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The Marine Observer

*A quarterly journal of Maritime
Meteorology*



Volume XXXI No. 191

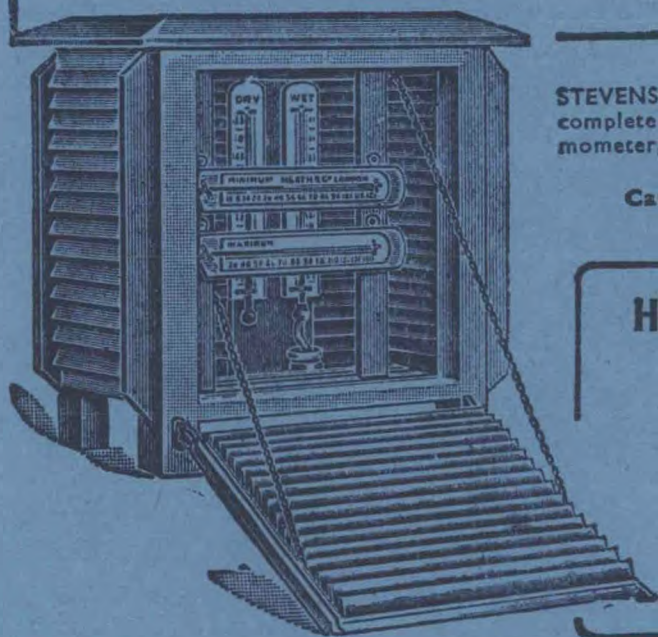
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THE MARINE OBSERVER

A Quarterly Journal of Maritime Meteorology
prepared by the Marine Division of the
Meteorological Office

Vol. XXXI

1961

THE MARINE OBSERVER

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

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JANUARY 1961

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*Letters to the Editor, and books for review, should be sent to the Editor, "The Marine Observer,"
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Editorial

One of the more outstanding examples of effective international co-operation is the meteorological work carried out by ships' officers aboard the voluntary observing merchant ships of various nations. The organisation of this scheme, in which about 2,500 ships now take part, the ships sending their observations to various meteorological services by radio and the meteorological services, in return, issuing weather information to the ships, is carried out by the Commission of Maritime Meteorology of the World Meteorological Organisation (W.M.O.).

This Commission, which has been in existence since 1907, and under the auspices of the W.M.O. since March 1950, held its Third Session as a Technical Commission of the W.M.O. at the 14th century University of Utrecht in August last year. Utrecht, although some thirty miles from the sea, is, like all Netherlands cities, not lacking in nautical flavour and there is plenty of water there in the canals! The home of the Netherlands Meteorological Service, which has always been very active in maritime meteorology, is at De Bilt, a few miles away.

Representatives of thirty-one countries and observers from nine international organisations attended the Conference, which was presided over by Dr. H. Thomsen of Denmark. Dr. Thomsen is an oceanographer and meteorologist and a keen yachtsman, and has been a member of the Commission since 1939; many other members of the Commission are seamen or oceanographers and all have specialised in some way or other in maritime meteorology. Four Port Meteorological Officers (one from Israel, two from Netherlands and one from South Africa) gave the Commission very helpful advice.

The Conference, which lasted a fortnight, was extremely amicable and it is refreshing to note that no political considerations arose; all members were doing their best to achieve the best possible results for shipping, on an international basis.

One of the chief problems discussed was that of endeavouring to improve the network of observations from the sparse oceanic areas of the world (notably the oceans in the southern hemisphere), for an adequate network of observations is a first essential towards the provision of accurate weather forecasts. The Commission had the aid of maps prepared by the W.M.O. Secretariat to show the number of observations received from ships throughout the world on days picked at random during the International Geophysical Year. The Commission recommended that in certain areas considerable improvement would be possible if Port Meteorological Officers of certain countries were more active in recruiting Auxiliary Ships and that certain countries could do more to disseminate rapidly all the reports they received from ships, for the benefit of neighbouring countries so that those reports could figure on all the weather-maps in the area. In other areas it was appreciated that there are no regular trade routes and the only way of getting additional reports there seems to be by the use of automatic floating weather stations,* or by the establishment of some form of manned floating meteorological station, similar to an ocean weather ship. The Commission recommended that a Committee be set up to consider the possibility of chartering laid-up tankers as one way of solving this problem economically—the idea being that a tanker could remain a long time (up to twelve months) at sea and a relief crew could be put aboard by tender when required. Aboard such a vessel, upper air and surface observations could be made, as aboard a weather ship.

The Commission also recommended that special steps be taken, on an international basis, to secure more co-operation by fishing vessels in the provision of radio weather messages (having in mind the fact that fishing vessels tend to operate in areas where shipping is sparse) and to educate fishermen as to the importance of doing this and as to the value to themselves of regular and accurate weather information.

* See article on page 27.

Bearing in mind the value to the meteorologist of upper air observations, consideration was given to the possibility of making such observations aboard certain merchant ships, on the basis of successful work of this nature done by the U.S. Weather Bureau aboard some of their ships. It was agreed that such observations, if carried out at all, could only be done by professional meteorologists aboard special types of ships (e.g., bulk carriers) which spend considerably more time at sea than in harbour.

Cloud observations are always rather difficult for voluntary observers, and the Commission has prepared a selection of photos from the International Cloud Atlas, with simplified description for issue to voluntary observers on an international basis. Publication of an International Cloud Card embodying these photographs, and guidance to observers on cloud height observations, were also recommended.

Marine observers will be glad to know that no drastic changes in the 'Ship' code form were proposed, but the possibility of including direct sea temperature readings, instead of difference between sea and air temperature, was discussed, and is still under consideration.

Various questions concerning marine meteorological instruments and accuracy of observation aboard ship (e.g. measurement of precipitation, sea temperature measurement and measurement of true wind by anemometer) were discussed, together with a suggestion that certain changes might be made in the wind speed equivalents of the Beaufort scale, but all these questions are being given further consideration and study.

Meteorological aspects of the 1960 International Convention for Safety of Life at Sea were discussed, and as a result the Commission made recommendations concerning the use of facsimile apparatus for the reception of weather maps and ice maps aboard ship, the provision of forecasts of state of sea and swell, and the problem of icing of ships' superstructures, due to frozen spray.

During the Conference an opportunity was taken to have a series of lectures on the question of "Methods of forecasting the state of sea on the basis of meteorological data", at which representatives from the Federal Republic of Germany, the Netherlands, U.S.A. and U.K. made contributions. It is hoped to reproduce the text of these lectures in later numbers of *The Marine Observer*. The U.S.A. in particular have used such forecasts quite considerably during recent years in connection with their programme of weather routing of ships.

A further Technical Discussion was held one evening, when the subjects discussed included activities aboard a U.S.S.R. oceanographical and weather ship in the Pacific, aspects of the ship routing programme as practised by the U.S.A. and Netherlands authorities, a description of a portable radio sonde used in certain U.S.A. merchant ships, and various applications of sea temperature isotherms. The Marine Superintendent of a Netherlands shipping company attended this discussion and seemed very satisfied with the results of the experimental ship routing technique which had been applied to two of the ships of his company. The Conference generally agreed that this technique is in its infancy and its success depends, to a large extent, upon the accuracy of relatively long term weather forecasts covering a period of up to five days ahead.

In order to get the fullest climatological value from the observations made aboard ships of all nations, the Commission recommended a scheme whereby the oceans of the world would be divided up into areas of responsibility for climatological purposes. Thus, the United Kingdom would be responsible for most of the North Atlantic, and punched cards of observations made in that ocean by the ships of other nations would be sent to the U.K. for processing.

The intention is that climatological data received from all ships in the various ocean areas, after they have been tabulated, will be sent to the W.M.O. secretariat at Geneva for publication in the form of monthly climatological summaries. It is considered that they would be of considerable value to meteorologists for various

purposes. It has not been practicable to publish such summaries before, because the data from ships have not been collected on an international basis. The Commission also made recommendations concerning the eventual preparation of a world climatological atlas of the oceans, based upon the data collected from all ships in the various ocean areas, the period selected being 1950 to 1979.

Another subject discussed by the Commission was that of sea ice; recommendations were made concerning a unified code for reporting ice from aircraft, ships and shore stations and for the publication of an international illustrated ice nomenclature and the adoption of an international system of symbols to depict ice conditions on maps (e.g., on facsimile maps).

The Conference set up several Working Groups to discuss various problems during the three years that must elapse before the Commission has its next meeting. At the conclusion of the Conference Mr. J. A. Montijn, of the Netherlands Meteorological Institute, was elected President in place of Dr. Thomsen (Denmark) who wished to resign the presidency. Mr. Montijn previously served afloat as a deck officer in the Netherlands Merchant Navy and has now for many years been engaged on maritime meteorological work ashore; he is at present in charge of the Marine Department of the Netherlands Meteorological Institute of De Bilt.

Those attending the Conference were hospitably entertained by their Netherlands hosts; the arrangements included a trip round Rotterdam docks in a 'Speedo', and receptions by the Burgomasters of Rotterdam and of Utrecht.

It is interesting to reflect that meteorology does not only affect the safety of ships but also their economics. The shipping press of 10th October 1960 pointed out that freight rates were temporarily affected in an adverse way by wet crops harvested in Europe, due to the fact that these were unsuitable for storage and "would have to be used as soon as possible". But presumably as soon as these crops have been used up there will be a considerable demand for outside supplies again—and freight rates will rise once more.

On behalf of the Director General and staff of the Meteorological Office, we send New Year Greetings to all our readers, afloat and ashore.

C. E. N. F.

THE MARINE OBSERVERS' LOG



January, February, March

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

CYCLONE

Coral Sea

m.v. *Nottingham*. Captain H. D. Sladen. Balboa to Brisbane.

28th February 1960. At 1200 GMT a cyclone was suspected in approximate position 16°30'S, 155°00'E. At 1700 a cyclone was confirmed in position 19°00' S,

156°00' E, moving south at 10 kt., central pressure 985 mb. At this time the vessel was in position 28°48'S, 169°18'E, experiencing a SSE wind, force 5, and the barometer was at 1010.0 mb., and rising. The vessel was approximately 900 miles from the storm centre.

The subsequent positions of the cyclone and vessel are tabulated on page 9:

28th February 1960, 0907 GMT. Vessel reduced speed to 10 kt., to allow cyclone to cross vessel's intended course line.

2050 GMT. Course altered to 212°. Cyclone maintaining slow speed and expected to recurve to the E.

1st March, 0215 GMT. Cyclone appeared to be maintaining its course. Speed increased in order to cross cyclone's track into navigable semicircle.

1820 GMT. Course altered to 255°, vessel having crossed into navigable semicircle. Vessel heading for Sydney, Port of Brisbane closed.

2nd March, 0230 GMT. Cyclone relocated by aircraft.

0035 GMT. Cyclone moving slowly away from coast. Course altered to 015°, vessel proceeding to Brisbane.

At 1300 GMT on 4th March the vessel arrived at Brisbane, the wind had dropped to SSE, force 4-5, and the barometer was rising.

The cyclone remained nearly stationary for the next 24 hours, slowly filling up. By 6th March, it was no longer classed as a cyclone, but had formed into a deep depression, moving SE at 10 kt.

The cyclone was unusual both in its slow speed and the fact that it did not re-curve. These peculiarities were attributed to a high pressure system (central pressure 1022 mb.) situated between Tasmania and New Zealand. From 1st March to 3rd March this high was almost stationary in approximate position 40°S, 165°E. On 2nd March a ridge from this high extended from New Zealand to the Friendly Is., preventing the cyclone from recurving.

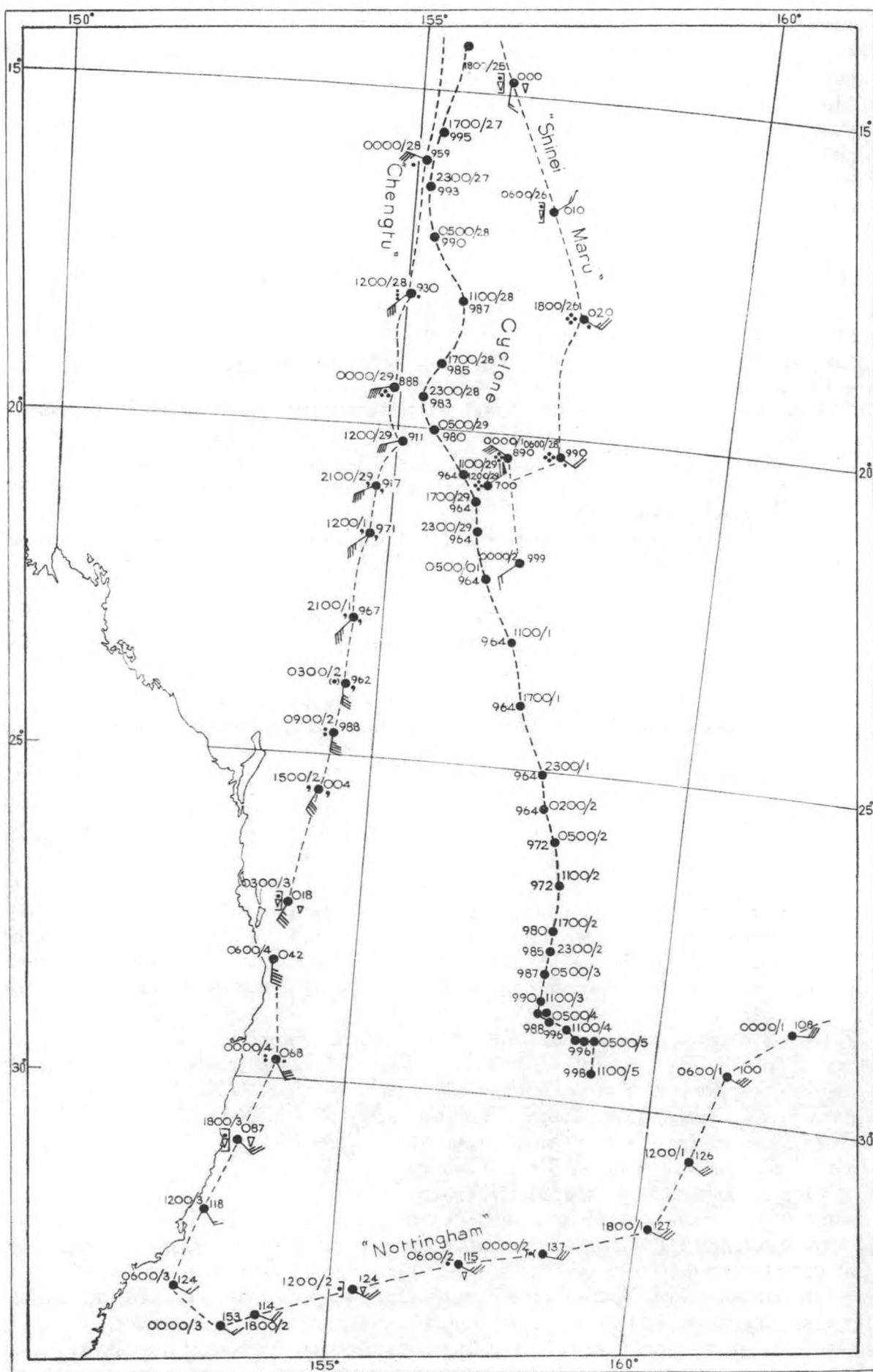
Note. This observation was forwarded to the Australian Director of Meteorology, who has sent us the following comments by Mr. H. E. Whittingham of the Tropical Cyclone Warning Centre at Brisbane:

This cyclone developed from a small depression first noted at 13.5°S 158°E in the Coral Sea to the south-east of the Louisiade Archipelago on 25th February 1960. A cyclone advisory (limited distribution) was issued on 25th at 0430Z giving its central pressure as 1002 mb. Coastal radios VIB Brisbane and VIS Sydney were requested at 0500Z to ask all ships in the area east of 150 E and north of 20 S to transmit weather and radar reports at regular three-hourly intervals. The response was immediate and generous, and reports began to flow into the Tropical Cyclone Warning Centre at Brisbane. The area of coverage was later enlarged and reports were received from the following ships, listed in their order of appearance on the synoptic charts:

Triona, Kweichow, Malay, Recorder, Shinei Maru, Tjimanuk, Sigli, Tulagi, Eiyo Maru, Chengtu, Kepwickhall, Ceronia, Triaster, Ceylon Maru, Harold Sleigh, Ventura, River Burnett, Caltex Canberra, Tambua, Meringa, Moraybank, Iron Derby, Nikkyo Maru, Nottingham, Shansi, Changsha, King Robert, Port Melbourne, Ternoy, Straat Clarence, Age, Eastern Queen, Cumberland, Ixion, Staberg, Taiyuan, Bilkurra, Malaita, Kaimanawa, Gange, Straat Clement, Kenwa Maru, Kawerau, Iron Yampi, Malekula, Mariposa, Kawarua, and Wanganella.

Most of the reports were in International Code; some were in plain language; all were most helpful. Reference to the accompanying map which gives the revised official path of the cyclone will reveal just how far away from the land-station network the cyclone was. Without the reports from shipping the location, movement and intensity of the storm would have been matters of mere conjecture.

On the map are shown the tracks of three representative vessels: the *Shinei Maru*, who roughly paralleled the cyclone's track to the east, the *Chengtu* whose southerly



DATE	GMT	POSN. OF CYCLONE		PRES-SURE	POSN. OF VESSEL		WIND	SEA	SWELL	BAROMETER TENDENCY	
		S	E		S	E					
28.2.60	1700	19°0	156°0	985	28°8	169°3	SSE 5	Mod.	Heavy S'W	1010°0	Rising
	2300	19°3	155°9	983	28°5	167°7	SE'S 7	Rough	Heavy S'W	1011°5	Rising
29.2.60	0500	20°0	155°3	982	28°3	166°1	SE 7	Rough	Heavy S	1010°8	Falling
	1700	21°0	156°2	964	28°1	163°4	SE'E 5	Rough	Heavy SE	1010°4	Falling
	2300	21°4	156°6	964	28°3	162°4	E 7	Very Rough	Heavy SE'E	1010°8	Falling
	0500	21°9	156°9	964	29°2	161°5	ESE 7/8	Very Rough	Heavy SE'E	1010°0	Rising
1.3.60	1700	23°0	157°0	964	31°6	160°3	ESE 7	Very Rough	Heavy SE'E	1012°7	Rising
	2300	23°5	157°5	964	32°2	158°7	E'S 7	Very Rough	Heavy ESE	1013°7	Falling
2.3.60	0230	25°5	157°8	—	32°3	158°0	E'S 7	Very Rough	Heavy ESE	1012°6	Falling
	0500	25°8	157°9	966	32°5	157°3	ESE 6	Very Rough	Heavy SE'S	1011°8	Falling
	1100	26°7	156°2	970	32°9	155°7	ESE 6	Very Rough	Heavy SE	1012°5	Falling
	1700	27°5	158°6	972	33°5	154°0	E'S 5	Rough	Heavy SE	1011°4	Steady
	2300	28°0	159°0	980	33°7	153°5	ESE 4	Mod.	Heavy ENE	1014°9	Rising
	1100	29°0	159°8	988	32°2	152°8	SSE 5	Mod.	V. heavy E	1012°2	Falling
3.3.60	1700	29°0	158°5	990	31°0	153°1	SE 6	Very Rough	V. heavy SE	1009°2	Falling
	2300	28°5	158°0	990	29°9	153°8	SSE 8	Very Rough	V. heavy SSE	1007°1	Falling
4.3.60	0500	28°5	158°0	990	28°4	153°7	S 9	High seas	Steep V. heavy S	1004°6	Falling

course lay to the west of the cyclone's track and the *Nottingham* whose course ran across the cyclone's path to the southwards. The plotted positions reveal the avoiding action taken by the master of the *Nottingham*. The undeviating track of the *Chengtú* was possible because of her being in the navigable semicircle. The track of the *Shinei Maru*, a slower vessel, would seem to indicate that she was almost caught up in the vortex. This view is strengthened by the fact that she reported a barometer of 970 mb. at 1200z on February 29th with heavy, steady rain and a north-east 55 kt. wind whilst by 0000z, March 1st, the wind had swung to north-west 40 kt. with barometer 989 mb. The Bureau of Meteorology was unable to contact the *Shinei Maru* in port to confirm the reports. The *Chengtú* had experienced winds of a similar strength from the south-west the previous day (February 28th) at 1200 and 1500z with gusts in excess of 70 kt. but with barometers near 990 mb. The lowest barometer reported from the *Chengtú* was 987·7 mb. at 2100z.

Shipping reports enabled the position and movement of the cyclone to be accurately assessed until March 1st, after which extrapolation had to be relied upon until the storm was re-located on March 2nd at 0230z by an aircraft from the R.A.A.F. base at Brisbane. The storm then commenced to lose intensity and stagnate, and filled on the 5th.

High seas and heavy swell were experienced by many of the ships; at 0000z, February 29th, the *Chengtú* reported 9 to 11 ft. seas with swell up to 28 ft., the period being 18 sec. At times it was impossible for the *Chengtú* to estimate the height of sea or swell owing to the violence of wind and sea and reduced visibility. On March 2nd waves 30 ft. in height were reported from Cape Moreton Lighthouse from which the wreck of the *Marietta Dal* on Smith's Rock could be clearly seen in the troughs of the waves.

CURRENT RIP

Flores Sea

s.s. *Caltex Canberra*. Captain P. J. Davies. Brisbane to Dumai. Observer, Mr. J. J. Purchall, 3rd Officer.

1st February 1960. At 0910 GMT the vessel passed through a strong tide rip which was first seen about a mile ahead. The surface of the sea was considerably disturbed giving the appearance of breakers. When the vessel entered the rip, which lay in a 340°-160° direction and was about 300 ft. wide, the ship began to fall off to port and

although maximum starboard helm was applied it failed to stop the swing until the rip was cleared. Wind w, force 4; sea temp. 80°F.

Position of ship: 8°00'S, 125°17'E.

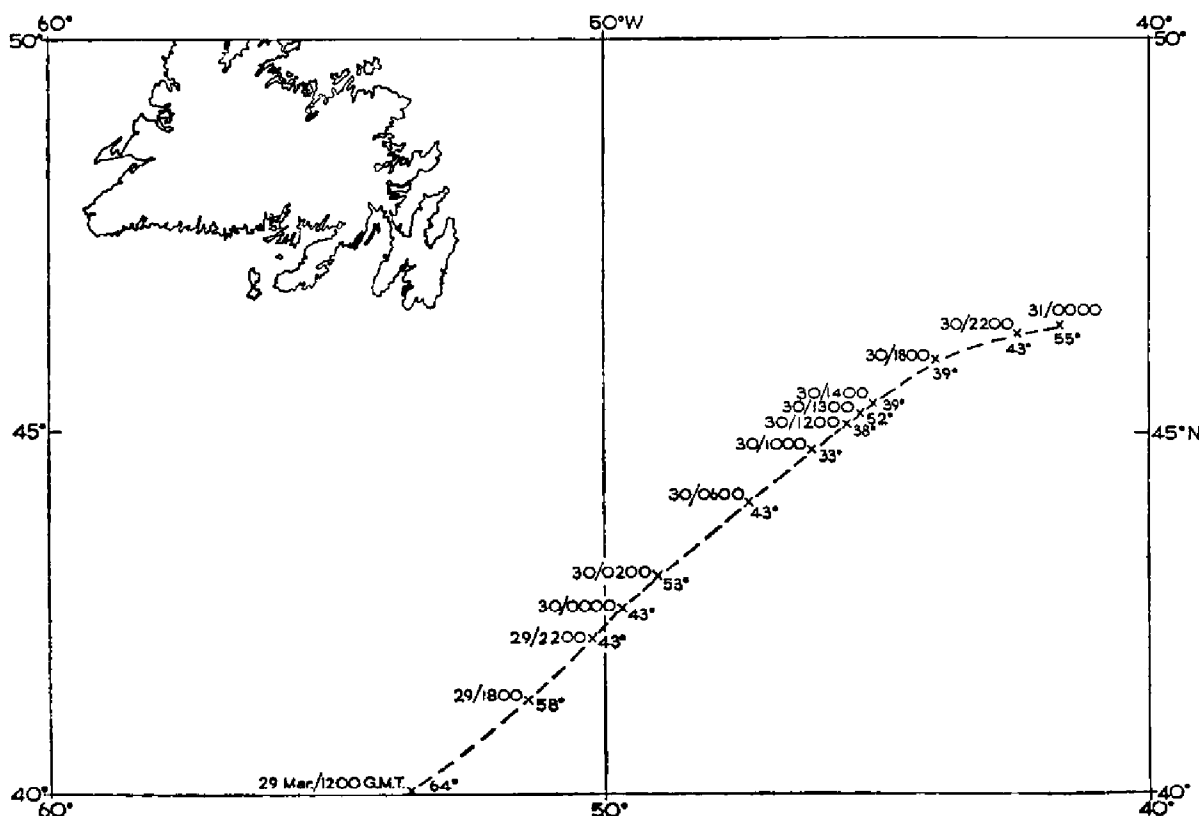
Note. Current rips are to be expected in this area at this time. Waters from the North and South Pacific Oceans converge in the Flores Sea, and the variable character of the sea bottom round the islands of the East Indies adds to the complexity of the flow.

CHANGES IN SEA TEMPERATURE

North Atlantic Ocean

s.s. *Golfito*. Captain G. M. Roberts, M.B.E. Jamaica to Greenock.

29th and 30th March 1960. The very marked variations in sea temperature, shown below, occurred between 41°30'N, 50°50'W and 46°30'N, 41°30'W.



Sea temperature by condenser intake.

(Times in GMT; intermediate positions interpolated from 6-hourly values.)

Note. The vessel was traversing the region where the very cold Labrador Current meets the warm waters of the Gulf Stream, and large variations of sea temperature are well known there. In March, there is an area centred at 42°N, 51°W within which the difference between the average maximum and the average minimum sea temperature amounts to no less than 25°F.

It is interesting to note that in the present instance, the range of temperature found by *Golfito* amounted to exactly this value.

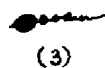
DISCOLOURED WATER

South Atlantic Ocean

m.v. *Ribblehead*. Captain G. D. Leith. Middlesbrough to Victoria. Observers, Mr. D. F. Brewer, 2nd Officer and Mr. K. MacKenzie, Radio Officer.

29th February 1960. At 1800 GMT the vessel passed through an area of discoloured water extending in patches over several miles. It resembled a yellowish scum lying on the surface of the water and gave off a faint, rather unpleasant smell.

A sample of the water was obtained and it was found to contain several organisms which, as they were small in size, were rather difficult to examine in detail. However, the following notes and sketches give some idea of the objects seen.



- (1) A hairy ball of yellowish brown colour about 0.2 mm. in diameter.
- (2) A cigar shaped body, orange in colour, with a relatively long, filament-like tail. The body was about 1 mm. and the tail 1.5 mm. in length.
- (3) A round body with a filament-like tail. This object was 1 mm. long overall and brownish in colour. It showed no signs of life.

Sea temp. 81°F; wind E, force 1; slight swell.

Position of ship: 16°42'S, 37°42'W.

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

m.v. *Ribblehead* in mid-Atlantic was not far east of the area where Gulf-weed is commonly met with, but it seems from the description to have been a bloom of the much smaller and truly planktonic alga *Trichodesmium thiebautii* which she encountered.

It is not possible to be sure of the minute plankton animals described in her report without the aid of a dissecting microscope but the descriptions given suggest that (1) could be a Radiolarian (one of a group of protozoa with an elaborate skeleton of siliceous spicules); (2) was almost certainly one of the larger planktonic Copepoda (crustacea); (3) could have been an Appendicularian such as *Oilcopleura* (they are easily killed getting them inboard, hence 'no signs of life').

It is most unlikely that any of these would have been so abundant as to cause discolouration unaided, in that area, though they would add to the visual effect of swarming microscopic algae.

Australian Waters

m.v. *Charon*. Captain R. G. J. Williams. Singapore to Fremantle. Observers, Mr. I. D. M. Dickson, 2nd Officer and Mr. A. Kennerley, 3rd Officer.

18th January 1960, 1600 GMT. The vessel entered an area of discoloured water patches.

The discolouration took the form of a yellowy-brown scum, first observed lying in streaks along the direction of the wind. Later the ship passed through great patches of varying density, the denser the layer the more yellow the colour.

Samples were obtained and appeared as minute particles of matter floating on or near the surface. There was a slight odour.

The doctor examined them under his microscope and gave the following description:

"Each piece was like a miniature tape worm in a translucent sheath divided into 80 or 90 cells, each with a nucleus. Each cell was entirely separate from its neighbours. The colour was greenish brown, the length approx. 0.4 mm. The arrangement was fascicular."

The ship cleared the discolouration at 0645. A whale was seen when the vessel first entered the discolouration.

Weather: wind 130°, force 2; moderate s'ly swell; baro. 1009.6 mb.; air temp. 78.0°F, wet bulb 73.6°, sea 74°.

Position of ship: 27° 12'S, 112° 24'E.

Note. This observation was sent to us by the Director of the Australian Bureau of Meteorology, together with the comments of Mr. G. G. Smith of the University of Western Australia as follows:

"The specimen is a free-floating blue-green alga of the *Trichodesmium* species. *Trichodesmium* is fairly common in surface waters of the Indian and other oceans. This alga is alleged to have given the Red Sea its name by virtue of its red pigmentation. The pigment is released on death of the alga and may give the water a diffuse pink colour, if the plants are in great density."

UNIDENTIFIED FLOATING SUBSTANCE

South Pacific Ocean

s.s. *Corinthic*. Captain A. C. Jones. Panama to Wellington. Observers, the Master and all deck officers.

1st January 1960. During daylight hours, pieces of an unidentified white substance resembling tripe were frequently seen floating about a foot beneath the surface of the sea. They were roughly circular in shape and approximately 1 ft. in diameter: it was thought they were some type of jellyfish. The substance was so white that even in a moderate sea it was seen at a distance of 400–500 ft. Sea temp. 64°F; wind ssw, force 5.

Position of ship at noon: 37° 17'S, 171° 26'W.

Note. Dr. F. C. Fraser, of the Natural History Museum, comments:

It is not possible to make any very definite identification. The specimens might have been jellyfish of some sort. On the other hand, if they were elongated but still roughly circular in shape they might have been the Tunicate *Pyrosoma*. Certainly, out of the water, *Pyrosoma* might be said to look more like tripe than any jellyfish does.

ST. ELMO'S FIRE

North Atlantic Ocean

s.s. *Birmingham City*. Captain E. Irish. Avonmouth to New York. Observer, Mr. P. J. Wright, 2nd Officer.

2nd March 1960. During violent hail squalls in the morning, the foremost truck and parts of the main aerial became alive with St. Elmo's fire. It took the form of rays, pale green in colour, which became brightest during the most intense period of each squall: they disappeared almost immediately the squall had passed.

Arctic smoke was also seen during the morning. Air temp. 33°F, sea 69°; wind NW, force 8.

Position of ship: 41° 20'N, 60° 00'W.

Note. The great instability giving rise to hail showers, and the Arctic smoke, are typical of cold Arctic air flowing over warm Gulf Stream water.

s.s. *Fanad Head*. Captain J. Alexander. Liverpool to St. John's, N.B. Observer, Mr J. S. Hanna, 2nd Officer.

31st March 1960. At 0000 GMT the weather, already bad, deteriorated rapidly as a very heavy snow shower passed over, accompanied by a W's wind of Force 10. Lightning could just be seen through the snow, but no thunder was heard due to the noise of the wind. Throughout the squall, a luminous glow was seen at the tip of the jackstaff and also along the foremost stay. It was a greenish white, and extended outwards for a distance of about 6 in. No other electrical phenomena were seen after the passage of the squall. Air temp. 38°F, wet bulb 36°, sea 54°.

Position of ship: 47° 32'N, 36° 28'W.

Note. This report and its explanation are very similar to that above (s.s. *Birmingham City*).

OROGRAPHIC CLOUD

Caribbean Sea

m.v. *Columbia Star*. Captain M. Bremberg. Liverpool to Curaçao. Observers, the Master and Mr. A. J. Fordham, 3rd Officer.

22nd January 1960. The large bank of Cu. shown in the photograph on opposite page was seen above the island of Santa Cruz at 1100 SMT as the ship was approaching from the NE. This was the only cloud in the vicinity at the time and it persisted until the island was out of sight. An isolated heavy shower was seen an hour later in the direction opposite to that of the island. Air temp. 81°F, sea 80°; wind E or SE, force 1–2.

Position of ship: 17° 30'N, 64° 25'W.

(Opposite page 12)

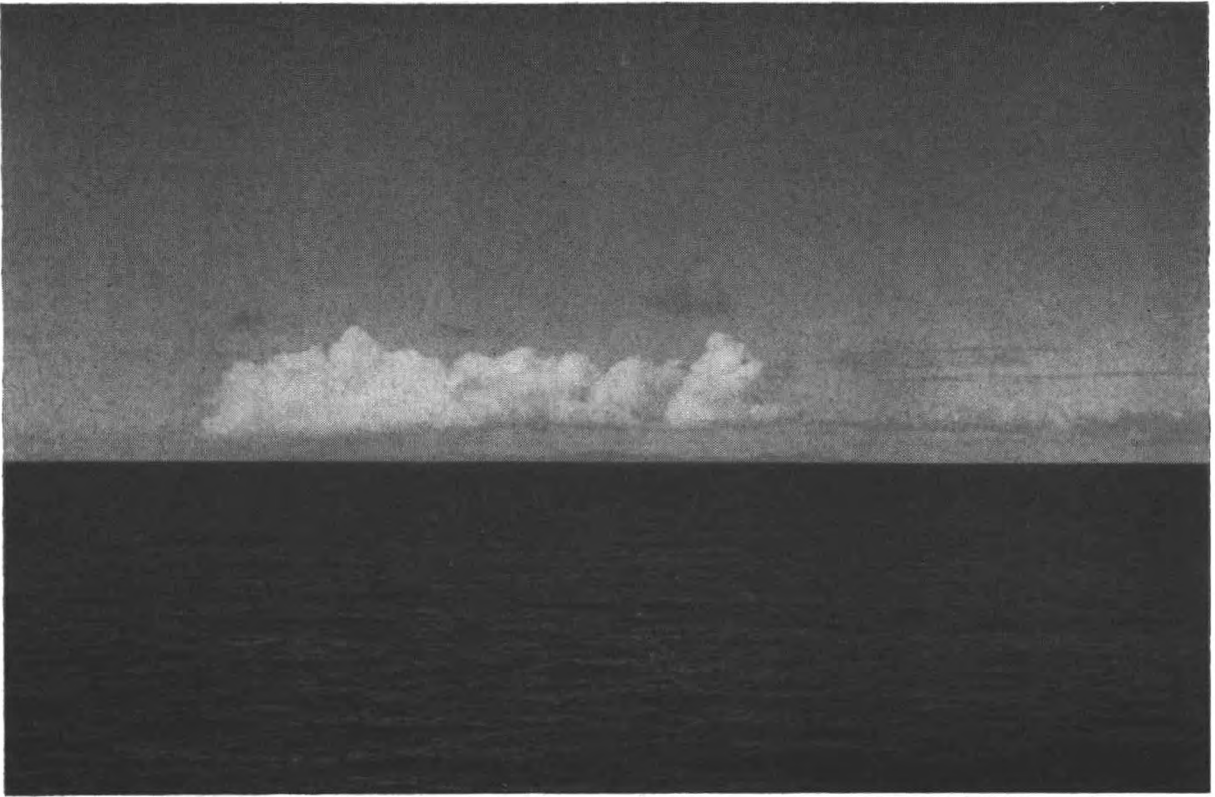


Photo by Captain M. Bremberg



Photo by Captain M. Bremberg

Orographic cloud observed from m.v. *Columbia Star* (see page 12).

(Opposite page 13)

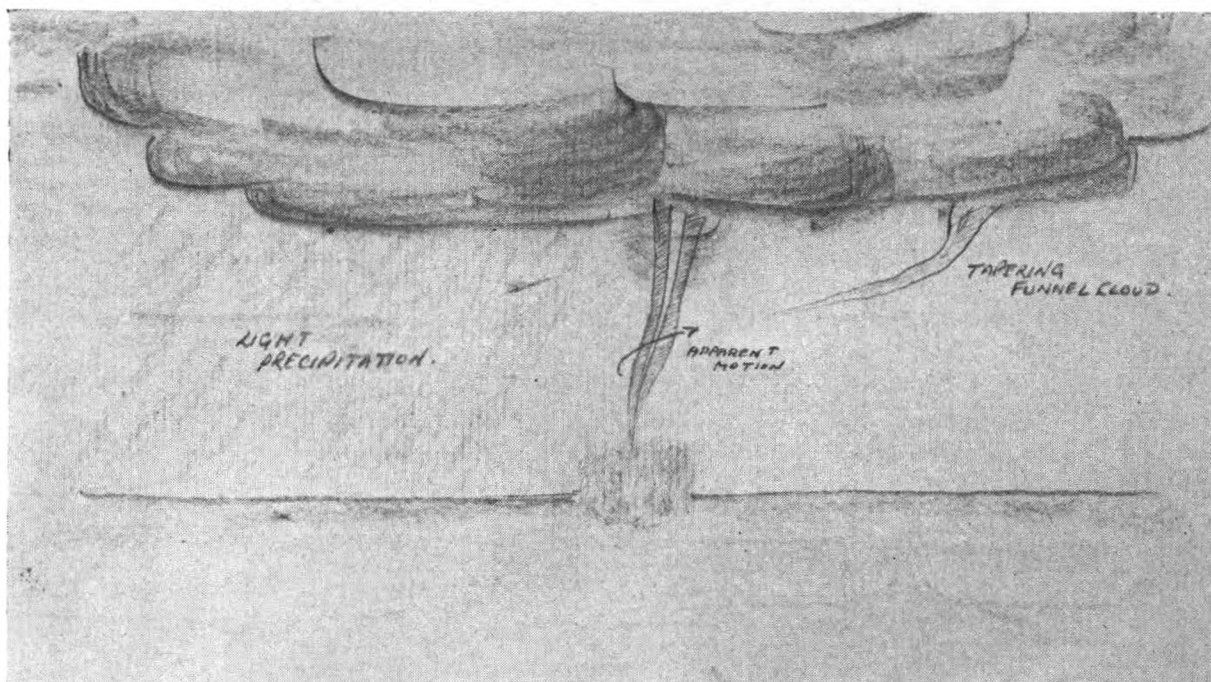


Photo by J. F. Kelly, 3rd Officer



Photo by J. F. Kelly, 3rd Officer

Waterspouts observed from m.v. *Wairimu* (see page 13).



Waterspouts observed from s.s. *Kawerau* (see page 13).

WATERSPOUTS

Off North-West Sumatra

m.v. *Wairimu*. Singapore to Bombay. Observers, the Master and all navigating officers.

9th February 1960. At 0505 GMT (1135 SMT) three waterspouts were observed forming on the port beam, and from then until 0535 seven waterspouts were observed in or about the vessel's track. When first sighted, one was half formed and another two were forming about 2 miles distant. The water was disturbed by the whirling motion of waterspouts and embryo waterspouts, and spray was tossed up from their bases. (See photograph (1) on opposite page.) In the space of 15 min., five had formed on the port beam and appeared to be moving along rain belt edge in a SE'ly direction. (See photograph (2).) At 0510 the radar was switched on, and a belt of rain 25 miles long and about 5 miles wide was seen on PPI in a NW-SE direction. Shortly, two waterspouts were sighted to starboard about 3 miles distant, and course was altered to clear the first. It was passed about 2 cables distant on the port beam, but was not fully developed. The counter-clockwise motion of the embryo waterspout was clearly observed, and spray from the base was tossed to a height of about 3 ft. The diameter of the waterspout was approx. 150-200 ft. A few min. later course was again altered, to avoid the second one. Its spiral motion showed very clearly on PPI at 8 cables. At 0535, torrential rain with accompanying thunder and lightning set in, lasting 20 min. When the belt of rain had passed, no further waterspouts were observed. At 0530 (1200 SMT): light variable winds, rippled sea, no swell; baro. 1012.9 mb.; air temp. 81°F, sea 84°; rain commencing; course 271°.

Position of ship: 5° 49'N, 94° 43'E.

Note. m.v. *Wairimu* was clearly in an area of storminess associated with the NE monsoon of south-east Asia. (See map in *The Marine Observer*, April 1960, page 74.)

South Pacific Ocean

s.s. *Kawerau*. Captain J. A. Kirk. Observers, the Master, Mr. G. Williams, 2nd Officer and Mr. P. Rayner, 3rd Officer.

30th January 1960. At 2315 GMT two waterspouts developed from the base of a heavy Cb. cloud from which showers were falling (see drawing on opposite page). One of the columns tapered away to nothing and lay at a rather small angle to the horizon, while the other, which was thicker, developed directly downwards and made contact with the water, causing a considerable disturbance on the surface. It was about three miles away, and when observed through binoculars appeared to be revolving in a clockwise direction. The sides of the column were dark and the central core much lighter. Calculations gave the height of the cloud base as 1,220 ft. Air temp. 78°F, wet bulb 72°, sea 75°.

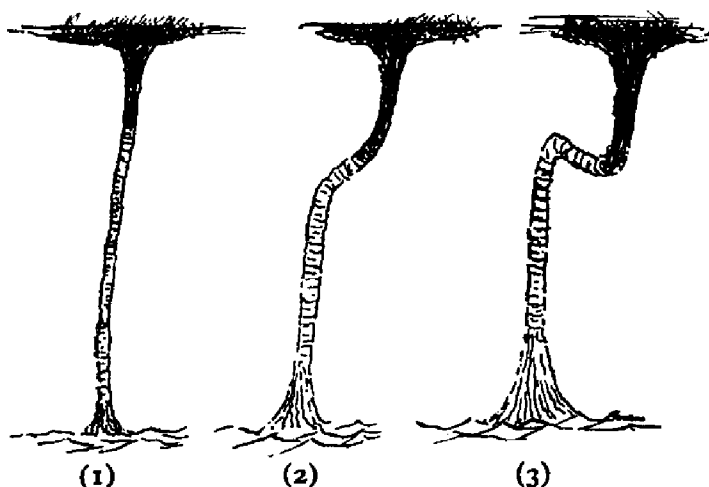
Position of ship: 31° 14'S, 166° 45'E.

Note. This observation illustrates that when water-spouts are experienced their exact location is accidental, but when one has formed it will develop and absorb the energy of possible vortices elsewhere.

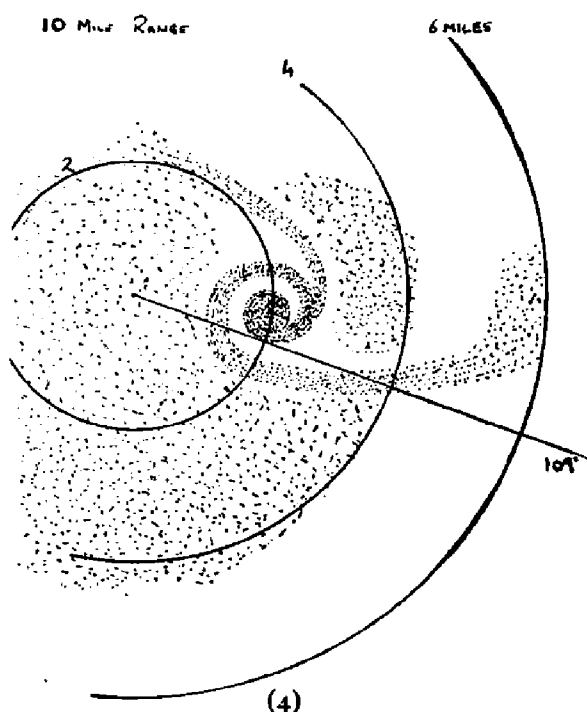
Indian Ocean

m.v. *Diomed*. Captain W. J. Moore. Aden to Penang. Observer, Mr. R. M. Ireland, Extra 3rd Officer.

24th February 1960. On clearing a heavy rainstorm at 1235 GMT a waterspout was observed 6 to 8 miles away. At first it was nearly vertical and very thin (Fig. 1), then it began to develop a kink and to broaden, especially at the base of the cloud (Fig. 2). Soon after the stage shown in Fig. 3, the spout broke up and disappeared, having been seen for 3 min. The radar was working efficiently at the time but it was not



possible to identify the spout with certainty and to separate it from the numerous small showers showing on the screen. Air temp. 80°F , wet bulb 79.9° , sea 80° ; wind NE'N, force 5; cloud, bad weather stratus fractus at 100–300 ft.



One hour after the spout had disappeared, the phenomenon shown in Fig. 4 was observed on the radar screen. No actual waterspout was seen despite the fact that the vessel passed within a cable of the hard core shown in the centre of the diagram. The radar set was in efficient working order; there was no change in the weather conditions given above.

Position of ship at 1235: $6^{\circ} 39'\text{N}$, $77^{\circ} 47'\text{E}$.

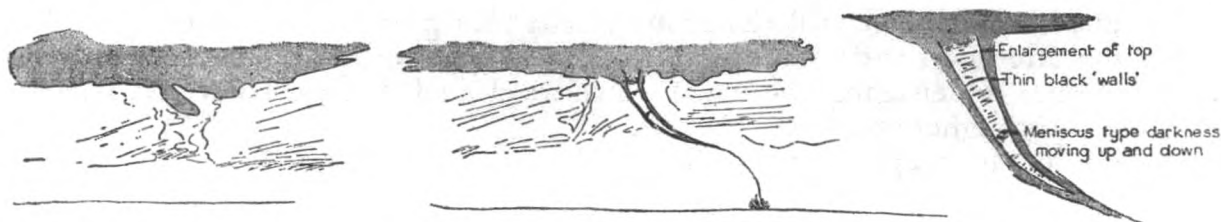
Note. This observation is of great interest, but not surprising. Circulatory systems of varying states and intensity occur in the atmosphere. A waterspout is a circulation of great intensity associated with the precipitation of water vapour. Intense circulations with less precipitation which are not clearly visible must occur frequently.

North Atlantic Ocean

s.s. *Gothic*. Captain L. J. Hopkins. London to Curaçao. Observers, the Master, Mr. R. Dyer, 3rd Officer, Mr. M. Jenkins, 4th Officer and all Cadets.

5th March 1960. Just before twilight at 2210–2220 GMT a thick protuberance was

seen to develop from the base of a large heavy-looking cloud mass, the only rain-producing cloud in the sky. After about 3 min. it shortened and seemed to disappear, but it might possibly have been indistinguishable against the grey background. Two min. later it reappeared from the same part of the cloud, but now it was long and



thin, resembling an enormous stockwhip: it thinned almost to a line where it met the water, which was considerably disturbed. It was too dark to see if the spout was revolving, but it was obvious that it had thin black 'walls' and that inside it there were dark areas which had convex meniscus-like tops, moving up and down. In the deepening twilight it was not possible to say how long the column persisted. The sketches show the appearance of the spout. Air temp. 76°F, wet bulb 72°, sea 76°; wind s, force 3; 3/8 Cu. and Cb.

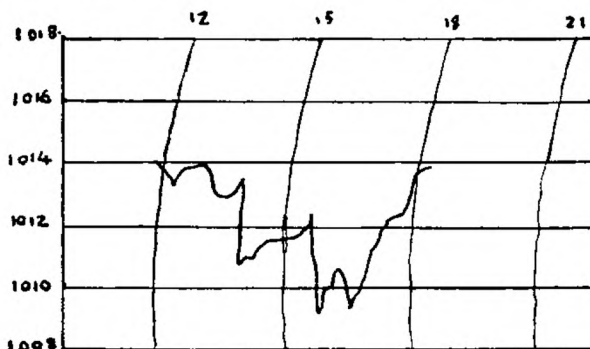
Position of ship: 24° 29'N, 54° 35'W.

Note. This observation gives very useful information concerning the structure of the water-spout. A few angular measurements, associated with an estimate of distance, would have added to the value of the report.

BAROGRAPH TRACE IN THUNDERY SQUALLS

Great Australian Bight

s.s. *Caltex Canberra*. Captain P. J. Davies. Bandar Mashur to Botany Bay. Observer Mr. B. V. Campbell, 2nd Officer.



3rd January 1960. When approaching Cape Otway, the vessel passed through thundery squalls, in which the SE/E wind gusted to force 8-9. The appearance of the barograph trace between 1200 and 1800 GMT is shown in the sketch. There was very little vibration due to the engines and the vessel was reasonably steady. Temp. at noon: air 58°F, wet bulb 53.5°, sea 59°.

Position of ship at noon: 39° 00'S, 142° 30'E.

STANDING ATMOSPHERIC WAVES

North Atlantic Ocean

m.v. *Kumasi Palm*. Captain J. S. Kopek. Rotterdam to Bathurst. Observer, Mr. J. I. Punton, 2nd Officer.

5th March 1960 between 0240 and 0310 GMT. Six banks of cumulonimbus, running N and S from horizon to horizon, passed over the vessel. Each bank was roughly ten miles distant from the preceding and succeeding banks.

The barometric pressure (1021.7 mb) and air temperature (62°F) remained steady throughout. The wind, which had been variable, force 1, settled to blow from 280°. With each bank directly overhead, cloud-base 250 ft., the wind reached force 7, and with the passing of the bank dropped immediately to force 2-3. When the last bank of cloud had passed overhead the wind again became variable, force 1, the barometer and thermometer still remaining steady. No precipitation occurred.

On the afternoon and evening of 4th March 1960 we had encountered several banks of thick to dense fog, the last of which we cleared at 2240. The vessel's course and speed throughout was 196°, 10½ kt.

Position of ship: 34° 10'N, 13° 06'W.

Note. This observation is of considerable interest dynamically, and is evidence of standing atmospheric waves taking place in the subsiding air on the eastern side of the Azores anticyclone.

UNUSUAL FOG BANK

South Pacific Ocean

m.v. *Empire Star*. Captain G. T. King. Wellington to Panama. Observer, Mr. I. C. Wood, 3rd Officer.

30th-31st January 1960. Between 2245 and 0200 GMT the vessel traversed a belt of fog, some 50 miles wide, in which the visibility ranged from 200-500 yd. It was difficult to understand the reason for the development of fog in view of the air and sea temperatures observed throughout the period. The air temp. decreased gradually from 70°F at 1800 to 69° at 2000 and to 67° at 0000. After the fog cleared the sky remained overcast, and there was a further fall of a degree in half an hour, making the lowest value 66°. The sea temperature remained unchanged throughout at slightly over 73° and the dew point remained steady at about 65°; the wind was NW'ly, force 4-5, all the time.

The forecast issued by the New Zealand authorities in the evening referred to an eastward-moving cold front, which was not far from the ship, and it seems possible that it may have been met during the period. Fog would not, however, be expected at a cold front.

Position of ship at 0000: 38° 21'S, 174° 55'W.

Note. The *Empire Star* appears on this occasion to have been in relatively warm humid air with sufficient wind velocity to transport moisture up from the sea continuously. This requires a deep, neutrally stable layer (several hundred feet thick) adjacent to the sea. Under these conditions humidity fluctuates continuously with saturation occurring locally for short periods.

ORNITHOLOGICAL ODDITY

North Atlantic Ocean

m.v. *Cheshire*. Captain A. H. Williamson. Amsterdam to Las Palmas.

22nd March 1960. During the day, when the vessel was some 150 miles off the Portuguese coast, a number of swallows were seen about the ship; at dusk they began flying in and out of doors and windows, sometimes being trapped in the accommodation and having to be released. Shortly before sunset a pair of hoopoes and a robin appeared. The birds seemed very tame and some spent the night on the top of the crew-messroom door. As the ship was heading in a generally S'ly direction and the birds were presumably migrating north, it would appear that they were behaving in a manner contrary to their instinct. During the day, the wind, which had been light and variable early, became ESE'ly, force 5. The visibility was very good and the height of the lowest cloud was over 2,000 ft.

Position of ship at noon: 39° 42'N, 11° 06'W.

Note. Captain G. S. Tuck, chairman of the Royal Naval Birdwatching Society, comments:

"These birds were obviously bound northwards during their seasonal migration. It is an example of land birds attaching themselves to ships at sea even though the ship may be steaming in the diametrically opposite direction to a bird's migration path."

PHOSPHORESCENCE

North Atlantic Ocean

s.s. *Brasil Star*. Captain L. Vernon. Rio de Janeiro to Teneriffe. Observer, Mr. M. Dunn, 3rd Officer.

8th March 1960. At 0445 GMT the vessel passed through an area of phosphorescence in which patches about 1 ft. across were grouped in parallel bands approximately 15 ft. wide. The bands were roughly 2 ft. apart and lay in a NW-SE direction, but their length could not be estimated. Breaking wave crests were a brilliant green, as were also the bow wave and wake. By 0500, all traces of phosphorescence had disappeared. Sea temp. 72°F; wind NE'E, force 3-4.

Position of ship: 12° 11'N, 23° 54'W.

Oman coastal waters

s.s. *Venassa*. Captain J. C. Nettleship. Rotterdam to Ras Tanura.

4th January 1960. At 2200 GMT, while rounding Ras al Hadd at a distance of 5 miles, the vessel passed through a large area of 'white water', in which there were numerous spots of bright light reminiscent of fairy lights. The most concentrated areas of phosphorescence seemed to lie towards the coast and parallel with it, between Ras al Khabba and Ras al Hadd: it was also present in several bands which stretched away from the coast. Phosphorescence was still seen when north of Ras al Hadd but it presented no unusual features. Sea temp. 74°F; wind, light and variable.

Position of ship: 22° 30'N, 59° 51'E.

Note. Mr. E. W. Barlow, formerly of the Marine Division of the Meteorological Office, comments:

"This does not appear to be the ordinary manifestation of the true 'White Water', which is a summer phenomenon of the SW monsoon period and which is uniform over the whole sea."

Indian Ocean

m.v. *Port Auckland*. Captain C. R. Townshend. Aden to Melbourne. Observers, Mr G. A. Botterill, Junior 3rd Officer, the Quartermaster and Lookout man.

19th April 1960. At 1000 GMT the vessel passed through a patch of phosphorescence comprised of spherical shapes about the size of a dinner plate. They were of a vivid purple colour and presented a most unusual appearance. The bridge fire hydrant was turned on at the time to wash down some spilt tea, and phosphorescence in the form of numerous small spots of colour, which were quite solid and could be smudged with the finger, poured on the deck. A sample was examined but to all intents and purposes it looked like ordinary sea water and was later thrown away by mistake. Sea temp. 83°F; wind SE, force 3. Sea slight to moderate.

Position of ship: 7° 20'S, 77° 50'E.

Note. Mr E. W. Barlow comments as follows:

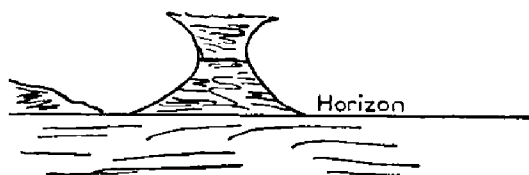
"It is very interesting to have this observation of unusual colour reported so soon after the only previous one, that of s.s. *Esso Manchester*, published on page 64 of the April 1960 number of this journal. It is not stated whether the colours of the spots on the deck was also purple, but presumably this was the case."

ABNORMAL REFRACTION

Mediterranean Sea

s.s. *Esso Cambridge*. Captain L. J. Smith. Thameshaven to Port Said. Observer, Cadet M. Douglas.

2nd February 1960. At sunset the visibility was exceptionally good and the mountains in Morocco, over 70 miles away, were plainly seen. Abnormal refraction

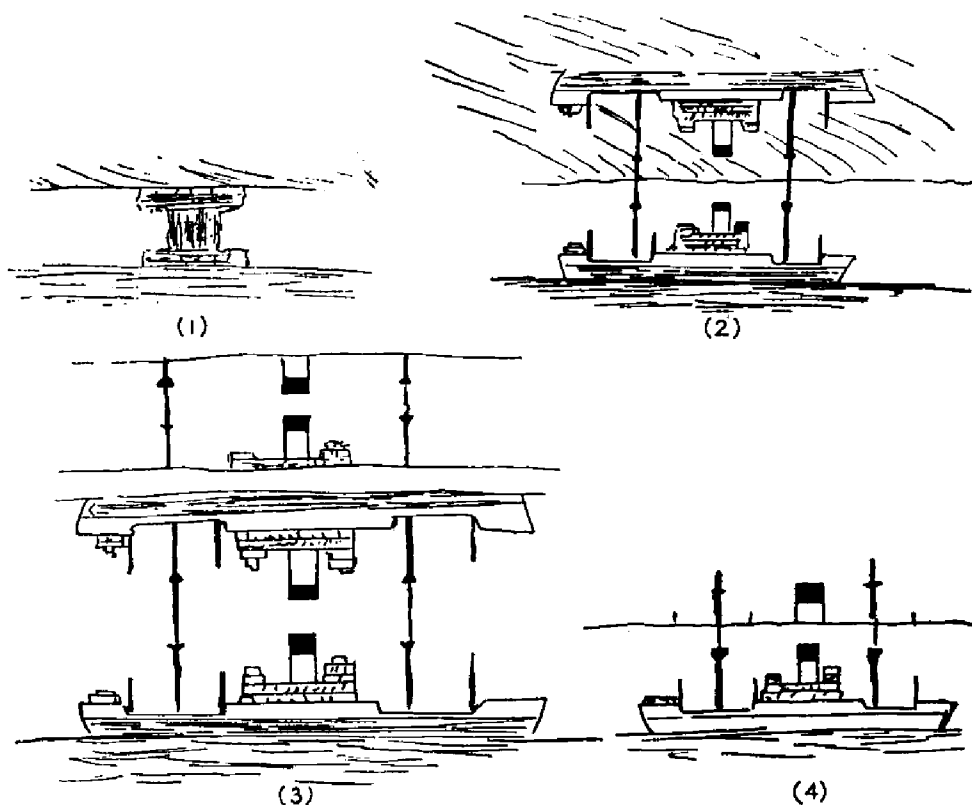


caused one of the peaks, some 5,300 ft. in height, to assume the appearance shown in the accompanying sketch. At 1800 GMT: air temp. 56°F , wet bulb 53° , sea 60° ; wind calm; cloud, $\frac{1}{8}$ Cc.

Position of ship: $36^{\circ} 16' \text{N}$, $3^{\circ} 15' \text{W}$.

s.s. *Afghanistan*. Captain D. Calvert. Port Said to Greenock. Observer, Mr. B. Tyrer, 2nd Officer.

18th February 1960. At 1300 GMT a vessel was sighted hull down at approx. 10 miles distance, and appeared to be underneath a bank of very low cloud. It had the appearance shown in Fig. 1 when on a bearing of 320° . When bearing 335° it appeared as in Fig. 2. The image underwent frequent changes and at one time, when bearing 345° , four images were observed (Fig. 3). At 1330 GMT when the vessel was due N at about 6 miles distance, it assumed its normal appearance and remained so



until out of sight. Air temp. 63°F , wet bulb 60° , sea 59° ; wind ssw, force 1-2; cloud, $\frac{2}{8}$ C_{H9} and $\frac{2}{8}$ C_{M1}.

Position of ship: $36^{\circ} 45' \text{N}$, $12^{\circ} 52' \text{E}$.

Note. This is an interesting record of abnormal refraction caused by widespread lack of atmospheric homogeneity.

s.s. *Clan Campbell*. Captain K. C. Simpson. Port Said to Immingham. Observer, Mr J. W. Wilcock, 3rd Officer.

24th February 1960. Cape Carbon (722 ft.) Light on the North African coast was seen, at 2200 GMT, at a distance of 57 miles: the normal rising distance for the height of eye on this vessel is 38.4 miles. Cape Bougaroun did not dip until the distance

was 39.5 miles, at 2350: it normally dips at 27.5 miles. Air temp. 58.2°F, wet bulb 56.4°, sea 57.8°; wind E'ly, force 3; sea rippled.

Position of ship at 0000 on 25th: 37° 18'N, 5° 42'E.

Note. It is interesting to record this example of exceptional visibility. It is a combination of atmospheric clarity with refraction by unusual vertical distributions of temperature and humidity.

RAINBOW

Great Australian Bight

s.s. *Southern Cross*. Captain L. H. Edmeads. Melbourne to Fremantle. Observers, Mr. I. P. N. Cameron, 1st Officer and Mr J. M. Bain, 4th Officer.

22nd January 1960. Between 0640 and 0643 SMT a rainbow of exceptional brilliance and unusual character was seen. It appeared first, 45° on the port bow, as a rain squall was approaching, and measured about 20° in arc. As the squall reached the ship, the rainbow, which had been increasing in size and in brilliance, became a complete circle, apart from the segment cut off by the hull. It seemed to rise out of the sea on both sides of the ship just forward of the bridge. The brilliance was enhanced by the bow being seen close at hand with the sea as a background. The outer radius was 42°. A partial secondary bow was seen, having the normal reversal of colour sequence. Air temp. 59°F, wet bulb 58°, sea 64°. 5/8 large Cu. Height of eye: 85 ft. above MSL.

Position of ship: 37° 56'S, 136° 26'E.

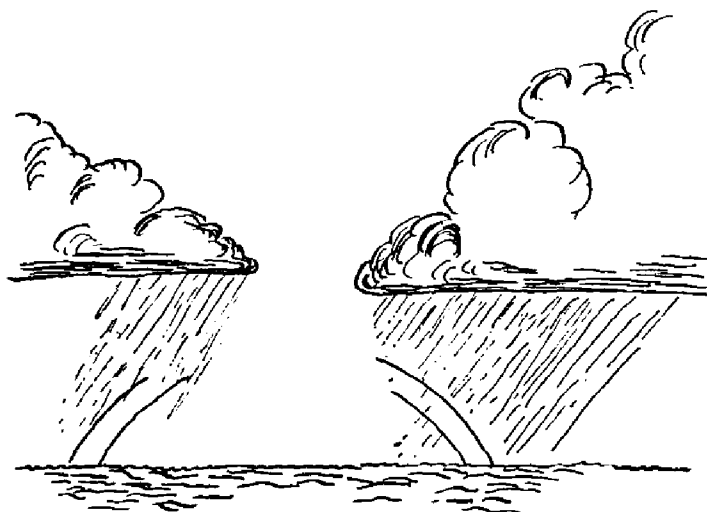
Note. The completely circular rainbow was due to the observer's nearness to the rain and to his being in an elevated position on the bridge.

LUNAR RAINBOW

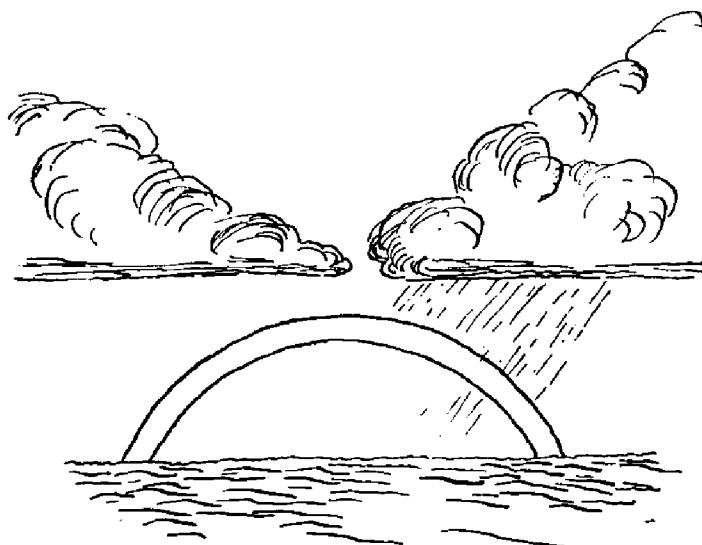
Indian Ocean

m.v. *Port Melbourne*. Captain P. H. Pedrick. Aden to Melbourne. Observers, Mr. T. R. Howe, 3rd Officer, Mr. Nissen, Able Seaman.

9th February 1960. During the latter stages of a fine shower of rain, at 0130 ship's time a partial lunar rainbow was observed ahead of the ship. The initial formation (Fig. 1) appeared as an incomplete bow and about 30 sec. later became



complete. No colours were observed and the phenomena appeared as a whitish colour. The whole sequence lasted approximately 2 min. then disappeared in the opposite way it was formed, i.e. the top of the bow disappearing first, then the base. The bearing of the moon at the time was 294° and the bearing of the rainbow 114°. The base of the bow subtended a horizontal angle of 72° (between 079° and 151°) and the altitude was approx. 16° 40'. Barometer 1010.0 mb.; dry bulb 81°F, wet



bulb 76° ; cloud, $5/8$ towering cumulus and stratocumulus; wind, light airs; smooth/rippled sea and moderate swell. Altitude of moon $20^{\circ} 20'$.

Position of ship: $15^{\circ} 18'S$, $88^{\circ} 00'E$.

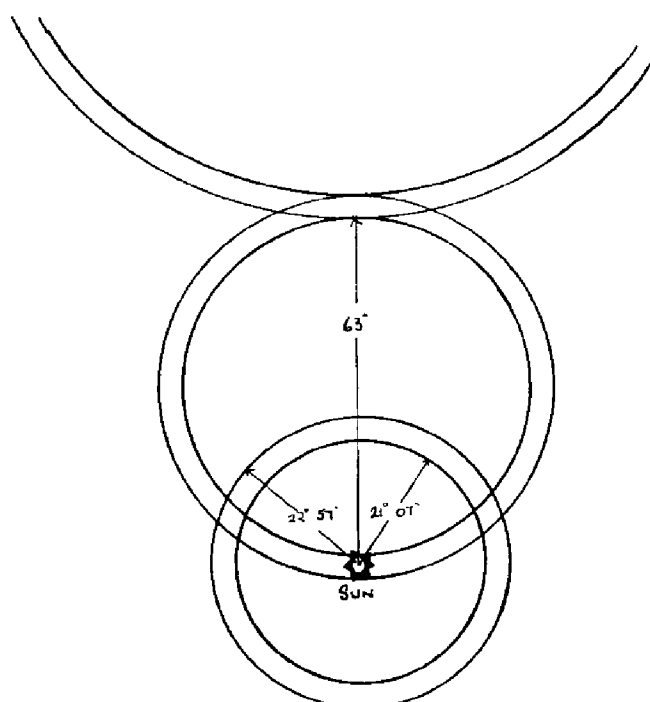
Note. This observation was forwarded to us by the Director of the Australian Commonwealth Bureau of Meteorology. The observers are to be congratulated on a well made observation. Bearings and angles are important in all observations of optical phenomena.

HALO COMPLEX

Caribbean Sea

m.v. *Middlesex*. Captain I. C. Davidson. Curaçao to Colon. Observer, Mr. D. Watt, 2nd Officer.

24th March 1960. The solar halo complex shown in the sketch was observed at



1900 GMT, when the altitude of the sun was $59^{\circ} 18'$ and $8/8$ Cs. was present. The halo of 22° showed much stronger colours than the larger complete halo, while the large arc of contact was much paler than either, and tapered away to nothing.

Position of ship: $12^{\circ} 05'N$, $73^{\circ} 30'W$

CORONA

Southern Ocean

s.s. *Devon*. Captain R. B. C. Brown. Adelaide to Port Huon (Tasmania). Observer, Mr. A. E. Robinson, 3rd Officer.

13th March 1960. At 1100 GMT a corona having four rings was seen, as the edge of a Sc. sheet passed across the moon, which was at an altitude of 23° and bearing 070° . The corona was approximately 8° – 10° in diameter, but there was insufficient time, unfortunately, for an accurate measurement to be taken. A single corona was also seen in apparently clear sky, but some dense cirrus at an altitude of 14° appeared a few min. later: it had a noticeable pink tint.

Position of ship: $40^{\circ} 54'S$, $143^{\circ} 12'E$.

Note. It is very rarely that a corona having four rings is seen and it is unfortunate that time was too short to allow of a fuller observation giving accurate measurements of the diameter of the rings. The size of the coronae is found to vary considerably; the brown border of the aureole, for instance, can have a radius of barely 1° whereas at other times it is as much as 5° . The extreme values which have been recorded are $10'$ and 13° . It also seems practically certain that the colour gradations vary occasionally: the bluish and yellowish tints are sometimes present and at other times are absent. The phase of the moon should be noted when a corona is being observed as variations in the phase cause changes in the diffraction pattern.

GREEN FLASH

North Pacific Ocean

m.v. *Surrey*. Captain A. C. Rollinson. Panama to Auckland. Observer, Mr. B. Smith, Chief Officer.

12th January 1960. An emerald green flash was observed on the sun as it set at 0055 GMT. There was at the time a narrow segment of clear sky, approximately $20'$ in vertical extent, between the edge of an Ac. sheet and the horizon, and an interesting feature of the observation was the fact that the margin of the cloud sheet assumed a bright green tint which lasted from about 30 sec. before the flash to approximately 90 sec. after it. Air temp. $75^{\circ}F$, sea 74° ; cloud, $7/8$ Ac.; wind SSE, force 3.

Position of ship: $2^{\circ} 00'N$, $100^{\circ} 30'W$.

Note. The tinting of objects in the path of the green ray is not unusual. However, the great length of time the green tint was observed suggests some irregularity in the temperature structure of the upper atmosphere.

PURPLE FLASH

South Pacific Ocean

m.v. *Port Macquarie*. Captain A. J. Hawkins. Brisbane to Balboa. Observer, Mr. D. Hawkins, 2nd Officer.

3rd January 1960. As the sun was setting at 0733 GMT small segments appeared to break away and turned purple. The sun was a very bright white at sunset, there being little trace of any red colour. As it went down below the horizon there was a bright purple flash of 2 to 3 sec. duration. Air temp. $71^{\circ}F$, wet bulb 66° , sea 72° ; wind SE, force 3.

Position of ship: $29^{\circ} 36'S$, $173^{\circ} 14'E$.

5th January. The same phenomena were again seen at 0700 GMT, but the colour of the segments was blue and the flash of shorter duration.

Position of ship: $29^{\circ} 46'S$, $173^{\circ} 30'W$.

Note. The phenomena described above are related to the green flash; their added complexity of form and colour are caused by variations in the vertical distribution of atmospheric temperature.

SCINTILLATION OF VENUS

off Los Angeles

s.s. *Loch Garth*. Captain C. C. Dingle. Los Angeles to Panama. Observers, Mr. M. Willetts, 4th Officer and Mr. J. Macneil, Able Seaman.

13th February 1960. At 0445 SMT Venus was observed rising on a bearing of 115° and alternating in colour from red to white, each change lasting about 2 sec. The planet was so bright that it was reported as a shore light by the lookout. The scintillation continued until 0845, by which time Venus had attained an apparent altitude of $2^\circ 03'$ and bore 117° . At the time, the sky was half covered with Cc and patches of Ac. (C_{M4}): shortly afterwards the moon, when at an altitude of 22° and bearing 260° , was seen to have a complete halo surrounding it. Air temp. 57.5°F , wet bulb 54° , sea 59° ; light WNW'ly airs; good visibility.

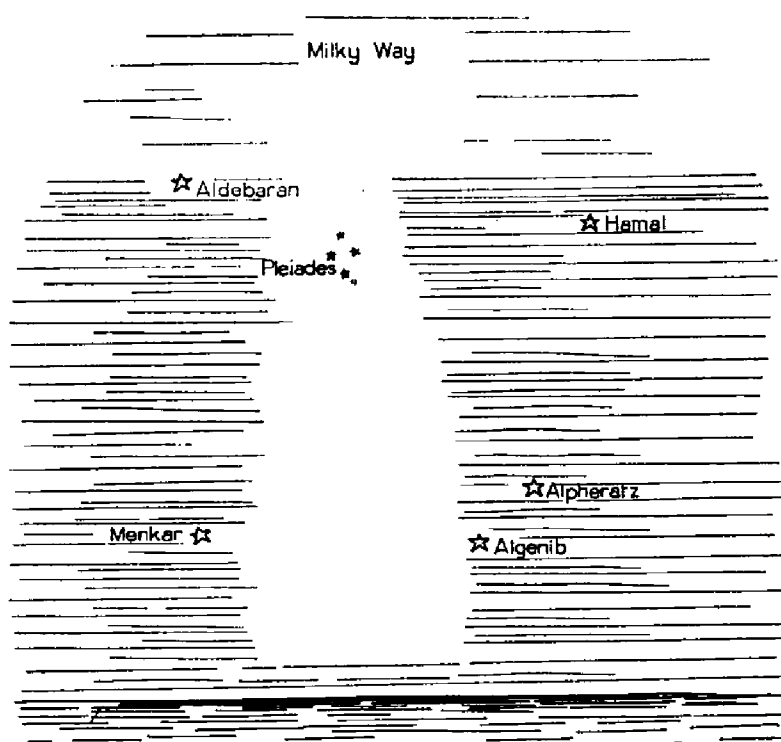
Position of ship: $32^\circ 06'\text{N}$, $117^\circ 42'\text{W}$.

ZODIACAL LIGHT

Gulf of Oman

s.s. *Esso Exeter*. Captain S. R. Dance. Persian Gulf to Aden. Observers, Mr. R. A. Harvey, 2nd Officer, Mr J. R. M. Humphries, 3rd Officer and Mr. R. Phillips, Extra 3rd Officer.

17th March 1960. At 1545 GMT the zodiacal light was first seen, in the form of a



cone of pale milky-white light about twice as bright as the Milky Way, into which the apex of the cone faded. The boundary between the zodiacal light and the sky was quite clean cut—the general appearance being as shown in the accompanying sketch. By 1630 the cone of light could only just be seen.

Position of ship: $24^\circ 00'\text{N}$: $58^\circ 44'\text{E}$.

Note. This is of particular interest because of the great brightness of the zodiacal light. Zodiacal light arises from two causes:

- (a) The tremendous illuminated disc of cosmic dust that surrounds the sun;
- (b) Electrified upper layers of the earth's atmosphere emitting light as they pass into the earth's shadow.

METEOR

South Pacific Ocean

m.v. *Port Macquarie*. Captain A. J. Hawkins. Brisbane to Balboa. Observers, the Master and Mr. S. P. Guy, Junior 3rd Officer.

11th January 1960. At 0700 GMT an exceptionally brilliant meteor, described by the Master as the brightest he had ever seen, suddenly appeared at an altitude of 20° on a bearing of 090°. It moved vertically downwards towards the horizon and disappeared at an altitude of 8°, the duration of the flight being 2½–3 sec. The meteor was pear-shaped, and brilliant white in the centre, but towards the edge it turned to green and was fringed with red. There was a good deal of cloud at the time: visibility was very good.

Position of ship: 22° 12'S, 133° 00'W.

AURORA

The following notes have been received from Mr. James Paton, of the *Aurora* Survey:

"The observations of aurora made in ships during the period 1st January to 31st March 1960 are listed in the accompanying table, which has been prepared by Mrs. Hallissey,

DATE (1960)	SHIP	GEOGRAPHIC POSITION		Λ	Φ	I	TIME (GMT)	FORMS
5th Jan.	<i>Weather Watcher</i>	62°15'N	31°50'W	060	+70	+75	2100	R, RA, C
7th	<i>Weather Watcher</i>	62°00'N	33°00'W	060	+70	+75	0030	R, RA, C
	<i>Ribblehead</i>	67°15'N	13°00'W	090	+71	+77	1840–1910	HA, RB
8th	<i>Weather Watcher</i>	62°00'N	33°30'W	060	+70	+75	0045–0115	R, RA, DR, F
18th	<i>Weather Watcher</i>	61°50'N	32°45'W	050	+70	+75	0001–0900	G
19th	<i>Weather Recorder</i>	59°09'N	19°00'W	070	+65	+73	2350–2355	G, RA
21st	<i>Port Auckland</i>	26°05'S	114°18'W	320	–18	–37	0600–0700	HB
	<i>Weather Watcher</i>	62°20'N	31°45'W	050	+70	+76	0830–0900	G
22nd	<i>Port Auckland</i>	26°05'S	114°18'W	320	–18	–37	0600–0700	S
23rd	<i>Weather Watcher</i>	62°00'N	32°25'W	050	+70	+76	0100–0130	G, RB
	<i>Weather Watcher</i>	61°35'N	32°25'W	050	+70	+76	1800–0700	G
	<i>Logna</i>	59°42'N	00°37'E	090	+60	+73	1930–2135	R
25th	<i>Weather Watcher</i>	61°55'N	32°25'W	050	+70	+75	2100–0300	G
26th	<i>Weather Recorder</i>	59°20'N	19°07'W	070	+65	+72	2230	G
29th	<i>Weather Watcher</i>	60°55'N	27°50'W	060	+68	+74	0300–0600	G
	<i>Weather Recorder</i>	59°00'N	19°00'W	070	+65	+72	0345	G
	<i>Weather Watcher</i>	59°35'N	22°55'W	060	+68	+72	2100	G
1st Feb.	<i>Weather Watcher</i>	57°50'N	13°50'W	060	+68	+72	0300	G
2nd	<i>Weather Recorder</i>	59°07'N	18°52'W	070	+65	+72	1910	G
	<i>Weather Observer</i>	58°00'N	15°30'W	070	+63	+72	1930–2000	R
	<i>Weather Reporter</i>	62°03'N	32°15'W	060	+70	+76	2035	RA
	<i>Weather Reporter</i>	62°03'N	32°15'W	060	+70	+76	2040–2052	RB
	<i>Weather Recorder</i>	59°07'N	18°52'W	070	+65	+72	2055	R
4th	<i>Weather Reporter</i>	62°00'N	32°50'W	060	+70	+76	0240–0250	RA, HA, HB
	<i>Weather Observer</i>	59°00'N	19°00'W	070	+65	+72	0530–0600	G
	<i>Weather Reporter</i>	62°05'N	32°50'W	060	+70	+76	2040–2057	RA, RB, R, C
13th	<i>Weather Reporter</i>	62°00'N	33°30'W	060	+70	+76	2230	HB
17th	<i>Clan Alpine</i>	—	—	—	—	—	2115	G
18th	<i>Weather Reporter</i>	61°50'N	33°15'W	060	+70	+76	0400–0430	RA
19th	<i>Weather Reporter</i>	61°55'N	33°00'W	060	+70	+76	2051	RB
	<i>Weather Observer</i>	59°00'N	19°00'W	070	+65	+72	2100–0600	G
20th	<i>Weather Observer</i>	59°00'N	18°48'W	070	+65	+72	2000–2200	G
21st	<i>Weather Reporter</i>	60°42'N	30°45'W	060	+70	+75	0701	RB, R, F, C
	<i>Waihemo</i>	25°23'S	167°15'E	242	–30	–52	1600–1645	G
	<i>Weather Observer</i>	59°00'N	19°00'W	070	+65	+72	2100–0300	G
22nd	<i>Weather Observer</i>	59°00'N	19°00'W	070	+65	+72	0530–0600	DR
	<i>Weather Observer</i>	58°36'N	19°30'W	070	+65	+72	2100–0600	G
25th	<i>Weather Observer</i>	59°00'N	18°48'W	070	+65	+72	2330–2400	G
27th	<i>Weather Observer</i>	57°40'N	12°06'W	070	+65	+72	2330–2400	G
2nd Mar.	<i>Zinnia</i>	45°50'N	56°10'W	020	+57	+72	0345–0405	HA, R, G
4th	<i>Pennyworth</i>	66°24'N	10°00'E	110	+66	+76	2005	RB
5th	<i>Dunedin Star</i>	46°59'S	108°38'E	180	–58	–76	1400–1545	HA, R
16th	<i>Marengo</i>	52°40'N	28°30'W	050	+61	+70	0145–0200	RA, RB
	<i>New York City</i>	40°30'N	70°42'W	360	+52	+72	0600	HA
24th	<i>City of Brisbane</i>	38°18'S	138°54'E	210	–48	–69	1200	S
31st	<i>Stratheden</i>	37°00'S	115°00'E	180	–46	–67	2000	G, R
	<i>Scottish Eagle</i>	—	—	—	—	—	2200–2230	R, S
	<i>Ionic</i>	50°30'N	9°10'W	070	+55	+67	2200	G
	<i>Hurumui</i>	36°26'N	32°28'W	040	+45	+59	2230	G
	<i>Athenic</i>	32°04'N	44°59'W	030	+42	+60	2230	G, R
	<i>Logna</i>	57°23'N	4°12'E	090	+59	+71	2130–dawn	G, R
	<i>Cornwall</i>	32°47'S	115°00'E	180	–44	–67	1600–2000	G, R
	<i>Regent Hawk</i>	32°10'N	36°30'W	040	+42	+56	2225–2235	G, R

Λ = geomagnetic longitude Φ = geomagnetic latitude I = inclination

(See explanation of magnetic co-ordinates in *The Marine Observer*, July 1960, page 147.)

research assistant at the Balfour Stewart Auroral Laboratory of the University of Edinburgh.

"These observations, along with those received from observers on land and in aircraft, have been plotted on charts designed to show the development of auroral activity during each night. As has been stressed often in the past, information of this kind is of great value to scientists studying related events, both ionospheric and geomagnetic, and we are deeply indebted to observers in ships for the very valuable information concerning displays of aurora which they provide.



"We are particularly interested in the position and movement of arcs. To make an investigation of this kind, it is important to know the elevation (h) in degrees of the highest point of the lower border of the arc at the time of each observation. We should be very grateful if observers would record this observation at times when they report the presence of arcs.

"It is, of course, always useful to know the lowest and highest elevation of the aurora. In the northern hemisphere these elevations would be measured from the northern horizon, and in the southern hemisphere from the southern horizon.

"We should like to repeat our invitation to any observer to visit the laboratory (Department of Natural Philosophy, The University, Drummond Street, Edinburgh 8) when he may be in or near Edinburgh."

HEADING OF THE MARINE OBSERVERS' LOG

The 'Marine Observers' Log' has, since the January 1933 number of *The Marine Observer*, carried a pictorial heading, usually made up of ships, books and instruments.

Readers will have noticed that the subject matter of the heading in this number has been changed. The new heading is a representation of the Neptune Fountain in Kansas City. A photograph of this fountain was recently sent to us by Mr. Herbert G. Burns, a resident of Kansas City and a regular reader of *The Marine Observer* for many years, surely our furthest inland private subscriber. Commander C. H. Williams, who was Port Meteorological Officer in London from 1930 to 1956, and who has been responsible for all the drawings of these headings, made a line drawing from the photograph and this drawing is reproduced as the pictorial heading.

The fountain itself was cast in lead in 1911, and now stands in an ornamental lake in front of the Country Club Plaza.

The statue depicts Neptune and his three attributes, the trident, the dolphin and the horse. He is rising from the sea, his chariot drawn by three horses, while two dolphins (not apparent in the sketch owing to shadow) leap playfully between the horses.

In Greek mythology, the creation of the horse resulted from a contest between Neptune and Minerva for control of the city of Athens. It was agreed that whoever should originate the most useful gift would rule the city, Minerva created the olive tree and Neptune the horse, but it was decreed that the olive tree was the more useful to mankind, hence the city was named Athens after Minerva's Greek name Athene.

It seems not inappropriate that Neptune should now head the 'Marine Observers' Log', for mythology tells us that "his was the power to lash the sea into fury, his also was the power to produce the favourable wind". His, then, was the power to produce the phenomena which we gladly record in these pages.

L. B. P.

Tsunamis

525.63:532.59:550.346:551.21

By B. J. HINDE

(National Institute of Oceanography)

The disastrous earthquakes in Chile which occurred in 1960, and the resulting sea waves spreading havoc and destruction round the Pacific, have focussed the attention of the whole world on one of nature's most terrifying weapons—the tsunami. Commonly called a tidal wave, the tsunami gets its name from the Japanese. Literally it means a 'harbour wave' which appears to be not unreasonable when it is realised that these waves affect harbours and bays much more than they do ships at sea.

How does a tsunami originate? The simplest explanation is to say that it is caused by a submarine earthquake. But instances can be found where a seismic sea wave, as it is sometimes called, results from an earthquake whose epicentre is entirely on land. It is now believed, therefore, that the main causes are:

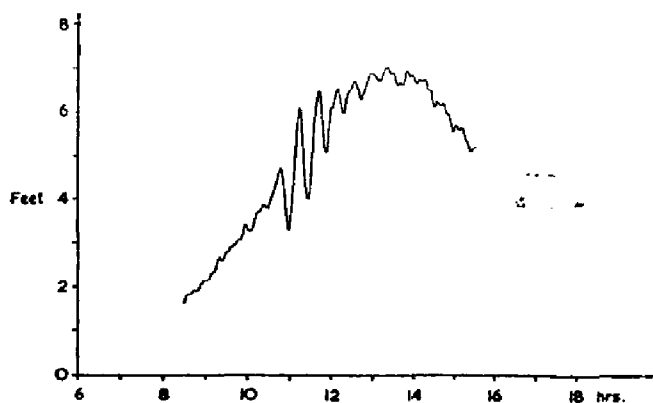
- (a) an undersea volcanic eruption.
- (b) a disturbance of the sea bed sufficient to cause a sudden raising or lowering of a large amount of water. This could occur around a shallow focus earthquake whose epicentre is under the sea. It could also occur adjacent to an undersea landslide which might result from an earthquake centred on the land. Obviously it is impossible to investigate the mechanism of generation of a tsunami since instruments are not available to measure the movements of the sea bed immediately preceding its formation. Earthquake epicentres, however, can be located with considerable accuracy, and it is then that the discrepancies with tsunami centres, plotted from travel times, are noted.

Tsunamis have been known to travel at speeds up to 500 m.p.h. for distances equal to one third of the circumference of the earth! It seems incredible, but it must be remembered that the effect of internal friction is negligible in such a large wave possessing such enormous energy. Of course, the waves do not hit the coast with such a terrific speed. In fact their velocity is proportional to the square root of the sea depth, and so near continents and islands their speed of onrush is considerably reduced, perhaps to about 25 m.p.h. In a similar manner to ripples on a pond when a stone is thrown in, tsunami waves diminish in size for the first few thousand miles of their travel provided that there is no land in their way, the wave crests travelling outwards in an ever widening circle. But then the curvature of the earth begins to have an effect. Since the radius of the circle of waves cannot exceed the radius of the earth, when the tsunami has travelled over a quadrant of the globe the wave front can no longer expand and, indeed, begins to contract. So the effect may be considerably greater at a distance of, say, 8,000 miles than it is at only 4,000 miles.

Over deep water, a tsunami may have a crest to crest distance of as much as 100 miles but with a height of only a few feet. Consequently in the open ocean ships do not even notice them and so are unable to send advance warnings. But, and herein lies the great danger, on approaching shallow waters such as those above a continental shelf the height may increase to as much as 50 feet as the leading edge of the wave is slowed down and more and more water piles up behind, creating a wave-front which may be almost vertical as in a tidal bore. Variations in the depth of the shelf may cause bending of the wave-front, one part of it travelling faster than another and an even larger wave may result converging on one unfortunate part of the coastline. Inlets and bays, too, can amplify the size of the wave. In fact the height usually reaches its greatest in deep U or V shaped bays. On the other hand, in a long shallow bay or in one with complicated boundaries, the height can actually be reduced by friction on the bottom and by repeated reflections from the sides. This type of feature does not change, and so an area which has up to now been relatively free of damage will probably remain so, whilst a danger area today will be a danger area for centuries. It might be mentioned here that it has long been realised that reefs form a most effective screen, and 'artificial reefs' such as those used to assist in coastal fishing, might give some protection, at reasonable cost, from the smaller inundations.

Where are tsunamis mainly to be expected? A glance at a map showing recent locations plotted on it will show that the vast majority originate in the Pacific. This is not surprising, since the world's major earthquake belt rings the ocean beginning in the Andes and running up the west coast of America and Alaska, through the Aleutians, Japan and eastern China to northern India, with a branch to the south through New Guinea to New Zealand. Although every submarine earthquake does

not set up seismic sea waves, it is clear that this ring of coastal weakness in the crust of the earth must be the region in which tsunamis are most likely to originate. From their source they spread out in all directions and Hawaii, itself free from earthquakes, has often become an unsuspecting victim of their attack. The Atlantic, too, is not immune. The Lisbon tremor of 1755 created a most damaging wave, sometimes 50 feet high, which reached as far as the West Indies, North America and even England. Despite this occurrence it is difficult to find definite records of a tsunami around our shores; however, on 1st July 1957 the harbour master at Lerwick in the Shetlands reported a fall and subsequent rise in the water level of $1\frac{1}{2}$ feet followed by several subsequent oscillations. The tide record from this period is shown below. The cause of this phenomenon still remains a mystery.



Part of a tide record taken at Lerwick on 1st July 1957 showing a tsunami of unknown origin superimposed on the usual tidal cycle.

The town of Concepción in Chile has suffered at least seven times during its history from inundations of the sea. At the time of writing, the death roll as a result of the recent earthquakes and the associated tsunamis has exceeded six thousand. The gigantic waves swept across the Pacific and rises in the water level were noticed at places as far apart as San Francisco and Wellington. Hawaii suffered badly also, but thanks to an efficient warning system the damage and loss of life was not as great as, for example, in 1946 when an earthquake in the Aleutians caused a 20-foot wave at Hilo, the island's second largest city. One hundred and sixty were killed and the damage was estimated at £8 million. A few moments before the wave struck, the sea withdrew from the harbour leaving much of it dry. Many people rushed down to see this unusual sight, but within minutes a gigantic wall of water returned crushing everything and everyone in its path. Wave after wave swept in, destroying homes and factories, leaving a trail of havoc and destruction and bringing with it enormous problems of sanitation, communication and medical supplies.

When the volcano Krakatoa blew up in 1883, three waves were created, reaching a height of 135 feet on the Java shores and killing thirty-six thousand people. These waves did not enter the Pacific, but instead crossed the Indian Ocean into the Atlantic and were recorded even as far north as the English Channel, although they then had only a height of an inch or two. Japan has been the scene of many a tsunami disaster. For instance, in 1703 more than one hundred thousand lost their lives when the coast of Awa was flooded, and as long ago as 1611 the town of Yamada was flooded although some 650 feet from the coast. But the record for encroachment must go to the Chilean wave of 1922 which, 17 feet high, travelled over a mile inland.

Spectacular as these reports are it must be remembered that even a small wave can do much damage. In shallow water a wave of only 5 feet can cause many pounds worth of damage by bumping a small vessel violently on the bottom.

In conclusion, one other type of seismic sea wave might be mentioned. Occasionally a submarine earthquake sets up longitudinal vibrations which travel up through

the water, rather like sound waves. If these hit a ship they can jolt it quite violently, making some of those on board believe that they have hit a submerged rock. Many early charts showed such 'rocks' at places where the ocean depth has now been found to be several thousand feet. Except near its source, however, this type of wave is practically harmless, and never rivals in dimensions and force the great Pacific tsunami.

551.507.2:551.508.824

Marine Automatic Weather Stations

(This article has been provided by the Observation and Station Facilities Division of the United States Weather Bureau)

For many years, various solutions have been sought to the problem of obtaining weather reports from sparsely travelled ocean areas. Thus far we have been only partially successful, permitting the unknown to prevail over large important gaps of the oceans. Various schemes have been proposed to improve the synoptic coverage over meteorologically critical areas. The most feasible of these are:

- (a) fixed ocean stations occupied by vessels
- (b) fixed platforms set in shoals ('Texas towers')
- (c) marine automatic weather stations.

Obtaining weather information from remote areas using ships or Texas towers is very expensive. Marine automatic weather stations are now undergoing final tests and are expected to be released for observational use within the near future.

Since there are a number of automatic weather stations under development in the United States, this article will concentrate on two types which have most nearly reached operational capabilities.

Floating Weather Station Model 3-B.

This free-floating weather station was developed for the U.S. Navy by the National Bureau of Standards in 1955 as a hurricane and typhoon monitoring buoy. As such, it was considered expendable. The following year the design was improved and in 1958-59 a number of these stations were successfully moored in the Gulf of Mexico in depths between 1,800 and 2,000 fathoms. Transmitted weather information from buoys was monitored by six shore stations.

The buoy-type station presently consists of a 16-inch diameter cylindrical buoy six feet in length, supporting an instrumented mast and a counter weight. The counterpoise weight is an eight-foot frame with a 40-pound lead ballast at the bottom and attached to the tail frame of the buoy. On the top of the cylinder is mounted a nine-foot superstructure which contains atmospheric pressure and air-temperatures sensors, anemometer and a seven-foot whip antenna making the overall length 30 feet. A wind vane fastened to the superstructure orients the cylinder with respect to wind direction while in the water. A resistance thermometer attached to the inside casing of the buoy gives the temperatures of the water. The total weight of the buoy is 600 pounds. The upper photograph opposite page 28 shows a part of the weather buoy as it rides in the water.

The programme timer is adjusted to transmit for a period of four minutes each six hours. Timing accuracy is controlled by a timing motor in conjunction with a current regulating ballast lamp. During the four-minute period, eight channels of information are sequentially transmitted. The transmitting sequence is attention signal, station identification, reference, barometric pressure, wind direction, wind speed, water temperature and air temperature.

The radio transmitter used in the buoy station emits a radio frequency signal consisting of a train of pulses, each pulse having a nominal value of 250 micro-seconds duration. Signals are determined by the rate of pulsation emitted for each element. The pulse rate is then referred to an appropriate calibration chart for the

actual value. The station has been reliably heard at distances of 600 miles during the day and 1,000 miles at night.

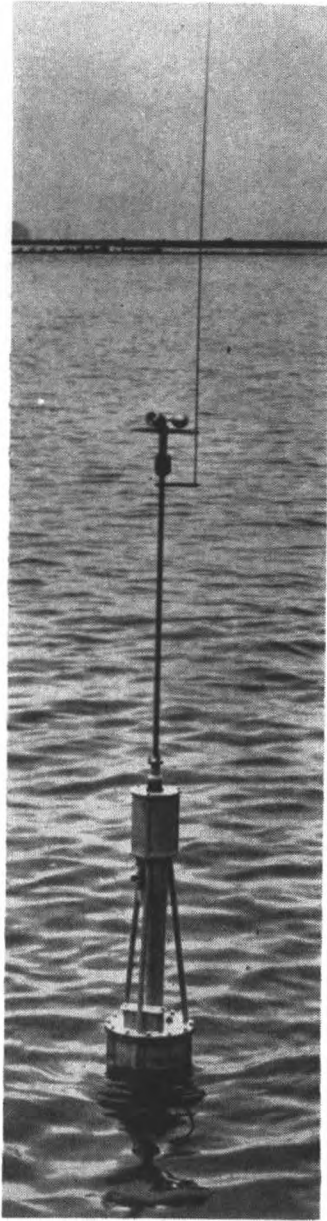
During the 1955 and 1956 hurricane seasons, free-floating weather buoys were launched 300 miles off the east coast of Florida, in the Gulf of Mexico and Caribbean Sea. One buoy was launched approximately 200 miles ahead of Hurricane Janet in 1955 by a Navy cruiser while in the Caribbean. The cruiser received regular weather reports from the buoy until the buoy was within 60 miles of the storm's centre. During 1958-59, weather buoy stations were moored in the Gulf of Mexico 25°N, 90°W. The stations were monitored by five shore stations. It is estimated that more than 75% of the required technical information was obtained from the programme.

Marine automatic weather station—Boat-type

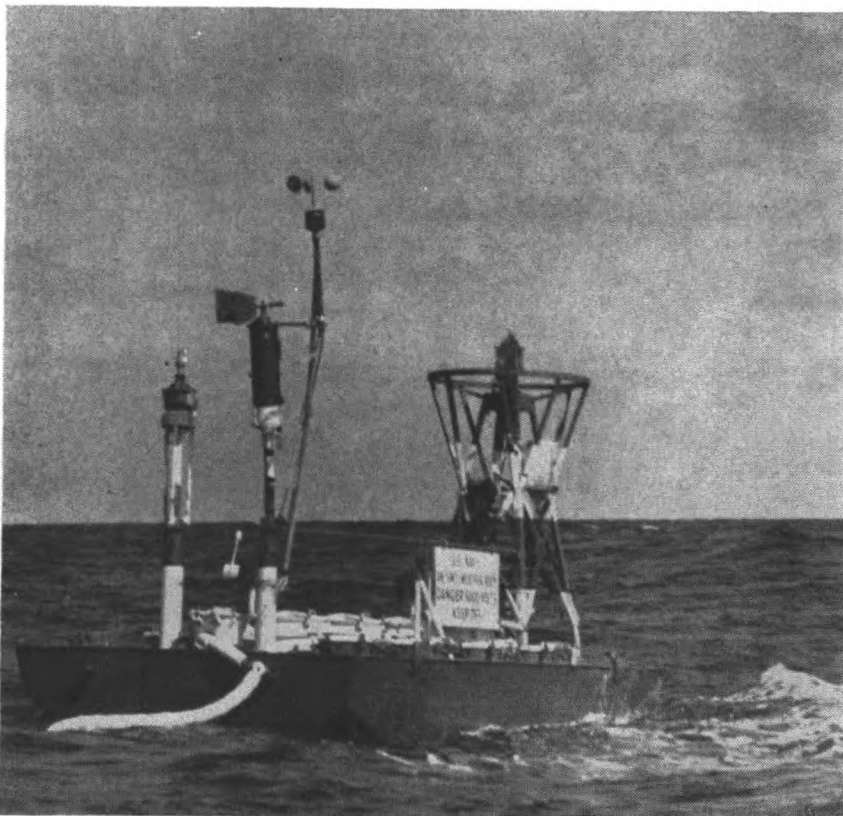
One of the more advanced and interesting marine automatic weather stations is the boat type, Model AN/SMT-1. The boat station is constructed of aluminium and other non-magnetic materials throughout. It is 20 feet long and 10 feet wide. Two masts, a large flashing beacon, a buoy-type bell, and a railing form the superstructure. Four water-tight wells extending below the deck hold the meteorological and electronic equipment. Each unit can be removed and replaced independently. The eight other water-tight wells are used for battery supply storage. The lower photograph on opposite page shows the boat station AN/SMT-1 at anchor in 25°N, 90°W. During the fall of 1959, the United States positioned a marine automatic weather buoy (Model 3-B) at approximately 61°S, 158°E. In this location, there is a sea mount extending 500 to 600 fathoms, making it a relatively convenient mooring point. The mooring system was a combination of $\frac{3}{4}$ -inch polypropylene line, chains and a mushroom anchor. The purpose of the weather buoy was to provide meteorological data on the route between New Zealand and the Antarctic.

The parameters measured and broadcast are: air temperature, water temperature, atmospheric pressure, wind speed and wind direction. Air and water temperatures are measured by means of commercially available thermistors with high negative temperature coefficient of resistance. The air temperature thermistor is mounted on the instrument mast and the water temperature thermistor is immersed in water at some distance from the boat. The air temperature element is calibrated in the range from -23° to +110°F. Atmospheric pressure is measured by a precision aneroid barometer. The pointer shaft of the barometer carries a contact arm which sweeps over a resistance strip. When a barometric pressure value is desired, a contact arm is clamped against the resistance strip and the pressure value is transmitted. The combination is calibrated for atmospheric pressure between 950 and 1050 millibars. The wind speed is measured by means of a rugged three-cup anemometer. The anemometer drives a small permanent magnet generator. The system is calibrated for wind speeds up to 124.5 knots. Wind direction is obtained by means of a wind vane mounted on the instrument mast near the anemometer. The shaft of the wind vane is directly connected to the gimbal mounting of a liquid-damped magnetic compass. The orientation of the compass mounting corresponds to the direction of the wind. At the time of measurement, a slave needle is clamped against a resistance strip on the compass. The value of the resistance thus determined is connected to the bridge and is a measure of the angle between the direction of the wind and magnetic north.

The automatic station translates information from each of five weather-sensing elements into three-letter groups in continental code and transmits the coded signals on a pulse modulated carrier frequency. These signals can be received on standard communications receivers and compared with a prepared decoding table which gives numerical values for each of the meteorological elements measured. A single transmission takes four minutes. During the interval, six items of information are broadcast. A three-letter signal which identifies the station is transmitted first, followed by coded transmission of the five weather elements. Controlled by a



The buoy-type automatic weather station undergoing tests in the Chesapeake Bay (see page 27)



Boat-type automatic weather station at anchor in 25°N , 90°W (see page 28).

(Opposite page 29)

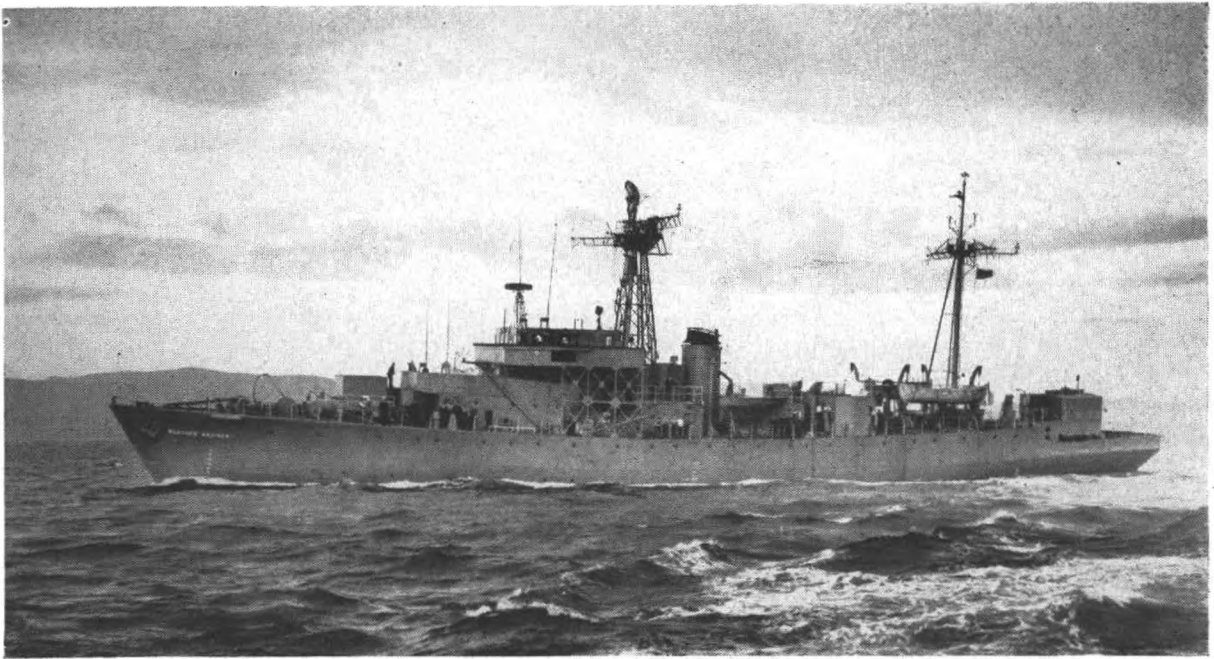


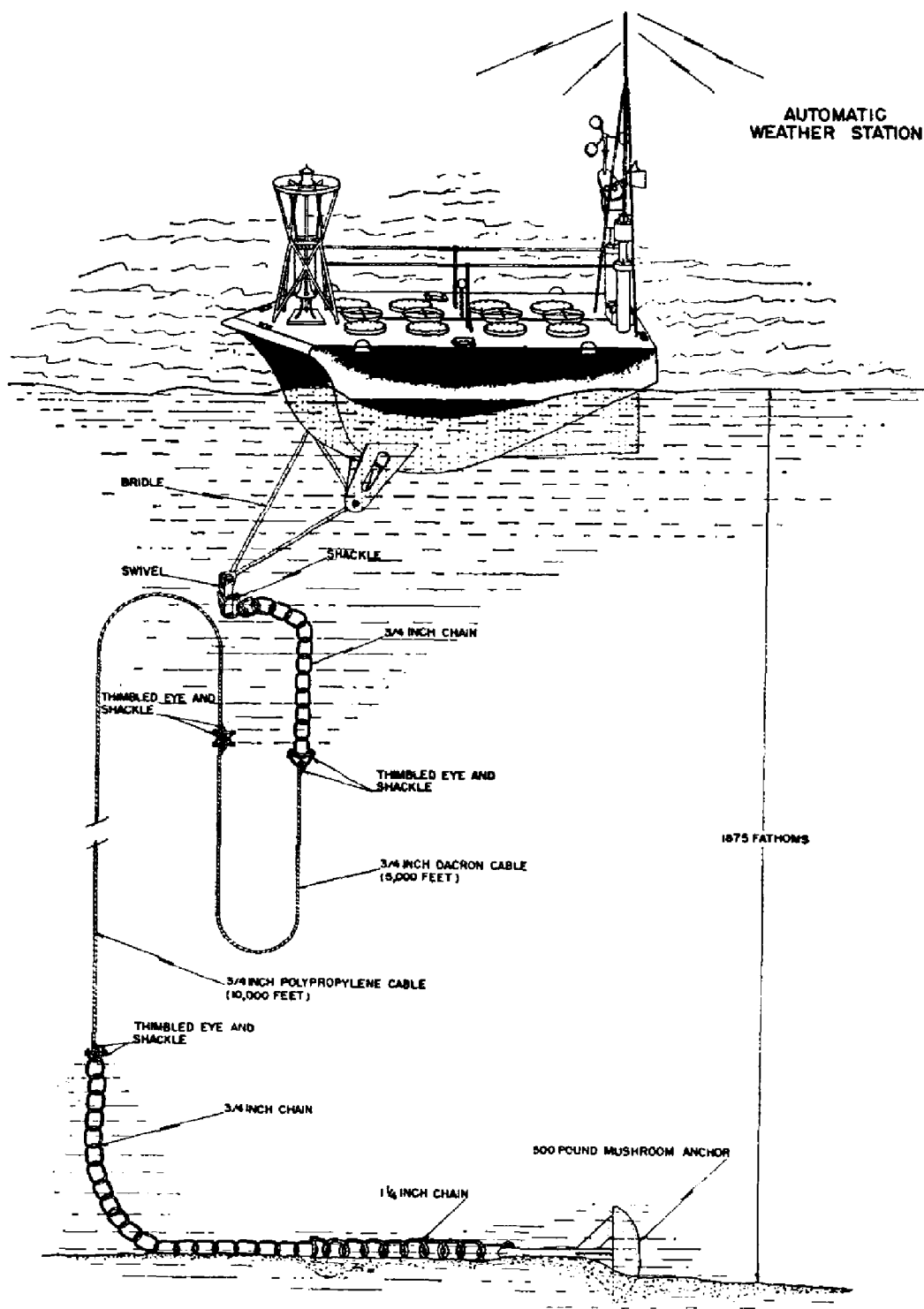
Photo by James Hall, Ltd., Greenock

Weather Adviser, the new ocean weather ship (see page 43).



By courtesy of H.M. Postmaster-General

Burnham Radio Station: HF receiving room wing A (see page 37).



Deep-water slack-line anchorage for boat-type automatic weather station. (Anchor system by Woods Hole Oceanographic Institution.)

programme timer, weather reports are transmitted to shore receiving stations every six hours on an assigned frequency of 5,340 kc/s.

Woods Hole Oceanographic Institute solved the anchorage problem by developing a suitable mooring system. The mooring system consists principally of a $\frac{3}{4}$ -inch polypropylene semi-buoyant cable 12,000 feet long. A yoke is directly attached to the hull, through swivels and shackles with 100 feet of $\frac{3}{4}$ -inch chain, 6,000 feet of $\frac{3}{4}$ -inch dacron and 6,000 feet of $\frac{3}{4}$ -inch polypropylene is used to make up the semi-buoyant cable. At the end of the polypropylene cable are shackles to which 225 feet of $\frac{3}{4}$ -inch chain is connected and finally a 500-pound mushroom anchor

is attached to the chain (see diagram). To date, the anchorage has withstood all required strains and stresses.

To test the durability of moorings, rigidity and performance of the stations and the effectiveness of communications, marine automatic weather stations were moored in the Gulf of Mexico in 25°N , 90°W ,* in 1958 and 1959. During this period the stations were monitored by Federal Communications Commission stations from Florida to Michigan. The U.S. Weather Bureau assisted by conducting monitoring programmes at Burwood, La., and Key West, Fla. With receivers tuned to the weather stations, advance warnings from the Gulf of Mexico can be received before severe tropical hurricanes reach the Gulf Coast line, such as 'Hurricane Audrey' which roared into the Texas-Louisiana coasts in 1957, producing a major inundation all along the coast. The boat-type station (lower photograph opposite page 28) has been reliably heard at distances between 800 and 1,000 miles.

To improve the life span of the station, a windmill trickle-charger, solar-cell batteries, and a 30 watt propane thermoelectric generator are now being tested. Based on past performance of the thermoelectric generator the station should operate independently for at least one year.

It might be well to note some of the advances made in the development of the marine automatic station in recent years. The most notable of these may be in the area of communications, design, mooring, and increased length of sustained operations. The range of transmission in 1956 was between 150 and 300 miles, as compared with 800 miles daytime and over 1,000 miles night-time range capability of the present station. During the 1959 tests the Federal Communications Commission received 100 per cent of all data transmitted by the marine automatic weather stations. It is therefore considered that operational use of marine automatic weather stations, particularly the boat-type, should be a reality in the very near future.

551.556.8:532.59:629.12

Sea State Information and Ship Design

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

(Ship Division, National Physical Laboratory)

Introduction

This note explains how wave and weather information collected from observers at sea can make an important contribution to improvement in the design and operation of ships in relation to service conditions.

Significant improvements in the seaworthiness and efficiency of ships at sea can be achieved if they can be designed for good performance under service conditions rather than merely for good trial results. To do this, it is necessary to have a large amount of information about service conditions.

The response of a ship to a seaway is a little similar to the response of propeller shafting or hull structure to engine rev./min. and other disturbances; there are critical ranges of frequency which shafting or hull will pick out from the general mixture. The critical properties of a seaway to which ship performance is sensitive are wave height, length and direction, and wind speed and direction. These quantities will, of course, vary widely according to season and geographical position. It is, however, possible from a sufficiently large number of observations to define useful statistical pictures, such as frequency distribution, of the way in which conditions vary according to the sea area and the time of year. Thus it is possible, for example, to estimate for a particular month in a particular sea area, what the average wave height and wave length are likely to be, and a limiting wave height or length which should not be exceeded more than some specified fraction of the time. It is also possible to

* *Editor's Note.*—The chart shows that the depth of water here is about 1,900 fm.

estimate what average wind speeds and directions should be expected and the maximum likely wind velocity; hence, since wind speed has a controlling effect on waves, it is possible to estimate characteristic wave conditions in some detail.

With the aid of such information, compiled from the observations collected from ships at sea, new ships can be designed to give good performance and avoid critical responses under the average conditions likely to be met in service, and also to withstand the more extreme conditions which may occasionally be encountered. It is also possible to estimate how often and how much a given ship may have to reduce speed due to bad weather on a given route at a particular time of year, and, if necessary, to alter the route. Thus, this information can be of value to ship operators to assist them in planning service schedules.

To explain the applications of sea state observations to ship design and operation, it is first necessary to state clearly what is meant by ship performance. Secondly, the rather vague idea of service conditions must be given a real meaning in terms of particular observations and measurements. Finally, it must be shown how research, based on these observations and measurements, can enable designers and operators to achieve significant improvements in specific aspects of seagoing performance.

The meaning of ship performance

For the purpose of these notes, ship performance is intended to mean any features of ship behaviour at sea which affect her safety and efficiency, and refers in particular to such factors as maintenance of speed, fuel economy, nature of pitching, heaving and rolling motions, slamming, wetness of decks, course-keeping, manoeuvring, stability and structural stresses. The relative importance of these factors will vary according to the particular services.

The meaning of service conditions

The performance of a ship as described above (for any given course and speed) is sensitive to three important properties of a seaway, namely wave height, wave length and wave direction. The wind speed and direction are also important, not only for their direct effect on ship performance, but also because of their controlling effect on sea conditions.

In general, a seaway is a complicated disturbance in which waves of many different heights, lengths and directions are all mixed together like the mixture of disturbing forces causing ship vibration. A good working picture of sea conditions may be obtained, however, if the lengths and heights of predominant waves are estimated, and an indication of crest length is given. The average extent of waves as measured along their crest lines is an important clue to the directional characteristics of a seaway. With the aid of special instruments it is, in fact, possible to determine by actual measurement the heights, lengths and approximate directions of the waves present in a given sea, and hence to define the sea in numerical terms. Experienced observers can also estimate visually the predominant characteristics of a sea, especially if it is reasonably long-crested. Short crested seas which result when a wide range of wave directions is present are difficult to assess, even with the aid of instruments.

A ship in its service life will encounter a wide range of conditions. None the less, on particular routes certain characteristic wind speeds and directions and certain basic ranges of wave heights, length and direction can be defined as average. It is also possible to estimate the order of extreme conditions which is likely to be encountered, and the probable frequency of occurrence of particular bad conditions and particular critical wave lengths. A comprehensive and very useful picture can be derived by studying monthly frequency distributions which show the relative frequencies of occurrence in each month of specified ranges of wave height and length and wind speed.

Sea state information and ship design

In the same way that propeller shafting is sensitive to frequency and may respond quite violently to certain critical frequencies present in the general mixture of disturbing forces, so a ship is sensitive to wave lengths and directions and under certain conditions may pitch or roll quite violently. This critical pitching or rolling occurs when a wave length to which the particular ship (with some particular speed and course) is highly responsive is present in the sea.

These critical properties and also more general features of ship performance in waves can be investigated in a model tank, using the information supplied from observations and measurements at sea, as discussed in the previous section. It is possible to generate waves with any required height and length (within the capacity of the wavemaker) in a model tank; it is also possible to generate disturbances containing known mixtures of wave height and length such as might be measured or observed at sea.

Thus it is possible to investigate the response of a given ship form either to waves of any given length or to a given mixture of wave lengths. If the responses of a ship in terms of the amplitudes and periods of oscillation of heave, pitch and roll can be determined for each of a series of wave lengths, then its responses to any known mixture of such waves can be estimated. In this way, individual ship designs can be tested and modified in the light of experience from systematic experiments to obtain suitable response characteristics for any given wave conditions. It is also possible thus to study the influence of particular design features such as the shapes of the bow sections or ship length in relation to predominant wave length. On the basis of such experimental investigations, it is possible with some knowledge of wave and weather statistics to design a ship to meet particular requirements of performance on a particular service.

The scope of tank testing in waves

As has already been indicated, waves with known properties related to actual seagoing conditions can be generated in the tank. The wavemaker in the new Ship Hydrodynamics Laboratory at Feltham, Middlesex, will initially be able to generate only regular waves with controlled height and length. Later, however, it is planned to instal a special control for generating irregular waves. It is intended to develop a library of possible wave disturbances correlated with the characteristic conditions in particular types of sea area associated with given standard weather intensities as defined by the Beaufort scale. Cross-channel ships, for example, might be tested in the shorter steeper seas characteristic of the English channel or Irish Sea, and, in fact, of seas with restricted fetches generally. North Atlantic liners, on the other hand, would be tested in longer waves such as are normally found in the open ocean. In sea areas where typhoons or other special weather conditions are commonly encountered, tests conducted under these more extreme conditions might be included to ensure adequate margin of strength and stability. Ship models can be tested in standard conditions or in any particular required conditions, to investigate any aspects of performance which may be of interest. Data from regular wave tests for a series of wave lengths of appropriate height can be used to determine response curves from which the response to any specified irregular wave system can be estimated.

Sea-keeping tests would normally comprise measurements of speed loss and recording of the motions of pitch and heave when running in given waves with conditions corresponding to different engine powers and ship loadings. These tests would normally be carried out in head seas, but there will also be facilities at Feltham for studying ship performance at different headings to the waves, and for investigating course-keeping and manœuvring with remotely controlled models. If required, ciné records can be made of any tests to give an impression of the nature of the motions, and of such features as slamming and wetness of decks.

Conclusions

It has been seen that features of ship performance such as speed, power, pitching, heaving and rolling, slamming, wetness of decks, course-keeping, manœuvring, stability and structural stresses, can be investigated in a model tank under controlled wave conditions, which can be correlated with observed or measured sea conditions. It has also been indicated how the planning of service schedules and routing of ships can be assisted by detailed knowledge of wave and weather statistics. Collection of sea state information can thus make an important contribution to improvement in the design and operation of ships in relation to seaworthiness and efficiency in service.

An enormous fund of wave and weather data is in fact being collected by voluntary observing ships all over the world, and is being recorded on punched cards by the Meteorological Office. These data include all the basic information required as described in this article, that is statistics of wave height, length and direction and wind speed and direction (and other information besides). This information is of great interest to us in Ship Division in planning the seakeeping research for our new laboratory at Feltham.

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Fifty Years of Maritime Radio Communications

A BRIEF HISTORY OF THE POST OFFICE COAST STATIONS

By S. W. CLARKE and P. MITCHELL

(Wireless Telegraphy Section, Post Office)

Weather information is of inestimable value to ships at sea, but reciprocally the Meteorological Office derives great benefit from the observations of individual ships. By extending the area from which meteorological information is available or by providing it in greater detail, these observations enable the meteorologist to keep an up-to-date and detailed weather chart, thereby permitting more reliable and much earlier forecasts to be made than would otherwise be possible. It would, for example, be impracticable to produce forecasts for the British Isles for more than a few hours ahead if adequate information from the Atlantic were not available. Maritime radiocommunication makes this possible.

29th September 1959 marked the fiftieth anniversary of the marine radio-communication service of the Post Office and, in view of the link which exists between the Meteorological Office and ships at sea, it may be of interest to readers of *The Marine Observer* to trace briefly the origin and development of the G.P.O. coast stations.

The early experiments of Maxwell and Hertz which paved the way for the discovery of wireless had since 1882 stimulated the interest of Sir William Preece of the Post Office, who later became its Engineer in chief. In this field of research it was Marconi, however, who first obtained practical radiocommunication and in 1896 he came to this country to patent his invention and develop it. He was given every assistance by Sir William and demonstrated the practicability of his invention by establishing communication over water between Lavernock and Flat Holm, a distance of $3\frac{1}{2}$ miles, on 11th May 1897. In July 1900 the Marconi Wireless Telegraph & Signal Company was awarded a contract to equip four naval land stations and twenty-eight H.M. Ships. The first British merchant ship to be equipped with wireless (in 1901) was the *Lake Champlain*, belonging to the Beaver Line. 'Wireless' was now a practical and commercial proposition.

Following the first International Radio Convention in 1906 it became clear that the Government would have to exercise some form of control in the development of wireless and, in July 1908, the late Commander F. G. Loring, R.N., was appointed the first Inspector of Wireless Telegraphy, to co-ordinate the formation of a British maritime radiocommunication service. The G.P.O., already interested in the development of wireless, had built a radio station at Bolt Head in 1908, but until that time all commercial wireless communication between ships at sea and shore stations in this country had been in the hands of the Marconi Company and Lloyd's, the latter being concerned, as they still are, in receiving reports regarding the movements and safety of ships. The Marconi Company owned and operated radio stations at Crookhaven, The Lizard, Niton, Caister, Seaforth and Rosslare: additionally they operated the radio station at Malin Head on behalf of Lloyd's, who also owned the North Foreland station. It was therefore not until the purchase of the privately owned stations was completed by the G.P.O. on 29th September 1909 that coast stations were brought under the control of the Inspector of Wireless Telegraphy, and the service as it is known today came into being. The total number of ships then fitted with w/r was 619, of which 286 were British; today the figures are approximately 6,300 British and 3,000 foreign ships. In addition to the control of coast stations the Inspector of Wireless Telegraphy was, as now, responsible for the technical examinations for the P.M.G. certificate of proficiency required by marine radio officers, implementation of international radio regulations, and the inspection of licensed radio stations.

In his Annual Report of 1910, the Postmaster General said: "There has been a substantial growth of business since the stations were taken over, and a very considerable number of additional ships have been equipped. There seems to be every prospect of still more rapid extension in both these directions in the immediate future. Steps are being taken to improve existing stations, and enquiry is being made as to the expediency of opening new stations in places where installations are not at present in existence.

"It is hoped that before long there will be a ring of thoroughly equipped stations round the coast of the United Kingdom. The system, when completed, is likely to prove of the greatest possible value to shipowners as well as to passengers, and I think that shipowners will be well advised to proceed as rapidly as possible with the equipment of their vessels."

The following chronological table shows the way in which that ring of coast stations developed over the years:

- 1908 Bolt Head opened.
- 1909 Crookhaven, The Lizard, Niton, Caister, Seaforth, Rosslare, North Foreland, Malin Head radio stations taken over.
- 1912 Cullercoats Radio opened.
- 1913 Fishguard Radio opened, replacing Rosslare.
Land's End Radio opened, replacing The Lizard.
- 1920 Wick Radio opened commercially.
Valentia Radio opened commercially, replacing Crookhaven.
Bolt Head closed.
Devizes (long distance station) opened.
- 1921 Portpatrick Radio opened.
- 1925 Burnham Radio (long distance station) opened replacing Devizes.
- 1927 Humber Radio opened, replacing temporary station at Grimsby which had earlier taken over from Caister.
- 1934 Fishguard Radio closed and work transferred to Burnham Radio.
- 1942 Stonehaven Radio opened.
- 1949 Oban Radio opened.
- 1950 Malin Head and Valentia radio stations taken over by Irish Republic.
- 1955 Ilfracombe Radio opened (subsequently taking over all short distance communications from Burnham Radio).
- 1960 Anglesey Radio opened, replacing Seaforth Radio.

Undoubtedly the most important feature of radio in the maritime field has been its contribution to the safety of life at sea. In the past fifty years the annual toll of the sea in our waters has been reduced tenfold and although improvements in life-boat services and shore rescue organisation, etc., have all played a part, the greatest single factor in this great achievement has been the use of radio.

In 1912 the *Titanic* disaster brought home tragically but forcefully to all concerned the potentialities of radio in connection with the safety of life at sea. The first and foremost duty of the coast stations individually and collectively is therefore to maintain careful and continuous watch for any such calls for help, and to advise as quickly as possible those authorities who may be able to assist: in addition, the information is broadcast to shipping by w/t and r/t and rescue arrangements are co-ordinated by keeping all concerned apprised of developments as they occur. Whenever conditions permit, coast stations also fix or obtain confirmation of a ship's position by taking radio bearings. No less important than these specific operations is the bond of sympathetic understanding which exists between the radio officer on board the ship and his counterpart at the coast station.

Some idea of the work done by British coast stations in connection with casualties may be obtained from the traffic return for the year ended 31st March 1960. During that period the coast stations co-ordinated the communications of 68 distress cases (66 ships and 2 aircraft) and in addition they handled the reporting of some 600 less urgent casualty cases.

Coast stations also provide a link with the shore when illness or accident strikes on board. Only large ships carry doctors. On other vessels the master has sometimes to be doctor, or even surgeon, to a sick or injured member of the crew. Today he can get immediate medical advice by radio; often the doctor or hospital is put in direct r/t communication with the ship. This service is available without charge to ships of all nationalities. During the year ended 31st March 1960, coast stations dealt with 175 medical cases, which entailed the exchange of 424 messages totalling 16,346 words and 199 r/t calls.

Arrangements were made about 1910 between the Post Office and the then Board of Trade for radiotelegrams concerning navigational dangers to be transmitted to ships at sea free of charge. In the words of the Postmaster General: "Whenever a derelict is reported to be lying in the track of ships, steps are taken to notify the Admiralty and Lloyd's and to forward the particulars by w/t to all ships proceeding in the direction of the danger on the North Atlantic, South Atlantic and North Sea routes." This then was the forerunner of the much more comprehensive and world-wide system of navigational warnings of today.

The partnership between ships at sea and the Meteorological Office came a little later. The potentialities of wireless on board ships in extending the area of observations was first recognised at a meeting of the International Meteorological Committee in 1905 but, mainly due to the intervention of the First World War, which considerably delayed development, it was not until 1921 that weather reports from Selected Ships were organised. In that year there were 1,472 reports; by 1926 this had risen to 4,714, and in the twelve months ended 31st March 1960 had risen to 54,472. The number of U.K. ships reporting has risen from 32 in 1926 to somewhere in the region of 700 today.

The following quotation is from a description of the original Lizard radio station:

"... a hut containing the apparatus which generally comprises a $1\frac{1}{4}$ h.p. oil engine, belt driving a 0.9 kw D.C. dynamo, charging accumulators energising a 10 inch coil. The transmitting apparatus is arranged for the production of a 300 metre wave by means of the usual jigger and Leyden jar."

Technical developments made possible the introduction of facilities which could not have been envisaged in the early days. For example, in 1928 r/t service was inaugurated which enabled suitably equipped ships to communicate with the shore

and with each other by means of the spoken word instead of by morse. Up to this time, communications for smaller vessels had remained a problem because only few of these could justify the employment of the highly skilled operator which w/t demands. Six years later, in 1934, a service was provided to allow R/T calls to be made between ships at sea and telephone subscribers on shore. Seaforth Radio had the distinction of being the first coast station to be equipped for this service. In the early days, conversation had to be limited to one direction at a time, the equipment being manually switched alternately from transmit to receive by the coast station operator. Modern equipment enables this to be done automatically, by the user's voice.

In 1938 there were approximately 1,300 R/T calls. The Second World War intervened but, on the resumption of commercial radio communications, the R/T service rapidly expanded. In 1947 there were approximately 6,000 calls; in 1949 there were 18,000 calls, and for the year ending 31st March 1960 the figure had risen to over 100,000 calls.

To reduce congestion on the medium frequencies during peak periods the Post Office has now installed very high frequency (VHF) channels at Clyde Radio, Niton Radio, North Foreland Radio, Land's End Radio and Humber Radio. These stations provide completely interference-free service over ranges of between 40-60 miles and, because the quality of service is exceptionally good, it is very suitable for use by passengers who are unfamiliar with R/T.

As early as 1920 it was obvious that the telegraphy range of the medium frequency coast stations was inadequate, so a station at Devizes was taken over from the Army and equipped with a low frequency transmitter and receiver with a working range of up to 2,000 miles. The value of this longer range service was soon recognised. Within five years more transmitters and receivers were needed and it was necessary to separate them to permit simultaneous transmission and reception on all channels. To meet these demands two new stations were set up—a receiving station at Burnham-on-Sea and a transmitting station at Portishead, about 25 miles away. This combination is now known as Portishead Radio, although all the operating and traffic handling is carried out at Burnham, from where the transmitters are controlled over landlines. The possibilities of using high frequencies for worldwide communication were soon realised, the first HF transmitter and receiver being installed in 1926. Again the response was immediate. By the outbreak of war fifteen receivers at Burnham and six transmitters at Portishead were handling a yearly load of 3,500,000 words!

Burnham Radio—The Commonwealth Area Scheme

In the early days, all communications were by what is called the direct method. Before a message could be passed over, direct contact had to be established between Burnham and the ship. Rather like paging at a hotel, Burnham had to transmit, at regular intervals, a list of ships for which messages were waiting. Ships wishing to send messages could, of course, contact Burnham at any time.

This method is still used at the medium-range stations and also at Burnham for communicating with foreign ships. But now, for long-distance work, all Commonwealth ships use the 'Area Scheme' developed during the last war in co-operation with the Admiralty. As propagation conditions sometimes make HF communication difficult, with the direct method a ship often had to call for long periods before establishing contact. To avoid this delay, the Area Scheme was developed. This divides the world into eight areas, each with its area transmitting and receiving stations. Each ship listens to the station in its area where messages for that ship are circulated.

The area stations transmit the messages at four-hourly intervals, 0000 GMT, 0400 GMT, etc. Ships receiving messages acknowledge as soon as possible: usually

messages are received at first transmissions. A ship with a message to send ashore calls the area station of destination, but any area station may accept a message and pass it to its destination over the Admiralty point-to-point wireless network that links the area stations.

After the war, partly because of the advantages gained from the Area Scheme, but mainly because of the increasing number of ships equipped for HF working, the volume of long distance traffic expanded rapidly. As a result of this increase, major re-equipment of Burnham became necessary and the station was reconstructed in 1948. It now consists of a control room from which radiate two wings of operating positions and a landline room. The receiving aerial system consists of ten double-ended rhombic (directional) aerals and twenty-two other aerals extending over an area of 40 acres. Each of the receiving wings (see photograph opposite page 29) contains sixteen operating positions, equipped with a standard-type communications receiver. Each position can select and control any one of the sixteen transmitting channels at Portishead, and also select the most suitable aerial for communication, depending on the position of the ship. There is telephone intercommunication between 'search' and 'working' positions and also with the control room.

The landlines can connect up to ten teleprinters into the inland telegraph system. In addition there are three direct teleprinter lines to the Admiralty, one to the Meteorological Office, Dunstable and one to Lloyd's, London. Messages are transported from the landline room to the control room and thence to the receiving wings by a continuously running conveyor belt.

The control room at Burnham is the nerve centre of the whole Area Scheme. Every message handled in the scheme passes through this room, a total of over a million messages (radiotelegrams, Ship Letter Telegrams, etc.) in a year. About 80% of the total is dealt with by Burnham itself, the remainder being messages to and from ships via the Commonwealth area stations.

A card index of the latest known positions of all Commonwealth ships, as well as the numerous foreign ships that work 'direct' with Burnham, is kept in the control room. The index is used for routing messages to the appropriate area station. Apart from being routed, messages are numbered in separate daily series for each ship, and a continuous check is made to ensure that all messages have been properly handled and that no serials are 'missing'.

Three large-scale steel maps, the largest 32 feet by 14 feet, are mounted on the wall; magnetic indicators mark the positions of ships. The maps are used mainly for air-sea rescue and other special purposes.

From the small beginning in 1920 at Devizes, a unique long-distance communication service has grown. The total staff at Burnham is now more than 120 and they handle more than 2,000 communications every day. On the peak day during the Christmas season the messages total 6,000.

General development

With very few exceptions, the Post Office can provide all the telegraph facilities available ashore to anyone on board ship. Through the coast stations, radiotelegrams can be sent to every country in the world participating in the international telegraph service. In fact, every coast station is connected to a teleprinter automatic switching system, so it is an inland telegraph office as well as a coast station. Telex facilities have recently been installed at Anglesey, Burnham, Cullercoats, Land's End, Niton and North Foreland stations. By means of this system a subscriber is able to contact by teleprinter any of these stations direct from his own office, thereby minimising delay: radiotelegrams are also delivered to subscribers direct from the coast station.

The Post Office has always maintained close liaison with the Meteorological Office and will continue to do so in a joint endeavour to provide the best possible weather service for those who go to sea.

Observation of Birds at Ocean Weather Station 'M'*

By INGVAR HJELMTVEIT

(Mr. Hjelmteit is a meteorologist of the Norwegian Meteorological Institute, and the article below covers ten years' observations when he was aboard the Norwegian weather ship *Polarfront I*.)

During the autumn of 1948, after a few tours of duty only, it became evident that when 'on station' the weather ship *Polarfront I* was visited by migratory land birds in greater numbers and more frequently than had been expected beforehand. It was further noticed that at times rather great numbers of various sea birds were present at the ship and that some of these were always to be seen. It was realised, of course, that if notes on the activities of the birds could be made regularly and sufficient scientific data obtained, such notes would be of some value even if the observations were made by an amateur ornithologist, and, thereby, the scientific capacity of the vessel would be better utilised too. But, unfortunately, during the first year and a half of service the prior demands of professional duties offered very little time to spare for bird watching at station 'M', and only casual notes were made.

Mariners have, however, always paid much attention to birds encountered at sea, and so also aboard this ship. Both among officers, the meteorological staff and the ship's crew an interest in the visiting birds persisted.

In the spring of 1950 the author was given the task of keeping records of the bird activities at the vessel. Some time later in the same year, contact was established between the meteorological department of the ship and the Zoological Museum, University of Bergen (the Port of Bergen is the shore base of the Norwegian weather ships), and it was presently agreed that reports were to be forwarded regularly to the Zoological Museum at the end of each voyage. Since then very close relations have existed between the vessel and the Museum, and the plentiful aid given, especially during the initial stages of bird observation at sea, was very much appreciated. Previously no literature on the subject had been available aboard but now some books with suitable plates for identification, etc. (recommended by the Zoological Museum) were purchased. The interest of the Museum in the observations carried out aboard the vessel is illustrated by the fact that Mr. J. F. Willgohs, Conservator of the Zoological Museum, accompanied the ship on its tour of duty in February 1955. His presence was, of course, of the greatest instructive value to the author.

The reports forwarded to the Museum generally contain information not only about visiting migratory birds, but also about the numbers, with their fluctuations if possible, of the most common sea birds, such as the fulmar and the kittiwake, the only birds certain to be seen at any time of the year at station 'M'.

In this article, of course, lack of space forbids the publication of observations in full. However, in order to show the great variety of birds observed till now, a brief account of the species will be given in the following, though not in a systematical order.

Among the gulls, which are seen frequently singly, or a few together, especially the glaucous gull and the great black-backed gull ought to be mentioned, but their numbers very seldom exceed twenty birds at a time. The black-headed gull is a very rare visitor, but it has been surely identified at some occasions. In April 1953 a flock of fifteen birds passed the ship. One of the birds seemed not to be well and stayed at the ship for three days, mingling with kittiwakes, before it continued its flight to the north.

Terns appear every summer and early autumn, but, unfortunately, in most cases pass unidentified.

Both the pomarine and the Arctic skua are fairly frequent visitors, the great skua

* Station 'M' is in 66°N, 02°E, i.e. some 250 miles from the Norwegian coast.

not quite so frequent, whilst the long-tailed skua has not been recorded till now. The skuas appear mostly singly or in pairs.

The occurrences of gannets are believed to be fairly well recorded, as this majestic bird is likely to rouse the attention of even the least interested person aboard.

The notes on shearwaters show that these birds in most cases are observed during late summer and autumn.

Petrels seem to be rather rare visitors. A few cases in which identifications were made showed birds belonging to the storm petrels (*Hydrobates pelagicus*). However, these birds are easily missed owing to their smallness and 'low-flying' habit, especially when the sea is rough and visibility poor.

Auks are recorded frequently but the task of identifying them is made difficult because the birds usually are seen in flight and at some distance. For instance, the cases of absolutely sure identifications of guillemots are relatively few, as these birds come close enough for detailed scrutiny only during the summer months. The little auk seems to be the most frequent visitor and this curious little bird has been recorded almost all the year round at station 'M'. The puffin has only been recorded on three occasions.

Most observations of ducks have been recorded during the months August to October, but, unfortunately, most of the birds have passed unidentified. However, specimens of the following species have been identified beyond doubt and in some cases caught (shot) and brought ashore: mallard, scaup, long-tailed duck and eider. Common scoter has been noted as a 'possible' several times, mainly during October.

The records of visiting waders contain several species and represent a very interesting chapter. The following have been the most frequent visitors: oystercatcher, dunlin, turnstone, ringed plover, purple sandpiper and whimbrel. More casual visitors have been the curlew, redshank, little stint, lapwing, golden plover and red-necked phalarope. With the exceptions of lapwing and red-necked phalarope, at least one specimen of each of the species mentioned has been caught and in most cases brought ashore.

Occasionally owls have been reported on board, but only the identities of hawk owl and short-eared owl have been established with certainty.

Falcons and hawks have been more frequent visitors and the following species have been identified, and in some cases shot and brought ashore: merlin, kestrel, sparrow hawk and goshawk. At least on one occasion it has been observed that a falcon (merlin) has accompanied a flock of small migrants (pipits), at times chasing them, and feeding on the ones that were killed. Half-eaten pipits were found on deck below the favourite resting-place of the falcon. Merlins have been observed both during spring and autumn.

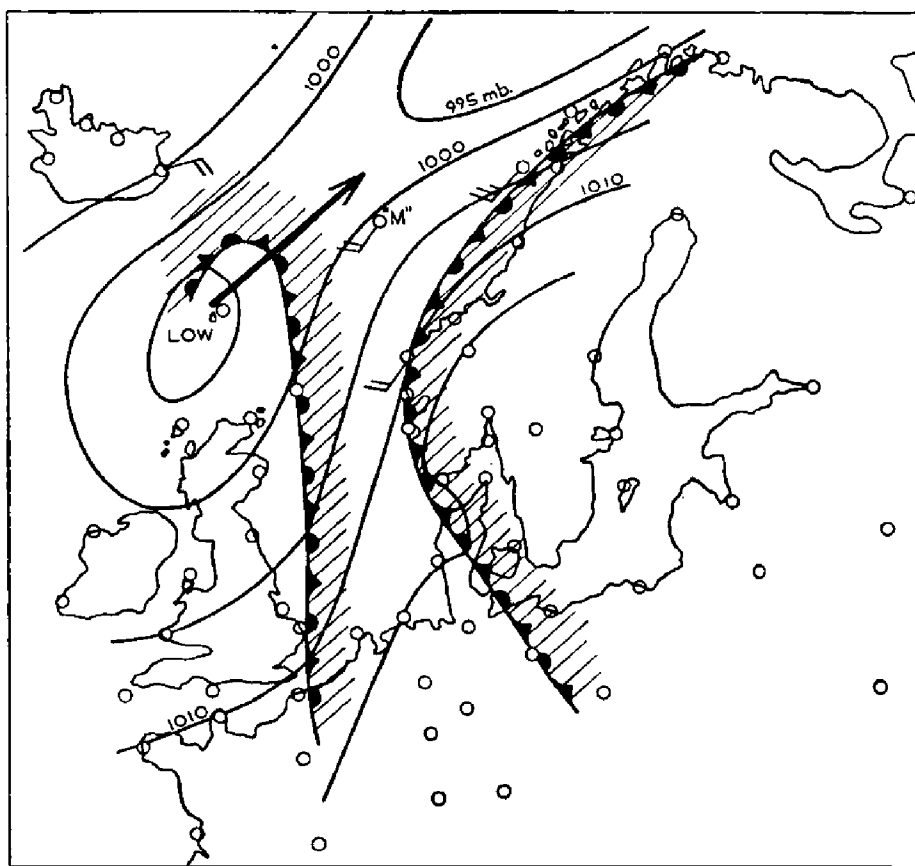
Considering the records of small migrants it is found that the following species may be regarded as regular visitors during spring and/or autumn: swallow (*Hirundo rustica*), fieldfare, blackbird, redwing, wheatear, meadow pipit, starling and snow bunting. At times redwings, starlings, and snow buntings occur in very great numbers, but also the wheatear happens to be numerous occasionally. The wheatear is especially interesting as the measurements of caught specimens differ, thus probably indicating that the specimens belong to different populations.

As more casual visitors the following species may be mentioned: swift, shore lark, sky lark, great tit, white wagtail, tree pipit, whinchat, redstart, house martin (*Delichon urbica*), willow warbler, chiffchaff, chaffinch, brambling, redpoll, and goldcrest. Furthermore, the reports show a few cases which are regarded as rather singular. Thus, the Zoological Museum, University of Bergen, has received from this vessel one turtle dove, one black redstart, four crossbills, and one Siberian lesser whitethroat.

On 9th March 1957 the rather strange arrival of one hooded crow and two rooks was noted. Various sorts of food were put out for the birds and most of it was eaten. However, as the birds stayed on they became visibly weaker, and on 15th March the

hooded crow was unable to take to its wings after having alighted on the sea, owing to its weakness. The same happened to one of the rooks the day after, whilst the other rook managed to keep alive till 20th March, when it suddenly disappeared. At the time of arrival of the crows we had an E to NE'ly wind, and rain or drizzle most of the day.

Considering meteorological notes in relation to the activities of migratory birds at station 'M', the records show that the gale force S to SW winds of the polar front storm-track are responsible for the majority of birds visiting station 'M', both during spring and autumn. Therefore, many of the birds caught or observed without doubt belong to western populations.



The general weather situation, 26th March 1957.

In the early morning of 26th March 1957, rather great numbers of birds were visiting the ship and one snow bunting, one chaffinch and four redwings were caught and weighed. At arrival the weather was rainy, overcast, temperature 6°C (43°F), pressure 1,000 mb., wind SSW, speed 20 km./hr. (earlier during the night, 45 km./hr.). The general weather situation in the area (see map): a low between Scotland and Iceland moving NE'ly caused a SSW'ly air flow in the area between station 'M' and the Norwegian coast. Frontal zones ran from the western North Sea over the Shetlands toward station 'M' and along the Norwegian coast. Under these conditions it is presumed that the birds were west-bound from West Norway, but forced off their course to the north (see chart).

In the afternoon of 26th September 1957, a meadow pipit arrived under the following conditions: overcast, rain, temp. 9°C (48°F), pressure 997 mb., wind SW, speed 54 km./hr., ceiling 280 metres. Furthermore, shortly after midnight 19th November 1957, a purple sandpiper arrived. Weather: overcast, rain, temp. 8°C (46°F), pressure 1013 mb., wind SSW, force 42 km./hr., ceiling 180 metres. In both cases the birds no doubt were east-bound from Iceland, but the prevailing comparatively strong SW'ly winds in the area of passage forced the birds off their course to the north. Attempts have been made by the author to reconstruct the most

probable 'path of flight' of the birds mentioned in the above examples, using the actual wind components and the most likely initial air speeds of the birds, and considering the influence of precipitation, etc. Such work will be continued.

During the period from the month of May 1950 till February 1960, the reports show that a total of 150 specimens of birds were caught or shot aboard the ship and delivered to the Zoological Museum in Bergen.

Weighing of the migrants on arrival, if possible, was commenced in the beginning of 1956, as contact was established between the author and the Zoological Laboratory, University of Bergen, at that time. It was presumed that the data thus obtained would be of great value, especially from a physiological point of view.

Thus, the observation of birds at sea is not only considered as a pleasant hobby by the author, but also as a source of varied information, and it is believed that this information eventually may be of some importance in the solving of problems of bird migration and bird physiology.

The assistance of officers and crew, of course, is of inestimable value in gathering such information aboard, and the author, therefore, cannot gratefully enough acknowledge the assistance rendered by the officers, meteorological staff, and crew of *Polarfront I*, with special respect to Captain I. Hanestad and Chief Officer O. Nordgreen, and to Mr. B. Ytrehus of the meteorological staff aboard.

BIBLIOGRAPHY

- PETERSON, R., MOUNTFORT, G. and HOLLAM, P. A. D. 1954. *A Field Guide to the Birds of Britain and Europe*. Collins, London.
FISHER, J. 1951. *Watching Birds*. Penguin Books, London.
WILLGOHS, J. F. *Ornithological Notes and News I* (*Årbok* 1954). Nat. vit. rekke No. 7. Universitetet i Bergen.
ELIASSEN, E. and HJELMTVEIT, I. *The Loss of Water in Wind-drifted Migratory Birds* (*Årbok* 1958). Nat. vit. rekke No. II. Universitetet i Bergen.

NOTES ON ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM JULY TO SEPTEMBER 1960

RELEVANT WEATHER FACTORS

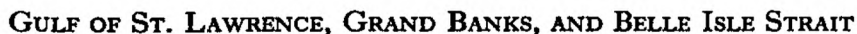
Throughout the period the Azores high was very active and pressure was above normal in the Arctic Basin. Towards the end of August, there was a considerable increase in depression activity all across the North Atlantic Ocean with some decline in activity in the Azores high. During most of the period relatively warm air covered the Polar Basin, but there were frequent outbreaks of air from the Arctic into the Northern Atlantic. In September, however, warm air masses predominated in the Russian side of the Arctic only, and over the United States and Canada, while the cold air masses appeared to recede from the East Atlantic and the sea approaches to Western Europe.

BAFFIN BAY, DAVIS STRAIT, HUDSON BAY AND STRAIT AND THE CANADIAN ARCTIC ARCHIPELAGO

This was a period in which field-ice was less in area and thickness than normal, and most of the West Greenland coast was ice-free; there were extensive areas of pack-ice off Baffin Island and towards Smith Sound. During September, practically the whole of Baffin Bay and Davis Strait became open water. In the Hudson Bay there were small amounts of pack-ice, particularly in the west in July, but these had largely cleared by August when the Hudson Strait was also largely ice-free. There were considerable concentrations of icebergs reported at the entrance to Hudson Strait during September, and icebergs were clearly present during July and August as well. There was much pack-ice reported in the Canadian Archipelago, but it was evident in September that the areas of open water were exceptionally great and there were reports of much open water along coastal areas adjacent to the Arctic Basin. However, it was never reported that the entrance to Baffin Bay from the Arctic Basin was free of ice although Smith Sound occasionally contained much open water.

The first ship to arrive at Churchill was the *Margit Brovig*, a Norwegian vessel which arrived on 27th July with icebreaker assistance. Ice conditions in the approaches to Churchill were unusually severe with ice 30–50 ft. thick in places.

Along the West Greenland coast throughout the period there were moderately large concentrations of icebergs towards 70°N. During the whole of the period small numbers of icebergs were reported off south-west Greenland and moderate numbers off the north-west coast.



EASTERN GREENLAND, SPITSBERGEN, BEAR ISLAND AND AREAS NORTH OF ICELAND

42

Icebergs sighted by merchant ships in the North Atlantic

(This does not include radar targets)

LIMITS OF LATITUDE AND LONGITUDE		DEGREES NORTH AND WEST									
		58	56	54	52	50	48	46	44	42	40
Number of bergs reported south of limit	JULY	*	*	> 189	> 94	> 48	10	4	1	0	0
	AUGUST	*	*	> 83	> 42	> 6	0	0	0	0	0
	SEPTEMBER	*	*	> 24	> 12	0	0	0	0	0	0
	Total	*	*	> 296	> 148	> 54	10	4	1	0	0
Number of bergs reported east of limit	JULY	> 189	> 188	> 129	> 80	> 32	> 18	1	0	0	0
	AUGUST	> 83	> 77	> 50	> 32	> 15	1	0	0	0	0
	SEPTEMBER	> 24	> 23	> 13	3	1	0	0	0	0	0
	Total	> 296	> 288	> 192	> 115	> 48	> 19	1	0	0	0
Extreme southern limit	JULY	42°17'N, 52°57'W on 21.7.60 48°35'N, 47°55'W on 3.8.60 50°42'N, 55°02'W on 10.9.60									
	AUGUST										
	SEPTEMBER										
Extreme eastern limit	JULY	52°40'N, 44°42'W on 10.7.60 48°35'N, 47°55'W on 3.8.60 51°42'N, 49°53'W on 8.9.60									
	AUGUST										
	SEPTEMBER										

* Probably large numbers, but none sighted: in excess of those reported in further south positions.
> indicates 'greater than' where there is some doubt as to the actual number of bergs. The value given is likely to be lower than the true value.

G. A. T.

551. 507. 22

“WEATHER ADVISER”—NEW OCEAN WEATHER SHIP

In November 1959, the 'Castle' class frigate *Amberley Castle* was towed to Blyth, for conversion to an ocean weather ship by the Blyth Dry Dock and Shipbuilding Company, Ltd. On 22nd September 1960, her conversion being satisfactorily completed, she was renamed *Weather Adviser* by Lady Sutton, wife of the Director-General of the Meteorological Office, in a little ceremony at Greenock. It was a fine sunny day for this meteorological occasion and *Weather Adviser*, with her yellow upper-works and blue hull and dressed with the flags of Canada, France, Netherlands, Norway, Sweden, U.S.A. and the United Kingdom, looked very colourful. The guests included the Provost of Greenock, representatives of the shipbuilders, and wives of members of the ship's company. During the ceremony the Director-General, in an address to *Weather Adviser's* ship's company and the guests, paid tribute to the excellent job that the ocean weather ships have done during their thirteen years of arduous duty in the North Atlantic. He stressed the international nature of their work and the value of their meteorological observations, not only for aviation, but for general meteorological purposes.

Weather Adviser (see photograph opposite page 29) replaces *Weather Observer*, which was the first British weather ship to take up duty on a North Atlantic Ocean Station, in August 1947 (see *The Marine Observer*, July 1960). *Weather Observer* did a consistently good job during her 103 voyages as an ocean weather ship and lived up to the reputation of the 'Flower' class corvettes for excellent sea-keeping qualities.

The layout of *Weather Adviser*, as converted to an ocean ship, is similar to that of *Weather Reporter* but certain improvements have been introduced. The arrangement of the accommodation has been improved somewhat by narrowing the alleyways, and the meteorological office, radio receiving room, radar office and chart room have been increased a little in size. The radio equipment is of a commercial design and is much more modern than the 'service' equipment aboard *Weather Reporter*; its scope and function is similar to that in the other North Atlantic weather ships. The stabilised 10 cm. radar equipment for radar finding and for giving navigational fixes to aircraft in flight is of a more modern design than in

Weather Reporter, and in order to achieve better results when the balloon is abaft the ship during a radar wind ascent the fore topmast has been removed. The meteorological equipment is similar to that carried in the other British ocean weather ships but the layout of the meteorological office has been improved. As in *Weather Reporter*, the linings and deckheads of all accommodation and offices is covered with plastic leather cloth bonded to asbestos panels, obviating the need for painting, and the decks are covered with resin-bound tiles.

The two 24 ft. motor life-boats are hoisted by means of a steam capstan, geared as necessary to the boat winches; the capstan is also used for mooring the ship aft.

After the ceremony, Sir Graham and Lady Sutton and their guests inspected the ship, and afternoon tea was served aboard.

In command of *Weather Adviser* is Commander H. Sobey, R.N.R., who joined the *Weather Watcher* as Chief Officer in 1947 and was promoted to command of *Weather Observer* in 1952. Unfortunately, Commander Sobey fell sick shortly before the renaming ceremony, and Captain J. Clark, who would normally be her Chief Officer, assumed temporary command of *Weather Adviser*. Two other members of her ship's company have served in the weather ships since 1947: Mr. Lambert, Radio Overseer and Mr. Gilbey, Boatswain. Mr. Jamison, her Chief Steward and Mr. Bremner, Radio Operator, have served in weather ships since 1948 and Mr. Dunphy, one of the meteorological officers, has the distinction of being the longest serving meteorologist in British ocean weather ships, having joined them in 1949.

Weather Adviser sailed on her maiden voyage, to Ocean Station 'I' (59°N, 19°W), on 28th September 1960.

C. E. N. F.

A REPLY TO MANY LETTERS

Each year we, in the Marine Division, send out letters to the officers of the hundred ships that have won an Excellent Award. As most of this year's letters have been answered and the Awards distributed, we would like to thank those of you who have written to us. It would be quite impossible to reply to all the letters received so, as we have done in the past two years, we will reply to them in general in this article.

Many officers have pointed out in their letters that an Award would never have been won had it not been for the teamwork on board. A radio officer writes, "... and it is a great pleasure to be considered one of the team". A captain also wrote "I give all the credit to my officers. The Radio Officer was very keen and persistent in getting off messages". There were several similar letters which do not actually mention teamwork, but reading between the lines it seems obvious that it is usually an important factor.

The meteorologists ashore come in for a fair amount of praise for their weather forecasts and their usefulness to the seafarer, such as in this letter from an observing officer, "May I add a seaman's appreciation of the excellent work done by your office each year, with regard to weather forecasts, etc. It is of great help to the North Sea trader, I assure you." A radio officer told us that the sending out of weather reports helped to break the monotony of a long voyage. Several officers found the work to be interesting: a captain wrote, "I am very interested in this sort of work and I shall do my utmost to send you all the Met. records I can, as I fully realise the benefit derived by all ships from these reports."

To officers who are studying for their certificates we know that meteorology is important. We have had some letters from observing officers about this and they tell us how their Met. work on board ship helps in this direction. For example, this letter from an officer in one of the 'top ten', "As I am leaving shortly to sit for my Master's Certificate, the knowledge I have gained in the past months will stand me in good stead."

We sometimes get amusing stories in the letters, such as this one from a radio

officer, "I complained to one of the officers that I could not read his figures—05 and 06 looked alike and sometimes even 8. Next day he sent down the OBS beautifully printed out in Roman numerals. Those of you who read morse will appreciate this!" Here is another letter, again from a radio officer, "The initial outlook [on receiving the letter] indicated something of a depression, with my having visions of the Income Tax man, but when the sky cleared it was a most welcome surprise to read of your most kind award. I've never imagined these official looking envelopes could carry as fair a wind."

We thank all those who have written for their interesting letters, as we at Harrow seldom have the chance to communicate as fully as we would like with the Observing Fleet, except through the Port Meteorological Officers and Merchant Navy Agents.

B. M.

Official Publication

METEOROLOGICAL OFFICE REPORT FOR THE YEAR ENDING 31st MARCH 1960

Routine work, new methods introduced, and progress made during the year are described in this Report. There are also sections on international co-operation, administration and publications. A list is given of books and papers by members of the staff which were published during the year.

The Report is published by H.M. Stationery Office at a price of 4s.

Book Reviews

Survival at Sea, by Lt.-Cdr. G. W. R. Nicholl, O.B.E., R.N. 8½ in. × 6½ in. pp. 166.
Illus. Adlard Coles, Ltd., London, 1960. 25s.

The author of this useful book concerned with the development, operation and design of inflatable lifesaving equipment writes from a wide knowledge of his subject, having been directly concerned with this equipment since its inception; first during his service in the R.N., then as technical adviser to the Naval Life-saving Committee, and finally in industry where he has had extensive practical experience in design and manufacture as well as in the operational problems facing the user in many types of vessel.

The book is in three parts. Part 1 traces the history of lifesaving appliances from the inflated animal skin, believed to have first been used about 880 B.C., to the early lifeboats, the Carley float, and the primitive inflatable products of the last century. It is recorded that life-preserving air pillows and an inflatable Mackintosh boat made in two parts and encased in an outer cover of canvas were used by Sir John Franklin's expedition to the Arctic in 1824. But it was not until 1945 that really significant progress was made in developing the inflatable liferaft. Mention is made of the useful contribution made by the British ocean weather ships in carrying out rough weather trials with various types of inflatable rafts.

Part 2 deals with the operation of the liferaft and provides the reader with useful advice on raftsmanship and special uses where the liferaft is particularly valuable. Part 3 supplies all the technical information required to give the mariner confidence in this equipment and explains its many advantages over the lifeboat.

Chapter 18, predicting the future trends of the inflatable liferaft, and Appendix III, which gives tables of comparative data of inflatable liferafts and lifeboats, are of special interest to mariners.

Considerable practical experience as to the value of inflatable liferafts in saving life at sea has been gained during recent years in casualties involving fishing vessels. The 1960 International Convention for Safety of Life at Sea (see Editorial, October

1960) has recognised the value of these liferafts aboard merchant ships and prescribes that they be carried as part of the lifesaving equipment aboard passenger ships and cargo ships.

A. D. W.

Understanding Weather, by O. G. Sutton. 7½ in. × 4½ in. pp. 215. *Illus.* Penguin Books, Ltd., Harmondsworth (Middx.), 1960. 3s. 6d.

In the preface, the author states that he hopes this book will help towards a better understanding, not only of weather, but also of the way in which the meteorologist approaches his problems. This hope was fulfilled in the case of the reviewer, who is not a meteorologist but a Master Mariner working in another Government Department. There can be little doubt that one so well qualified and experienced as Sir Graham Sutton can write with authority on the subject of weather. It is, as he shows in this book, a wide subject of which there is still a lot to be learned.

A reader without much scientific knowledge may wonder, when reading the first chapter, if he is likely to become involved in science and fail to understand the following chapters, but on reading further it becomes obvious that this is not so, as the author has easily explained even the simplest rudiments of science that are brought into this book.

The description of the work of the Central Forecasting Office at Dunstable is such that one can almost feel the atmosphere of this Office. To those who have not seen the working of the Central Forecasting Office, and are not familiar with the problems of the forecaster, the chapter on professional forecasting will not only be enlightening but also of great interest, and after reading to the end of this chapter the reader will not be in such a hurry to criticize weather forecasts.

From Chapter 6 onwards this book deals with aspects of meteorology of which the majority of readers know little, and although some readers may not follow the page or two of mathematics in Chapter 6, this will not detract from the interest they are bound to find in the possibility of forecasting by numbers.

It would be wrong to say that all subjects in this book are clearly explained because, as the author shows, there is still a lot to be discovered and learned about meteorology. It would, however, be fair to say that any matters which can be explained are clearly and simply dealt with. The reader is not burdened with unnecessary diagrams; those that are shown are necessary, and only the relevant information is given on them. Some interesting experiments, particularly those of rain making, are described, as are many theories that existed in the past.

One may feel, after reading this book, that when more is known about meteorology the job of the forecaster will be no less difficult but that weather forecasts will be more reliable. It gives a good insight into the problems that a forecaster has to face; it also provides an indication of the vastness of the interesting science of meteorology, and should help many in understanding weather.

G. A. W.

Lloyd's Register of Shipping, 1760 to 1960, by George Blake. 9½ in. × 6½ in. pp. 194. *Illus.* Lloyd's Register of Shipping, London, 1960. £2 2s. 0d.

It was inevitable that the shippers, merchants and bankers, who frequented the coffee house of Edward Lloyd for the purpose of insuring vessels and their cargoes on their lawful occasions, the genesis of the great Insurance Corporation of Lloyds, would seek some guarantee of the fitness of the vessels concerned for the voyage in prospect.

Thus it was that in 1760, a group of customers of the same coffee house decided to start a reference book for their use, containing details of all ships trading to and from ports in Great Britain. Underwriting a maritime venture was, in those days, as much a gamble as a business venture and the book was designed to provide everything that the underwriters would need to know about a ship, including a system of

coding to show the condition of the hull and equipment. Mr. Blake's book is wholly concerned with this organisation which eventually became known as Lloyd's Register of Shipping and, despite popular confusion, quite separate from the Insurance Corporation bearing the same name.

To ensure the accuracy of the Register, a committee appointed surveyors at the principal ports to survey ships and report on them. Sixteen shipmasters were the first holders of these posts; today there are over a thousand technically qualified surveyors distributed throughout the ports of the world.

It was not long before the surveyors were making recommendations concerning the scantlings and strengths of ships. When shipowners began building their ships to the recommendations, so as to gain the coveted A.1 classification which was the Register's hallmark of seaworthiness, the organisation assumed a more technical aspect and rules for the guidance of shipowners were established. The latter part of the nineteenth century saw Parliamentary legislation establishing a compulsory load line. But forty years before the Plimsoll line was established by law, Lloyd's Register had formulated a rule recommending that a merchant vessel should have a freeboard of three inches for every foot in depth of her hold, a rough and ready rule but one which was at least a beginning. When, in 1876, the Board of Trade was empowered by Parliament to detain overloaded ships, it was to the Register's Surveyors that it turned for expert advice, and to them was delegated the authority for fixing the load line.

Though Mr. Blake makes no mention of the fact, it is on the load line question that the work of the Register is closely allied to that of the Meteorological Office, for the boundaries of the seasonal and permanent load line zones are determined by meteorological conditions. For instance, a loading to tropical marks is only permitted in areas where there are no hurricanes and not more than one per cent of gales. Thus a ship passing through the equatorial North Atlantic or the Caribbean Sea may only load to her tropical marks in the close season for hurricanes; in the hurricane season she may load to her summer marks, but then only if the frequency of gales in the area is less than ten per cent. In the light of fresh meteorological data, provided by ships of the voluntary observing fleet, and improvement in forecasting possibilities, it is prudent to review these zonal boundaries from time to time for the benefit of sea-borne trade and safety of life at sea generally.

The fifteen chapters of the book are very readable and, far from producing merely a treatise for specialist students of ship classification, the author has reached beyond the minutiae of official records by tracing the international development of the society side by side with the growth of merchant navies throughout the world. He has in effect given us a tabloid history of shipping through the past 200 years and has especially stressed the international standard and outlook of Lloyd's Register.

There are also many anecdotes and tales of the personalities who built this great organisation. The reviewer particularly likes the story of the thirteen men of Jersey who, in 1844, suggested that a mark should be introduced into the Register book to distinguish ships wholly manned by teetotallers!

The book contains photographs of some interesting historical relics, a number of drawings in line and wash and a colour plate of the arms granted to Lloyd's Register of Shipping in 1958. Its binding and contents make it well worthy of a place on the bookshelf of any shipmaster or officer.

L. B. P.

Personalities

RETIREMENT.—COMMODORE E. W. RAPER retired on 31st July last after nearly 50 years at sea, 45 of which were spent in the service of Manchester Liners.

Edward Worth Raper commenced his seagoing career in 1911 as an apprentice with W. Runciman & Company of Newcastle, and after obtaining his 2nd Mate's

Certificate in 1915 he joined the Manchester Liners as 3rd Officer of the *Manchester Miller*. During this early part of his career Commodore Raper was twice, within the space of two months, sunk by German submarines—in June 1917 whilst still serving in the *Manchester Miller*, and the following month in the *Manchester Commerce*.

Commodore Raper passed for Master in 1920 and was appointed to his first permanent command, the *Manchester Shipper*, in 1927. During the Second World War, Commodore Raper served on the North Atlantic throughout, in the *Manchester Progress* and *Manchester Trader*, acting as Convoy Commodore on many occasions on the Canadian coast, for which he received special mention by the Royal Canadian Navy.

Commodore Raper was awarded the gold headed cane on two occasions for commanding the first ship into Montreal after the winter freeze-up. His last command was as Company's Commodore in the *Manchester Miller*, a namesake of his first ship in the company.

Commodore Raper's first meteorological logbook came from his first command in 1927. Since then, in 16 years he has sent us 45 meteorological logbooks, 13 of which have been classed 'excellent'. He received Excellent Awards in 1948, 1949 and 1959.

We wish him health and happiness in retirement.

J. R. R.

OBITUARY.—It is with regret that we record the death of COMMODORE C. BRADLEY, O.B.E., which occurred on board his ship *St. John* when approaching Beirut on 30th July 1960.

Charles Bradley was born on 3rd September 1906 and commenced his career with the Merchant Navy in 1922. He joined the South American Saint Line, Ltd. as Chief Officer in September 1937, was promoted to his first command with this company in June 1941 and appointed Commodore of the company in January 1957. During the Second World War he was awarded the O.B.E. for his part in the gallant defence of s.s. *Chaucer* when she was bombed and sunk by enemy action. He subsequently had the misfortune to be held a prisoner of war in Germany from 1941 to 1945, and for his work on behalf of fellow prisoners was Mentioned in Despatches.

During three years of valued co-operation with the Meteorological Office while in command of the *St. John*, eight Meteorological logbooks have been received from Commodore Bradley, of which seven were classed 'excellent'.

We extend our deepest sympathy to Mrs. Bradley in her sad bereavement.

F. G. C. J.

Notices to Marine Observers

SHIP'S RADIO WEATHER MESSAGES

Will captains and officers please note that radio weather messages addressed to the U.K. should be transmitted to Portishead whenever practicable. This will ensure that the observations reach the forecasters with the least possible delay, as there is a direct teleprinter line from Portishead to Dunstable. When the Central Forecasting Office moves to Bracknell, a direct teleprinter line will be established between Portishead and Bracknell.

We are glad to advise captains and officers that when unable to raise Portishead they may now pass their radio weather messages for the U.K. to *any* other G.P.O. coast radio station, i.e. Anglesey, Cullercoats, Humber, Ilfracombe, Land's End, Niton, North Foreland, Oban, Portpatrick, Stonehaven or Wick. The ocean weather

stations I and J, however, are still only to be used by ships having only M/F transmitters, when they are out of range of the G.P.O. stations and not within 400 miles of the coast.

The Marine Observer's Guide will be amended in due course.

GALE WARNING NOMENCLATURE

The terms 'imminent', 'soon' and 'later' have a definite meaning when used in forecasts issued by the Meteorological Office at Dunstable:

Imminent—within 6 hours of time of issue.

Soon—between 6 and 12 hours of time of issue.

Later—more than 12 hours after time of issue.

MOVE TO BRACKNELL

In the April 1960 number a short article appeared concerning the forthcoming move of headquarters branches of the Meteorological Office to a new building at Bracknell. We are now able to announce that the Marine Division is due to move to Bracknell during the week commencing 20th February 1961. From that date, the Marine Division's address will be

Meteorological Office (M.O.1),
London Road,
BRACKNELL,
Berkshire.

The telephone number will be Bracknell 2420.

ADDENDUM

In the article "Weather and the Fishing Industry" on page 87 of the April 1960 number of *The Marine Observer*, the following statement appeared: "The Greenland coast is well served by a daily report in English from the Danish station at Julianehaab . . ." This statement should have read: "The West coast of Greenland is served by weather bulletins in English from Danish stations on the Greenland coast and from Canadian Stations . . ."

ERRATA

The Marine Observer, July 1960.

Page 129—

line 2 from foot of page: *for* minute organisms were seen *read* minute organisms, glowing bright green, were seen.

[The Note below the observation takes this into account.]

The Marine Observer, October 1960.

Page 208—

lines 7 to 9: In the statement "accordingly, aboard British voluntary observing ships, the change from Fahrenheit to Celsius will not take place until 1st January, 1962", *for* until 1st January, 1962 *read* before 1962.

IN LIGHTER VEIN

Are there many ships like we
Among the few selected
Who scan so hard the sky and sea
And feel so oft dejected?
No phenomena,
No met. diploma.

In a column of the log,
Is entered 'passing shower'
Shifts of wind, sea, ice and fog
Are seen at any hour;
Fauna and Flora
Scarce as Aurora.

Of other ship's good fortunes
We read in *Marine Observer*
No mermaids or sea urchins,
But yet we read with fervour
And persevere hard
For sake of punched card.

N. E. POLLOCK
2nd Officer

Fleet Lists

Corrections to the lists published in the July 1960 number of *The Marine Observer* are printed below.

AUSTRALIA (Information dated 1.9.60)

The following has been recruited as a Selected Ship:
Windarra (James Patrick & Co.)
The following ships have been deleted:
Sigli, Sinabang, Triona

CANADA (Information dated 20.9.60)

The following has been recruited as a Selected Ship:
John A. MacDonald (Govt. of Canada)
The following have been recruited as Supplementary Ships:
Emerillon (Shell Canadian Tankers, Ltd.)
Fort Ross (J. R. Cooney, Vancouver, B.C.)
Key West II (F. G. R. Thompson, Gabriola Island, B.C.)
Thorsriver (A. S. Thor Dahl, Sandefjord, Norway)
The following ships have been deleted:
Fort Severn, Stugard, Elisabeth Bakke

HONG KONG (Information dated 3.10.60)

The following ships have been deleted:
Choy Sang, Hoi Ying

INDIA (Information dated October 1960)

The following have been recruited as Selected Ships:
*Jalaputra** (Scindia S.N. Co., Ltd.)
*Jalausha** (Scindia S.N. Co., Ltd.)
The following have been recruited as Supplementary Ships:
Indian Success (India S.S. Co., Ltd.)
Indian Tradition (India S.S. Co., Ltd.)
Jaladuhita (Scindia S.N. Co., Ltd.)
Jalakala (Scindia S.N. Co., Ltd.)
Jalavishvajyoti (Western Shipping Corporation, Ltd.)
State of Assam (Eastern Shipping Corporation, Ltd.)
Vishvaprabha (Western Shipping Corporation, Ltd.)
The following ship has been deleted:
State of West Bengal
• Formerly a Supplementary Ship.

MALAYA (Information dated 1.10.60)

The following have been recruited as Selected/Supplementary Ships:
Keningau (Straits S.S. & Co., Ltd.); Captain A. D. Watterson; Observing Officers, W. M. Evans, C. R. Rankine; Senior Radio Officer, P. V. Abraham
Kunak (Straits S.S. & Co., Ltd.); Captain J. M. Harkness; Observing Officers, R. D. Nicolson, J. V. Mitchell, Peter Ho Kia Tuang; Senior Radio Officer, K. M. Pillai
The following ship has been deleted:
Kajang

GREAT BRITAIN (Information dated 14.10.60)

The following have been recruited as Selected Ships:

NAME OF VESSEL	DATE OF RECRUITMENT	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
<i>Andania</i> ..	7.7.60	A. Bridgewater	F. A. Woods, B. Newcomb, M. McGoldrick	D. Wilson ..	Cunard S.S. Co., Ltd.
<i>Andes</i> ..	2.6.60	G. M. Fletcher	C. Lindel, J. Niblock, I. Farquharson	G. Sewell ..	Royal Mail Lines, Ltd.
<i>Aragon</i> ..	26.4.60	T. W. Stevens, R.D.	B. J. Kidwell, J. Wisdon, M. G. Rogers, — Taylor	W. Rollinson	Royal Mail Lines, Ltd.
<i>Arlanza</i> ..	29.9.60	J. D. Swallow	M. R. Childs, J. E. Flood, R. Forrester, D. Bell, J. Beck	R. Dunk	Royal Mail Lines, Ltd.
<i>Bishopgate</i> ..	20.9.60	H. H. Howie	C. Forth, H. Whitelaw, R. Jones	D. Galley ..	Silver Line, Ltd.
<i>British Advocate</i> ..	4.5.60	J. H. Jones	E. G. Ashurst, D. Dixon, T. W. Bauckham	D. J. O'Shea	B.P. Tanker Co., Ltd.
<i>Caltes London</i> ..	13.4.60	J. Gillies ..	P. A. Denham, W. Hilton, T. Wilson	..	Overseas Tankship (U.K.), Ltd.
<i>Camito</i> ..	26.5.60	A. Thomson	D. Wilkinson, P. A. Chubb, C. Chester	..	Elders & Fyffes, Ltd.
<i>City of Oxford</i> ..	6.7.60	W. S. Doidge	J. Martin, H. O. Wharton	Ellerman Lines
<i>City of Wellington</i> ..	24.5.60	M. L. Hernan	J. Campbell, I. Horton, J. Watson	..	Ellerman Lines
<i>Cragmoor</i> ..	6.10.60	J. P. Hogg ..	J. R. Fox, F. R. Marshall	..	Runciman (London), Ltd.
<i>Ionis</i> ..	23.3.60	R. Grant ..	B. H. Willcox, A. Jones, C. Patterson, I. MacIntosh	D. Waterhouse	Shaw Savill Line
<i>Iron Ore</i> ..	19.8.60	J. G. Wright	R. Bell, W. Knox, P. Moran ..	V. Griffith ..	Common Bros., Ltd.
<i>Laganbank</i> ..	13.7.60	J. Porteous ..	K. Bruce, J. D. Todd, C. S. Stitt	..	Andrew Weir Shipping Co., Ltd.
<i>Lindisfarne</i> ..	10.8.60	G. Robison	T. Fox, B. J. Mercer, B. Pickering ..	W. E. Johnson	W. A. Souther & Co., Ltd.
<i>Manchester Explorer</i> ..	5.4.60	— Webster	J. R. McMaster, K. Lehigh, R. Shinkfield	..	Manchester Liners, Ltd.
<i>Manchester Prospector</i> ..	13.5.60	P. Fielding ..	R. B. Dickson, T. Avers, P. Miller ..	J. C. Marlin	Manchester Liners, Ltd.
<i>Ocean Monarch</i> ..	4.10.60	R. Marshall	K. M. McLennan, I. P. M. Cameron, W. H. Thomson	J. Hynes ..	Furness Withy & Co., Ltd.
<i>Penic</i> ..	16.8.60	G. W. Houchen, O.B.E., R.D.	C. Leggat, G. Sanguine, B.P. Brough	W. Peat ..	Shaw Savill Line
<i>Royal Crown</i> ..	7.7.60	A. Somerville	I. S. Lawn, D. R. Taylor, F. Pearson	D. MacGillivray	Hall Bros. S.S. Co., Ltd.
<i>Sagamore</i> ..	29.7.60	G. Lindsey ..	W. Marnie, R. Safe, F. McHugh ..	T. Scott ..	Furness Withy & Co., Ltd.
<i>Silvercrag</i> ..	17.8.60	A. A. Walker	A. J. Swift, E. Wyness, L. Illingworth	H. Hamilton	Silver Line, Ltd.
<i>Southbank</i> ..	30.6.60	B. L. Carnie	C. M. Scofield, D. Rees, G. Wright ..	D. Farthing	Andrew Weir & Co., Ltd.
<i>Stanthorpe</i> ..	24.8.60	L. Davis ..	D. R. Ellis, R. E. L. Webb, P. T. D. Ferguson	J. Jackson ..	Stanhope S.S. Co., Ltd.
<i>Sunda</i> ..	12.5.60	L. Porter ..	A. Paterson, J. Lange, J. Duguid ..	J. Peck ..	P. & O. Line
<i>Thelma</i> ..	26.4.60	R. MacLachlan	I. Barnett, J. R. Darby, J. C. Perkins	G. Glass ..	Glen & Co., Ltd.
<i>Trecarrell</i> ..	1.9.60	I. M. Price	R. Bayliss, C. Miller, D. Watson, K. Mills	F. Curran ..	Hain S.S. Co., Ltd.
<i>Turakina</i> ..	23.9.60	R. Owen ..	J. Bryon ..	H. Hall ..	New Zealand Shipping Co., Ltd.
<i>Westmeath</i> ..	20.4.60	H. Coates ..	B. W. Hayward, A. Duncan, T. F. Jones	..	Trinder Anderson & Co., Ltd.
<i>Willowpool</i> ..	21.6.60	C. H. Churchill	Sir R. Ropner & Co.
<i>Windsor Castle</i> ..	12.8.60	G. H. Mayhew, C.B.E.	N. C. L. Wilkie, P. Robson, D. Bell	— Pitt, D.S.C.	(Management), Ltd. Union Castle S.S. Co.

The following have been recruited as Supplementary Ships:

<i>Ethel Everard</i> ..	14.10.60	W. G. Hunt	R. D. R. Maxwell, R. Croft	Everard & Sons, Ltd.
<i>Garlinge</i> ..	6.4.60	A. L. Wood	W. J. Jones, C. Spencer	Constants, Ltd.
<i>Greenbatt</i> ..	31.5.60	W. N. Bainbridge	J. Reed, J. Ord, J. Lobb ..	J. S. Kinnaird	E. R. Newbigin, Ltd.
<i>North Britain</i> ..	7.7.60	J. Watson ..	W. Bossor, N. McRae ..	D. G. Parry	North S.S. Co., Ltd.

GREAT BRITAIN (Cont.)

The following coasting vessels (Marid Ships) have been recruited:

NAME OF VESSEL	CAPTAIN	OWNER/MANAGER
<i>Alderney Coast</i> ..	G. S. Palmer	British & Channel Is. S.S. Co., Ltd.
<i>B.P. Marketer</i> ..	K. Ross	Shell-Mex and B.P., Ltd.
<i>Ferryhill</i>	J. Innes	Aberdeen Coal & Shipping Co., Ltd.
<i>Forth</i>	H. A. Matheson	William Sloan & Co., Ltd.
<i>Helmsdale</i>	J. S. Masson	Northern Trading Co., Ltd.
<i>Hesperus</i>	C. Campbell	Northern Lighthouse Board
<i>Jade</i>	T. Soullely	William Robertson, Ltd.
<i>Loch Mor</i>	J. MacKinnon	D. MacBrayne & Co.
<i>May</i>	R. Williamson	Northern Lighthouse Board
<i>Pharos</i>	J. W. Hunter	Northern Lighthouse Board
<i>Pole Star</i>	W. Walker	Northern Lighthouse Board
<i>Prince Louis</i> ..	H. G. de Chair, D.S.C., R.N. ..	Outward Bound Moray Sea School
<i>St. Clair</i>	J. C. McKinnon	North of Scotland Shipping Co.
<i>St. Clair II</i> ..	L. Mainland	North of Scotland Shipping Co.
<i>Sappho</i>	C. Knight	Bristol S.N. Co. Ltd.
<i>Spray</i>	J. Andrews	Ellis & McHardie
<i>Torquay</i>	G. Youngson	J. A. Davidson, Ltd.
<i>Thrift</i>	H. J. Tait	Northern Co-operative Society

The following skippers have been added to the Trawler Fleet List:

SKIPPER	TRAWLER OWNER/MANAGER	SKIPPER	TRAWLER OWNER/MANAGER
P. D. Abbey ..	T. Hamling & Co., Ltd.	E. Harris ..	J. Marr & Son, Ltd.
E. Anderson ..	Hellyer Bros., Ltd.	J. Littleproud	Hellyer Bros., Ltd.
L. Barker ..	Hellyer Bros., Ltd.	F. H. Patmore	Kingston Steam Trawling Co., Ltd.
V. Buschini, Jr.	J. Marr & Son, Ltd.	F. Pidgen ..	Northern Trawlers, Ltd.
R. Devries ..	T. Hamling & Co., Ltd.	D. Pougher ..	T. Hamling & Co., Ltd.
G. Drewery ..	Hellyer Bros., Ltd.	K. Saul ..	Kingston Steam Trawling Co., Ltd.
J. Dunne ..	J. Marr & Son, Ltd.	T. Sawyer ..	T. Hamling & Co., Ltd.
W. Fletcher ..	Lord Line, Ltd.	S. Sparkes ..	T. Hamling & Co., Ltd.
J. C. Gibson ..	T. Hamling & Co., Ltd.	W. Wood ..	Boyd Line, Ltd.

The following ships have been deleted: *Balaena, Clan Alpine, Dilwara, Duncraig, Enderby, Eumaeus, Great City, Hawkinge, Hesione, Highland Monarch, Kingsbury, Lingula, Lochearn, Lotorium, Manistee, Marabank, Markhor, Marna, Northia, Ramsay, Regent Hawk, Retriever, Rhodesia Castle, Ribblehead, St. Magnus, Salacia, Sandhoe, Southern Garden, Southern Venturer, Tasmania Star, Tectus, Teviot, Tongariro, Treworlas, Tribulus, Tweedbank, Vienna, Winchester Castle.*

NEW ZEALAND (Information dated 11.10.60)

The following has been recruited as a Selected Ship:
Karamu (Union S.S. Co. of New Zealand, Ltd.)
The number of Auxiliary Ships (previously termed 'Supplementary Ships') is now 12.
The following ships have been deleted:
Monowai, Port Quebec

PAKISTAN (Information dated 21.9.60)

The following ship has been deleted:
Mustali

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