	Glen & Co., Ltd.
<i>Kinnaird Head</i> ..	GCSQ	J. Grant	A. F. Henry & MacGregor
<i>London Merchant</i>	MBRZ	C. A. Piper	London Scottish Lines, Ltd.
<i>Marine Craft Unit</i> (R.A.F.) No. 1102			
<i>Melrose</i>	MCFD	Flt.-Lt. D. A. Koster ..	Royal Air Force
<i>Melrose Abbey</i> ..	GSYW	J. Murray	Geo. Gibson & Co., Ltd.
<i>Meta</i>	MPWB	J. Blackburn	Associated Humber Lines
<i>Milo</i>	GQDP	A. D. McNab	Glen & Co., Ltd.
<i>Minna</i>	GKPS	H. E. Lawson	Bristol Steam Navigation Co., Ltd.
<i>Moray Coast</i> ..	MKDL	T. Mather	Scottish Home Department (Fishery Division)
<i>Narva</i>	GQFP	O. Evans	Coast Lines, Ltd.
<i>Ocean Coast</i> ..	GYMP	R. J. McNinch	Glen & Co., Ltd.
<i>Peregrine</i>	GIGM	G. Mearns	Coast Lines, Ltd.
<i>Princess Maud</i> ..	GWRT	J. Davis	General Steam Nav. Co., Ltd.
<i>Rattray Head</i> ..	GCBR	R. E. Sherwood, D.S.O., R.D., R.N.R.	British Railways (L.M. Region)
<i>Rora Head</i>	MKVB	J. Graham	A. F. Henry & MacGregor, Ltd.
<i>Runa</i>	GFSW	A. F. Ramsay	N. of Scotland & Ork. & Shet. S.N. Co., Ltd.
<i>St. Abbs Head</i> ..	GODU	J. Gilfillan	Glen & Co., Ltd.
<i>St. Clair</i>	MMFX	P. Stickle	A. F. Henry & MacGregor & Co., Ltd.
<i>St. Clement</i> ..	GRGM	T. Gifford	N. of Scotland & Ork. & Shet. S.N. Co., Ltd.
<i>St. Helier</i>	GLBT	W. J. Ramsay	N. of Scotland & Ork. & Shet. S.N. Co., Ltd.
<i>St. Julien</i>	GLBV	— Goodchild	British Railways
<i>St. Magnus</i> ..	GFBK	L. J. Richardson ..	British Railways
<i>St. Ninian</i>	GJYK	W. G. Stout	N. of Scotland & Ork. & Shet. S.N. Co., Ltd.
<i>Selby</i>	GJBB	A. M. Dundas	N. of Scotland & Ork. & Shet. S.N. Co., Ltd.
	MLFT	A. C. Allen	Associated Humber Lines

Marid Ships—contd.

NAME OF SHIP	CALL SIGN	CAPTAIN	OWNERS/MANAGERS
<i>Slieve Bawn</i>	MQCC	W. N. Greenwood ..	British Railways (L.M. Region)
<i>Slieve Bearnagh</i>	MLNL	J. B. Williams	British Railways (L.M. Region)
<i>Slieve Bloom</i>	MQDD	E. A. Horspool	British Railways (L.M. Region)
<i>Slieve League</i>	MQCM	R. A. H. Lord, D.S.C., R.D., R.N.R.	British Railways (L.M. Region)
<i>Slieve More</i>	MQBM	R. E. Sherwood, D.S.O., R.D., R.N.R.	British Railways (L.M. Region)
<i>Southern Coast</i>	MASD	A. Galloway	Coast Lines, Ltd.
<i>Teal</i>	GBXC	C. C. Reynolds	General Steam Nav. Co., Ltd.
<i>Thelma</i>	MBKK	F. Fairweather	Glen & Co., Ltd.
<i>Vanellus</i>	GDVW	J. E. Green	British & Continental S.S. Co., Ltd.
<i>Vienna</i>	GTBR	A. Pearson Sutton	British Railways (Eastern Region)

Trawlers

The following is a list of trawlers voluntarily observing and reporting those elements of the weather which do not entail the use of any meteorological instruments.

NAME OF TRAWLER	CALL SIGN	MASTER	OWNERS/MANAGERS
<i>Admiral Sir John Lawford</i>	GMVW	N. Jinks	Iago Steam Trawler Co.
<i>Corella</i>	GRRV	T. Harris	Dinas Steam Trawling Co., Ltd.
<i>Ella Hewett</i>	QOMG	G. Elliott	Hewett Fishing Co., Ltd.
<i>Ernest Holt</i>	GFXD	H. J. Aldiss	Ministry of Agriculture and Fisheries
<i>Frobisher</i>	GTRN	T. Sutton	Short Blue Fishing Co., Ltd.
<i>Lammermuir</i>	MFCF	R. Cooke	B. A. Parkes, Ltd.
<i>Lord Middleton</i>	GYTX	J. Penny	Associated Fisheries Trawling Co., Ltd.
<i>New Prince</i>	GBRN	M. Wright	Heward Trawlers, Ltd.
<i>Red Charger</i>	GCNF	R. Wright	Iago Steam Trawler Co., Ltd.
<i>Red Crusader</i>	GTBP	K. Hames	Iago Steam Trawler Co., Ltd.
<i>Red Hackle</i>	MLCX	E. Littler	Iago Steam Trawler Co., Ltd.
<i>Red Knight</i>	MBQT	M. Wright	Iago Steam Trawler Co., Ltd.
<i>Red Lancer</i>	MKTP	J. Tomlinson	Iago Steam Trawler Co., Ltd.
<i>Red Rose</i>	MEMX	J. McKernon	Iago Steam Trawler Co., Ltd.
<i>Reptomian</i>	GWQF	H. Reader	Dinas Steam Trawling Co., Ltd.
<i>Robert Hewett</i>	MDYS	G. Elliott	Hewett Fishing Co., Ltd.
<i>St. Amant</i>	GFVD	A. Muncer	J. Marr & Son, Ltd.
<i>St. Britwin</i>	MFEX	J. H. Miller	T. Hamling & Co., Ltd.
<i>St. Elstan</i>	GDDL	G. Argumont	T. Hamling & Co., Ltd.
<i>St. Just</i>	GTWJ	V. A. Buschini	Heward Trawlers, Ltd.
<i>St. Nectan</i>	GZJY	E. Moore	T. Hamling & Co., Ltd.
<i>Westella</i>	GTWV	H. Daniel	Dinas Steam Trawling Co., Ltd.
<i>Woolton</i>	MBFN	P. Bedford	Merchants (Fleetwood), Ltd.
<i>Wyre General</i>	GDXW	R. Hutcheon	Wyre Steam Trawling Co., Ltd.

Light Vessels

The following Light vessels voluntarily observe, record and/or report from coastal waters of Great Britain.

NAME OF VESSEL	MASTERS
<i>Bar</i>	E. E. Abbott
<i>Dowsing</i>	J. R. Audley, S. R. Smith
<i>East Goodwin</i>	A. Giblin, F. M. England, W. S. Parish
<i>Galloper</i>	S. J. Vincent
<i>Humber</i>	F. I. Butcher, L. A. Brett
<i>Newarp</i>	T. J. Sales, W. J. Rogers
<i>Royal Sovereign</i>	W. J. Sheaf
<i>St. Gowan</i>	H. G. T. Morgan, W. Thomas
<i>Seven Stones</i>	H. C. King, —, Appleby
<i>Shambles</i>	J. H. Cooper, W. C. Moulard
<i>Shipwash</i>	G. W. Broom, C. G. Isaac
<i>Skulmartin</i>	D. Hawkins
<i>Smith's Knoll</i>	W. J. Hall, J. W. R. Reeve, B. Hadden

Training Establishments

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

ESTABLISHMENT	CAPTAIN/SUPERINTENDENT	LAST RETURN RECEIVED
<i>Conway, H.M.S.</i>	E. Hewitt, R.D., Capt., R.N.R.	12.8.52
<i>Pangbourne Nautical College</i>	H. C. Skinner, O.B.E., Cdr., R.N.	31.7.52
<i>Warsash, School of Navigation</i>	G. W. Wakeford, Capt.	31.7.52
<i>Worcester, H.M.S.</i>	G. C. Steele, V.C., Cdr., R.N. (Retd.)	31.7.52

AUSTRALIA

Voluntary Observing Ships

The following is a list of observing ships voluntarily co-operating with the Meteorological Branch of Australia.

NAME OF VESSEL	OWNERS
Selected Ships :	
<i>Asphalion</i>	Alfred Holt & Co.
<i>Bulolo</i>	Burns Philp & Co., Ltd.
<i>Canara</i>	British India Steam Navigation Co.
<i>Charon</i>	Alfred Holt & Co.
<i>Chupra</i>	British India Steam Navigation Co.
<i>Duntroon</i>	Melbourne Steamship Co., Ltd.
<i>Gorgon</i>	Alfred Holt & Co.
<i>Idomeneus</i>	Alfred Holt & Co.
<i>Koolinda</i>	Western Australian State Steamships
<i>Koomilya</i>	McIlwraith McEacheron, Ltd.
<i>Koorawatha</i>	McIlwraith McEacheron, Ltd.
<i>Kooringa</i>	McIlwraith McEacheron, Ltd.
<i>Lowana</i>	Melbourne Steamship Co., Ltd.
<i>Malaita</i>	Burns Philp & Co., Ltd.
<i>Malekula</i>	Burns Philp & Co., Ltd.
<i>Nellore</i>	Eastern and Australian Steamship Co., Ltd.
<i>Orestes</i>	Alfred Holt & Co.
<i>Triadic</i>	British Phosphate Commission
<i>Trienza</i>	British Phosphate Commission
<i>Triona</i>	British Phosphate Commission
<i>Wanganella</i>	Huddart Parker & Co., Ltd.
<i>Westralia</i>	Huddart Parker & Co., Ltd.
Supplementary Ship:	
<i>Kabbarli</i>	Western Australian State Steamships

CANADA

Voluntary Observing Ships

The following is a list of observing ships voluntarily co-operating with the Canadian Meteorological Division.

NAME OF VESSEL	CALL SIGN	OWNERS
<i>Canadian Challenger</i>	VGSK	Canadian National Steamship Co., Ltd.
<i>Canadian Constructor</i>	VGBY	Canadian National Steamship Co., Ltd.
<i>Canadian Cruiser</i>	VGPZ	Canadian National Steamship Co., Ltd.
<i>Esso Knoxville</i>	HPTK	c/o Imperial Oil, Ltd.
<i>Fort Avalon</i>	MBMC	Furness Withy & Co., Ltd.
<i>Fort Hamilton</i>	GCSS	Furness Withy & Co., Ltd.
<i>Imperial Alberta</i>	VGSF	c/o Imperial Oil, Ltd.
<i>Imperial Charlottetown</i>	VDWG	c/o Imperial Oil, Ltd.
<i>Imperial Fredericton</i>	VDWB	c/o Imperial Oil, Ltd.
<i>Imperial Quebec</i>	VCQC	c/o Imperial Oil, Ltd.
<i>Imperial Toronto</i>	VGSG	c/o Imperial Oil, Ltd.
<i>Imperial Winnipeg</i>	VGSD	c/o Imperial Oil, Ltd.
<i>Lake Atlin</i>	VCGM	Western Canada S.S., Ltd.
<i>Lake Kootenay</i>	MAKZ	Western Canada S.S., Ltd.
<i>Lakemba</i>	VPKV	Pacific Ship Owners
<i>Lake Minnewanka</i>	VCNC	Western Canada S.S., Ltd.
<i>Lake Pennask</i>	VDYR	Western Canada S.S., Ltd.
<i>Lake Sicamous</i>	VGVS	Western Canada S.S., Ltd.
<i>Lake Winnipeg</i>	VDTY	Western Canada S.S., Ltd.
<i>Lord Kelvin</i>	GDMN	Western Union Cable Co.
<i>Maplecove</i>	GNLX	Canadian Pacific S.S. Co., Ltd.
<i>Mapledell</i>	GBBS	Canadian Pacific S.S. Co., Ltd.
<i>Mossel Bay</i>	GKCB	Western Canada S.S. Co., Ltd.
<i>Paloma Hills</i>	VGGX	c/o Deep Sea Tankers, Ltd.
<i>Pinnacles</i>	VGGZ	c/o Deep Sea Tankers, Ltd.
<i>Rincon Hills</i>	VGGY	c/o Deep Sea Tankers, Ltd.
<i>Rupertsland</i>	VDXX	Hudson's Bay Co., Ltd.
<i>Standard Service</i>	VGJG	Standard Oil Co. of B.C., Ltd.
<i>Waihemu</i>	ZMJO	Canadian Australasian Line
<i>Waikawa</i>	ZMJI	Canadian Australasian Line
<i>Wairuna</i>	ZMJT	Canadian Australasian Line
<i>Waitomo</i>	ZMKO	Canadian Australasian Line
<i>Cyrus Field</i>	GKQC	Western Union Cable Co.
<i>Lower Light</i>	WC4966	
<i>Lurcher Lightship</i>		Department of Transport
<i>Sambro Lightship</i>		Department of Transport

BERMUDA

Voluntary Observing Ships

The following is a list of observing ships voluntarily co-operating with the Meteorological Station, Bermuda.

NAME OF VESSEL	CALL SIGN	OWNERS
<i>Queen of Bermuda</i>	GZKF	Furness, Withy & Co., Ltd.
<i>Ocean Monarch</i>	GJXD	Furness, Withy & Co., Ltd.

INDIA

Voluntary Observing Ships

The following is a list of observing ships voluntarily co-operating with the India Meteorological Department.

NAME OF VESSEL	OWNERS/AGENTS
Selected Ships:	
<i>Alavi</i>	The Mogul Line, Ltd.
<i>Bahadur</i>	Asiatic Steam Navigation Co., Ltd.
<i>Bombay</i>	Scindia Steam Navigation Co., Ltd.
<i>Dara</i>	British India Steam Navigation Co., Ltd.
<i>Daressa</i>	British India Steam Navigation Co., Ltd.
<i>Dumra</i>	British India Steam Navigation Co., Ltd.
<i>Dwarka</i>	British India Steam Navigation Co., Ltd.
<i>Havildar</i>	Asiatic Steam Navigation Co., Ltd.
<i>Indian Pioneer</i>	India Steam Ship Co., Ltd.
<i>Islami</i>	The Mogul Lines, Ltd.
<i>Jal-azad</i>	Scindia Steam Navigation Co., Ltd.
<i>Jala-duta</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalaganga</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalajawahar</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalakrishna</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalamanjari</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalamani</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalapprakash</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalaveera</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalayamuna</i>	Scindia Steam Navigation Co., Ltd.
<i>Jehangir</i>	The Mogul Lines, Ltd.
<i>Kampala</i>	British India Steam Navigation Co., Ltd.
<i>Karanja</i>	British India Steam Navigation Co., Ltd.
<i>Mahadevi</i>	Asiatic Steam Navigation Co., Ltd.
<i>Maharaja</i>	Asiatic Steam Navigation Co., Ltd.
<i>Mozaffari</i>	The Mogul Lines, Ltd.
<i>Nadir</i>	Asiatic Steam Navigation Co., Ltd.
<i>Nurani</i>	Asiatic Steam Navigation Co., Ltd.
<i>Rajula</i>	British India Steam Navigation Co., Ltd.
<i>Santhia</i>	British India Steam Navigation Co., Ltd.
<i>Shahjehan</i>	Asiatic Steam Navigation Co., Ltd.
<i>Subadar</i>	Asiatic Steam Navigation Co., Ltd.
<i>Umaria</i>	British India Steam Navigation Co., Ltd.
<i>Warla</i>	British India Steam Navigation Co., Ltd.
Supplementary Ships:	
<i>Badarpur</i>	Burmah Oil Co., Ltd.
<i>Bharatjal</i>	Bharat Lines, Ltd.
<i>Bharatmata</i>	Bharat Lines, Ltd.
<i>Bharatraja</i>	Bharat Lines, Ltd.
<i>Bharatrani</i>	Bharat Lines, Ltd.
<i>Indian Importer</i>	India Steam Ship Co., Ltd.
<i>Itaura</i>	British India Steam Navigation Co., Ltd.
<i>Jaladurga</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalagopal</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalakendra</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalaketu</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalamayur</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalarajendra</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalaratna</i>	Scindia Steam Navigation Co., Ltd.
<i>Malika</i>	Asiatic Steam Navigation Co., Ltd.
<i>Risaldar</i>	Asiatic Steam Navigation Co., Ltd.
<i>Rizwani</i>	The Mogul Lines, Ltd.

MALAYA

Voluntary Observing Ships

The following is a list of observing ships voluntarily co-operating with the Malayan Meteorological Service.

NAME OF VESSEL	CALL SIGN	OWNERS
<i>Islander</i>	VSPS	British Phosphate Commissioners
<i>Stanley Angwin</i>	GNXG	Cable & Wireless Ltd.

NEW ZEALAND

Voluntary Observing Ships

The following is a list of observing ships voluntarily co-operating with the Meteorological Branch of New Zealand.

NAME OF VESSEL	OWNERS
Selected Ships:	
<i>Kauri</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Karitane</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Kaimanawa</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Kaitoke</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Kawaroa</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Komata</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Kopua</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Koromiko</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Kowhai</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Kuroo</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Kurutai</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Matua</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Maui Pomare</i>	New Zealand Government
<i>Monowai</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Tofua</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Waimate</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Waimea</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Waipori</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Wairata</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Wairimu</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Waitemata</i>	Union Steam Ship Company of New Zealand, Ltd.
Supplementary Ships:	
<i>Kaiapoi</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Kairanga</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Kaitangata</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Kaitawa</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Kawatiri</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Konui</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Korowai</i>	Union Steam Ship Company of New Zealand, Ltd.
<i>Piri</i>	Imperial Chemical Industries, Ltd.
<i>Port Waikato</i>	Holm & Company, Ltd.
<i>Vasu</i>	Tasman Steam Ship Company of New Zealand, Ltd.
<i>Viti</i>	Tasman Steam Ship Company of New Zealand, Ltd.
<i>Waiana</i>	Union Steam Ship Company of New Zealand, Ltd.

FLEET LIST (Hong Kong)

VOLUNTARY OBSERVING SHIPS

The following is a list of observing ships voluntarily co-operating with the Royal Observatory, Hong Kong.

NAME OF SHIP	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	SHIPPING COMPANY OR OPERATOR
Anking	J. McKinlay	G. S. Ireland, J. F. O'Connor, J. Dawson	D. F. MacDonald	China Navigation Co., Ltd.
Anshun	A. Naismith	L. Walker, C. Lorimer, F. T. Quinn	Ng Chiang Soon	China Navigation Co., Ltd.
Castle Peak	W. J. Lang	I. S. Clarke, Yuan King Lau, Jo Tai Chang	Kwok Shek Hee	Moller's Ltd.
Changsha	F. N. Booth	V. R. Woolfe, A. W. K. Prosser, R. N. Frappell	T. W. Pomeroy	China Navigation Co., Ltd.
Choy Sang	M. I. Groundwater	P. G. Harkness, P. G. Bush, K. C. Yeung	J. D. Clutton	Indo-China Steam Navigation Co., Ltd.
Chun Sang	L. C. Cox	W. E. MacLackland, J. P. B. Stormont, J. H. Jeffries	E. West	Indo-China Steam Navigation Co., Ltd.
Eastern Glory	H. J. Cairns	T. J. Ashcroft, P. J. Sullivan, P. C. Whittle, A. S. Affleck	A. C. Martin	Indo-China Steam Navigation Co., Ltd.
Eastern Queen	D. G. Burleigh	W. J. Bartlett, R. K. Learoyd, R. Broomfield	R. O. Smith	Indo-China Steam Navigation Co., Ltd.
Eastern Saga	R. I. Groundwater	G. Parish, A. F. Cameron, C. M. Gibbs, G. C. Taylor	R. J. Bartlett	Indo-China Steam Navigation Co., Ltd.
Eastern Star	N. H. King	F. H. Main, T. H. Nichols, J. Hardisty, J. R. Simpson	A. Smith	Indo-China Steam Navigation Co., Ltd.
Eastern Trader	J. L. Baines	Tai Ai Chun, Liu Jui Tu, Huang Chi Hsin	Simon Chang	Great Southern Steamship Co., Ltd.
Elbeth	R. H. R. Hall	C. B. Skinner, O. Y. Wellington	Pun Kwong Yee	Shun Cheong S.N. Co., Ltd.
E Sang	E. J. Thomson	M. J. K. Crichton, J. Taylor, W. M. Coates	W. I. Briggs	Indo-China Steam Navigation Co., Ltd.
Fengting	F. Hindle	A. O. Atkinson, J. R. Saffren, P. Bulatoff	R. A. Castro	China Navigation Co., Ltd.
Fengtien	W. B. B. Paul	P. Flory, L. W. Rothwell, V. A. Boutskoi	Leung Kan	China Navigation Co., Ltd.
Foochow	J. W. Evans	J. R. Keddie, F. Coulson, A. P. Sokoloff	Tsang Pui Leung	China Navigation Co., Ltd.
Fort Charlotte	F. G. Edwards	R. J. Secombe, R. H. Gollop, W. Sey	G. H. Parker	Royal Fleet Auxiliary
Fukien	W. E. Awcock	J. Hunter, D. S. M. Tosh, J. C. Mark	Yeung Wai Ki	China Navigation Co., Ltd.
Funing	M. McMillan	C. Stark, D. L. Wilson, S. T. Sung	D. E. Tavares	China Navigation Co., Ltd.
Hai Lee	J. Hansen	T. K. Pedersen, John Leren, Helge Johansen	Wuie Iu Chan	China Siam Line
Hai Meng	I. Strang-Olsen	B. Thodesen, P. Brandal, Leif Andaa	Chan Kan Tsun	China Siam Line
Hang Sang	I. F. G. Fotheringham	C. M. Wilson, G. J. Eastwood, J. Parish	Chan Kwok Chuen	Indo-China Steam Navigation Co., Ltd.
Hanyang	F. Kelly	D. W. R. Gash, M. J. Clark, C. M. Li	M. R. Leong	China Navigation Co., Ltd.
Henrich Jensen	R. A. D. Nielsen	C. S. Jensen, A. A. Lassen, W. Kronenbitter	T. G. Oliver	Jebsen & Co.
Helios	G. Hamre	G. Sundholm, E. B. Høiskar, Ivar Krogstad	Ip Yuk Fai	China Siam Line
Hermelin	Leif Eide	Hans Kystvaag, Olas Asserson, Kristian Gundorsen	Lai Kwong Yin	China Siam Line
Hermod	R. G. Stanton	P. S. Schibsted, S. Sorvik, Robert Grønveid	So Yuet Hang	China Siam Line
Hew Sang	G. W. F. Edwards	J. G. Perrin, M. de Verteuil, A. Nelson	Ho Hung Ki	Indo-China Steam Navigation Co., Ltd.
Hin Sang	Sverre Jensen	L. Oysianmikoff, J. H. Gould, T. Y. Yuen	Ma Ping Leung	Indo-China Steam Navigation Co., Ltd.
Hiram	K. Munkejord	O. Utseth, A. Johannesen, T. Thomassen	H. Fastingsen	China Siam Line
Hoi Houw	M. Bjerkenes	B. Maeland, R. Okland, T. Hansen	A. Takvam	Karsten Larsen & Co. (Hong Kong) Ltd.
Hoi Wong	C. A. N. Baker	W. J. Coburn, D. S. Southey, K. Y. Lee	Ho Hung Fu	Karsten Larsen & Co. (Hong Kong) Ltd.
Hunan	W. E. Hargrave	W. Davidson, A. I. Thomas, P. Y. Lam	Yu Pak Pui	China Navigation Co., Ltd.
Hupei	G. R. Hansen	J. Johansen, J. N. Holst, A. Decker	E. Belard	Jebsen & Co.
Jacob Jensen	T. C. W. Marr	J. H. Thomas, G. H. Thompson, J. B. Bowman	K. M. Gleeson	Indo-China Steam Navigation Co., Ltd.
Lok Sang	G. T. M. Ramsay	W. Pollock, C. A. P. Brennan, C. F. Yang	Lo Kin Chek	Chun Seng Hong Shipping Co., Ltd.
Mui Hach	I. W. E. Warrior	C. N. Stewart, K. A. Page, C. F. Chan	Cheung Shau Wai	China Navigation Co., Ltd.
Pakhoi	L. Hetland	J. Aksnes, J. Samuelson, L. Fagerland	Chan Keng Chuen	China Navigation Co., Ltd.
Poyang	E. Bruce	S. J. Yeandle, B. J. S. Squire, J. Paton	Wai Pun Un	Karsten Larsen & Co. (Hong Kong) Ltd.
Produce				China Navigation Co., Ltd.
Shansi				

<i>Shengkong</i> ..	..	E. H. Histed ..	..	J. Storey, R. Perry, K. C. Lo ..	..	U In San ..	China Navigation Co., Ltd.
<i>Shillong</i> ..	..	G. A. Wild ..	..	T. Whynates, P. J. Ady ..	..	T. A. Martin ..	Mackinnon, Mackenzie & Co., Ltd.
<i>Sinkiang</i> ..	..	A. Taylor ..	..	A. V. Harrison, D. A. Hutchinson, T. R. Young ..	..	Chin Fook On ..	China Navigation Co., Ltd.
<i>Sirdhana</i> ..	..	D. W. Speirs ..	..	H. B. W. Cray, L. A. E. Lamet ..	..	S. G. Wessels ..	Mackinnon, Mackenzie & Co., Ltd.
<i>Soochow</i> ..	..	J. Taylor ..	..	W. J. Bunney, J. H. Adams, R. E. Easley ..	..	R. M. Inwood ..	China Navigation Co., Ltd.
<i>Star Alcyone</i> ..	..	G. V. A. Almstrom ..	..	L. H. Blomquist, F. A. J. Hartmann, F. A. J. Blomqvist ..	..	P. E. G. Wengelin ..	Everett Steamship Corporation
<i>Star Betelgeuse</i> ..	..	A. G. Florin ..	..	W. F. Ringstrom, P. I. Persson, A. T. Sorensen ..	..	P. E. G. Nilsen ..	Everett Steamship Corporation
<i>Szechuen</i> ..	..	D. Needham ..	..	R. C. W. Gorman, J. R. Brett, R. A. Burton ..	..	Choi Pong Cheung ..	China Navigation Co., Ltd.
<i>Tai Chung Shan</i> ..	..	E. C. Thomson ..	..	W. J. Windrum, Lee Yat Sang, Chan Mau Tung ..	..	Tsui Chi Chiu ..	Shun Cheong S.N. Co., Ltd.
<i>Tai Ping</i> ..	..	N. L. Hall ..	..	R. A. Smith, A. G. Hunt, C. C. Springali ..	..	Leung Cheuk Shing ..	Australia Oriental Line
<i>Tai Yuan</i> ..	..	Y. N. Campbell ..	..	A. Watson, L. L. Watson, J. A. MacDonald ..	..	L. J. S. Cohn ..	China Navigation Co., Ltd.
<i>Tak Sang</i> ..	..	W. T. Rochester ..	..	W. Graham, C. Przbyslinski, K. Y. Feng ..	..	S. A. Erlansson ..	Indo-China Steam Navigation Co., Ltd.
<i>Thai</i> ..	..	B. E. S. Wildung ..	..	G. H. Drake, K. A. Albertson, U. G. H. Hergman ..	..	T. Y. How ..	Everett Steamship Corporation
<i>Valles</i> ..	..	A. M. Troyan ..	..	K. K. Li, H. T. Shih, S. M. Chen ..	..	A. G. Lam ..	Wheelock Marden & Co., Ltd.
<i>Wing Sang</i> ..	..	H. G. Goddard ..	..	J. M. Marshall, D. Thompson, Ko Keng Jen ..	..	K. J. Bourke ..	Indo-China Steam Navigation Co., Ltd.
<i>Wo Sang</i> ..	..	G. Owens ..	..	J. E. Williams, W. G. White, R. D. A. Owen ..	..	Tsang Kau ..	Indo-China Steam Navigation Co., Ltd.
<i>Yochow</i> ..	..	D. McG. Holmes ..	..	B. McLennan, S. W. Owen, W. E. O'Connor ..	..	Leung Shu Fun ..	China Navigation Co., Ltd.
<i>Yunnan</i> ..	..	D. C. Sim ..	..	J. F. Follett, G. Baxter, I. F. Lee ..	..		China Navigation Co., Ltd.

FLEET LIST (South Africa)

The following is a list of observing ships voluntarily co-operating with the South African Weather Bureau.

NAME OF SHIP	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS
<i>Abraham Larsen</i> ..	E. Christophersen ..	H. G. Amor, L. D. Moon ..	J. Klosser ..	Union Whaling Co., Durban
<i>Africana II</i> ..	R. L. V. Shannon, O.B.E. ..	M. Williams, G. P. Brand, R. J. Shipp ..	..	Division of Fisheries, Cape Town
<i>Aloe</i> ..	S. S. Edwards ..	A. A. Ruckbie ..	..	South African Railways Ships, Cape Town
<i>F. T. Bates</i> ..	R. W. Watson ..	J. S. McKean, G. R. Davies, D. W. R. Reeve ..	D. Wittridge ..	South African Railways & Harbours
<i>Benin</i> ..	T. E. M. Jenkins ..	D. Powell, A. D. Forster, A. Bluet, P. Jackson ..	A. Briggs ..	Elder Dempster Lines
<i>Constantia</i> ..	A. C. Thomas ..	S. J. Hurst, P. Carrington, S. H. Damp ..	J. Fluitman ..	South African Marine Corporation Cape Town
<i>Dalia</i> ..	E. N. Stewart ..	E. Ladbrooke, R. G. Addinall, I. Mackintosh ..	P. Soper ..	South African Railways Ships, Johannesburg
<i>Gilia</i> ..	J. Lundberg, M.B.E. ..	M. A. Hoffman ..	..	Irving & Johnson, Ltd., Cape Town
<i>Kaapland</i> ..	P. F. M. Buchholtz ..	P. J. Le Marchand, G. B. Perkins ..	..	South Africa Lines, Cape Town
<i>Mashona Coast</i> ..	L. Coltham ..	A. Pearson, F. D. Liggett, C. Etherington ..	G. Adey ..	Thesen's Steamship Co., Cape Town
<i>Malabete Coast</i> ..	E. Hale ..	P. Sharp, W. Storm, R. Underwood ..	H. A. Pypers ..	South African Marine Corporation, Cape Town
<i>Morgenster</i> ..	D. W. Thorpe ..	G. P. Stevens ..	..	Van Riebeck Lines, Cape Town
<i>Noordwal</i> ..	D. C. Wallwork ..	J. Van der Veer ..	..	Thesen's Steamship Co., Cape Town
<i>Ovambo Coast</i> ..	P. Bolinn ..	H. Poulton, D. H. Harris, K. Macnish ..	S. P. Garnett ..	Tristan Development Co., Cape Town
<i>Tristania</i> ..	O. Mohr ..	..	L. Stanley ..	South Africa Marine Corporation, Cape Town
<i>Vergelegen</i> ..	F. Honeyman ..	..	..	..
South African Nautical College <i>General Botha</i>	G. V. Legassick, D.S.C., R.D., Capt. R.N.R. ..	The Senior Cadets	..	..
Naval Gymnasium, Saldanha Bay	Lt.-Cdr. P. Selk ..	The Senior Trainees

Marine Observer's Handbook

7th Edition, 1950

(reprinted 1952)

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