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## WORLD TONNAGE AND MARINE METEOROLOGY.

LLOYD'S Register of Shipping for 1931-1932 was published just as this number was going to the press. We therefore hasten to give an amended table overleaf to that published in the January 1931 number in the general description and instruction for the British "Selected Ship" system of communication.

This will be included as usual in the January number next year.

Of the countries party to the Convention on Safety of Life at Sea, the proportionate increases and decreases of tonnage which may be seen exactly by the Table are with the exception of Great Britain and the United States of America very small. They have the following effect upon the number of "Selected Ships" to be

maintained by each nation according to the Agreement reached through the International Marine Meteorological Commission.

*Decreased Numbers.*

Great Britain, United States of America, Japan and Spain.

*Increased Numbers.*

Canada, Norway, and Sweden.

To-day, July 21st, 1931, the actual number of British "Selected Ships" on the list and functioning as such is 312. It will be reduced to the proper number, 306, on the day this number is to be published, September 2nd, 1931.

# Total Merchant Tonnage approximate (Steam and Motor) of the World

(Vessels over 100 tons, Lloyd's Register Book, 1931-32)

## and Number of Selected Ships required for making W.T. Weather Reports,

in all Oceans, World Wide.

Country.	Steamers and Motor Vessels.		Percentage of World Tonnage.	Number of "Selected Ships" required.	Number of Ships fitted for C.W. Long Wave Transmission (June, 1931).
	Number	Gross Tons.			
Great Britain and Ireland.	7,781	20,193,677	30.6	306	201
Australia and New Zealand.	593	677,463	1.0	10	—
Canada (excluding Lakes).	645	959,671	1.6	16	19
Hong Kong ...	119	273,431	0.4	4	—
India and Ceylon	150	191,551	0.3	3	—
South Africa and Other Colonies*	502	446,820	0.7	7	3
British Empire Total.	9,790	22,742,613	34.6	346	223

\* Including Dominion of Newfoundland.

Country.	Steamers and Motor Vessels.		Percentage of World Tonnage.	Number of "Selected Ships" required.	Number of Ships fitted for C.W. Long Wave Transmission (June, 1931).
	Number.	Gross Tons.			
British Empire Total.	9,790	22,742,613	34.6	346	223
America (excluding Lakes) (United States).	2,847	10,454,013	15.8	158	398
Argentina ...	299	303,333	0.5	5	1
Belgium ...	234	542,432	0.8	8	8
Brazil ...	297	493,943	0.7	7	10
Chile ...	113	180,115	0.3	3	3
China ...	229	331,849	0.5	5	—
Danzig ...	41	204,716	0.3	3	—
Denmark ...	677	1,133,201	1.7	17	27
Estonia ...	90	82,089	0.1	1	—
Finland ...	223	244,357	0.4	4	—
France ...	1,521	3,513,179	5.3	53	17
Germany ...	2,151	4,226,050	6.4	64	45
Greece ...	539	1,397,782	2.1	21	—
Holland ...	1,410	3,111,357	4.7	47	28
Italy ...	1,101	3,273,525	5.0	50	58
Japan ...	1,969	4,276,341	6.5	65	218
Jugo-Slavia ...	180	361,365	0.6	6	—
Norway ...	1,981	4,081,629	6.2	62	14
Portugal ...	176	254,258	0.4	4	17
Russia (Soviet Union).	383	600,835	0.9	9	10
Spain ...	771	1,211,817	1.8	18	18
Sweden ...	1,339	1,678,776	2.6	26	3
Turkey ...	190	179,287	0.3	3	—
Other Countries	712	1,040,992	1.5	15	2
Total ...	29,263	65,899,859	100.0	1,000	1,100

## WORK IN HIGH LATITUDES.

IN this number we publish an account of the first cruises of the new Royal Research Ship *Discovery II* in the Antarctic, by her Commander W. M. CAREY, R.N. (retired list), and in doing so we congratulate most heartily Captain CAREY and his officers upon the excellence of their Meteorological Log.

We do not as a rule so congratulate any individual ship; our thanks and acknowledgment and the Meteorological Committee's awards are communicated to all in "Work of the Year" each year in the June number. When the observing officers of a ship under the rigorous conditions in which they live and work in Antarctic Waters produce such excellent logs as are returned by *Discovery II* and her commander contributes such informative notes for the general information of the Corps of Voluntary Marine Observers, they have earned special commendation.

We hope that the fine example set by Captain CAREY and Messrs. A. L. NELSON, R. A. B. ARDLEY and F. E. DAVIES, Chief, 2nd and 3rd officers respectively, may lead the commanders and officers of others ships using high latitudes to become members of the Corps of Voluntary Marine Observers, and to there being no question of this nautical work being done by others in exploration and research ships.

In days gone by the old Whalers, sail and auxiliary steam vessels, and exploration ships, have contributed meteorological information from the Arctic and Antarctic, but since 1914 less information has been forthcoming from Arctic waters.

There is now taking place a development of the navigation of higher latitudes, aircraft also are using them, and there is little doubt that in years to come high latitudes will be frequented more by civilised nations. Hence we seek to extend our world wide net work of voluntary marine meteorological observation in British registered ships which is now mainly concentrated on the trade routes lying between the Latitudes of 57° N. and 57° S.

This does not mean that it is intended to increase the total number of British observing ships but that it is desired to improve their distribution. Indeed now that the number of British "Selected Ships" is fixed according to our proportion of the World's tonnage, it is intended to slightly reduce the total number of British observing ships, for with improved organization, which means better distribution and better work, fewer ships may be able to more effectively do this specialised work for the whole British Merchant Navy and Fishing Fleets.

Since the 1st of May, 1930, during the season of pleasure cruising by British Liners, most of which are "A Selected Ships," the service has greatly benefited by the routine Wireless Weather reports received from high latitudes by means of the control system worked through Portishead.

The Corps of Voluntary Marine Observers will generally assist by pointing out to those who are responsible for the command and navigation of vessels using high Latitudes, both North and South, how desirable it is that observations of ice should be recorded and reported in those regions, so that not only may Arctic and Antarctic navigators have information, but also their brethren on those trade routes towards which the ice drifts.

Similarly to complete knowledge of the currents of the oceans we need data from the Polar and sub-polar regions. The International Meteorological Organization attaches such importance to a better knowledge of the atmosphere over the polar regions, to promote better understanding of the laws which govern the Weather, that they have arranged for what they term "A Polar Year" i.e., the year 1932-33, when they are asking the national meteorological services each to assist by the working of a service of meteorological observation stations ashore in the Arctic.

MARINE SUPERINTENDENT.

London,

9th July, 1931.



## THE MARINE OBSERVER'S LOG.

It is hoped that these pages will be filled each month with a selection of the contributions of Mariners in manuscript, or remarks from the Logs and Records of regular Marine Observers.  
Responsibility for statements rests with the Contributor.

## R.R.S. "DISCOVERY II" IN THE SOUTHERN OCEAN.

By HER COMMANDER, W. M. CAREY, R.N. (RETIRED).

THE Royal Research Ship *Discovery II* has completed her first commission in Antarctic waters, and has proved herself a very suitable ship for her job.

She was specially built for scientific research by Ferguson Brothers of Port Glasgow, in 1929, and left England in December the same year.

The object of the Discovery Expedition is, broadly, research into practically every branch of science in Antarctic and sub-Antarctic Regions; the main objects being the gathering of information which may be of assistance to, or have a bearing on, the whaling industry; hence the work is chiefly oceanographical. In addition to the usual ship's complement, she carries six scientists—Dr. S. KEMP, Director of Research, two zoologists and three hydrologists.

During the first commission, South Georgia was the base of operations, and oil and water were obtained from the whaling station in Grytviken, whence the first departure was made in the middle of January, 1930.

The oceanographical work is done in "stations." The ship is stopped on a pre-arranged position and a sounding taken, after which brass "water-bottles" are sent down on wires from specially-built winches. The water-bottles are mechanically closed when they reach the required depth by messengers sent down the wire, the temperature and a sample of the sea-water at any depth being thus obtained. At the same time, small self-closing nets of fine mesh are fished from another winch and collect the small marine organisms at known distances below the surface, the operations being modified to the needs of any special circumstances.

During the whole commission, 400 of these stations were worked, in all, and the average time taken on each was about 2 hours, though of course this varies with the sounding and with the nature of the gear used.

From the water samples, the hydrologists are, by analysis, able to work out quite accurately the set and drift of the submarine currents at all depths, and from the contents of the nets the zoologists collect data on the distribution of plankton and much other information. The blue and fin whales, which are the chief kinds caught in the Southern Ocean, feed on a rather uninteresting looking shrimp called *Euphausia superba*.

The deep-sea soundings were at first of all taken with a Lucas machine, but this performance nearly doubled the time on station, and in the latter half of the commission the Deep-sea Echo machine was made to function and all the soundings were taken with it. It was found to give very accurate results, and the deepest sounding obtained was north-east of the Sandwich group, 4,300 fathoms.

After working 7 lines of stations round South Georgia at distances of from 10 to 100 miles off the coast, we steamed down to the Sandwich Group, in March, and a running survey was made of all the islands.

These islands had never been surveyed before, and few people had even sighted them, so very little was known about them.

Early in April, an attempt was made to reach a point South east of Joinville Island on the western side of the Weddell Sea, but we met pack-ice south of the South Orkneys and had to turn north and returned to South Georgia after working a line of stations between the South Shetlands and Cape Horn.

From South Georgia we proceeded to South Africa, visiting Gough Island on the way, and the next four months were occupied in refitting at Simonstown and working a number of stations off the Cape, to about 500 miles to the southward and round to Durban.

After returning to Capetown to oil, water and store ship we left for the South again early in October, ran a survey of Bouvet Island and unsuccessfully searched for Thompson Island. We then stood south till we met the ice in 57° S., and skirted the pack edge to the westward to South Georgia, working several stations on the way, and arriving early in November. Another series of stations round South Georgia occupied the next three weeks, and December saw us heading south again.

The programme included a survey of the South Orkneys, which are very imperfectly charted, but pack-ice all round the islands put surveying out of the question, so a number of stations were worked in Bransfield Strait and we spent Christmas in Deception Island, South Shetlands, where there is a shore whaling station. After Christmas we sailed from Deception and worked south-westward outside the Palmer Archipelago, with the idea of getting as far south as possible and ascertaining ice conditions.

In Longitude 101° W., we reached Latitude 69° 50' S., and if there is land anywhere in the neighbourhood, it must either be very low or a long way to the south, for the weather was very clear.

Throughout the Bellingshausen Sea ice and weather conditions were interesting and deep-sea echo soundings were taken (as they were the whole of this season), every few miles. These soundings are useful, as they show the contour of the sea bed and account for up-welling, deflections and all sorts of vagaries of the deep-sea currents. Many whales were observed in the Bellingshausen Sea, too, and on one occasion 64 were seen in 24 hours, mostly great blue whales.

The next objective was to get into Marguerite Bay, south of Adelaide Island, and verify the existence of the broad strait which Sir Hubert Wilkins reported after his flight over Graham Land and which is said to separate Graham Land from the Antarctic continent. Here again pack-ice barred the way.

Matha Bay, just north of Adelaide Island, of which little is known, was entered next and found to be dotted with small snow-capped islets. These islets were practically undistinguishable from bergs, of which there were many in the bay, and they rendered navigation a tricky business.

Port Lockroy was reached towards the end of January and the channels of Anvers Island traversed. The scenery in this locality beggars description; great glaciers and ice-falls and sheer craggy peaks combining to form probably some of the most spectacular views in the Antarctic.

The early part of February was spent in examining and surveying the western parts of the South Shetlands, and in spite of rather inclement weather, quite a lot of information was gathered.

On our return towards South Georgia, we again found that weather and ice conditions precluded a survey of the Orkneys, and the rest of the season was spent in running lines of stations between the South Shetlands, South Orkneys and Staten Island and the Falklands.

Of the weather, particularly between the 52nd and 62nd parallels, perhaps the less said the better. It is all that the book of sailing directions has to say about it; a series of strong winds and gales interspersed with periods of thick weather. More than 12 consecutive hours of fine weather is unusual, and towards the end of the season, in April and May, a fine day is an event.

The weather is overcast, with a very low ceiling, about 70 per cent. of the time, but during the whole of the two seasons, we did not experience a single really severe gale. Fogs, too, of the real "pea-souper" type of the Channel or the Banks, are almost unknown, but a high percentage of grey weather with damp mist and visibility from 3 to 5, compensates for them. In higher latitudes, in the Bellingshausen Sea, the weather was more pleasant, and nothing stronger than a strong breeze was experienced in three weeks, and though no fog was met, a fairly high percentage of overcast weather and fairly frequent snow prevailed.

Only on one or two occasions during the commission did heavy weather preclude the taking of a station, for it was possible to keep the deep-sea tackle fairly well up-and-down in anything up to a 40 miles an hour wind, with heavy sea and swell, by steaming head to wind. In calm and light breezes the ship was simply stopped for stations.

However, the weather does seriously hamper survey work. Practically all the coasts and lands in the area the ship operates in are precipitous and ice-bound and surveying ashore is quite out of the question except in isolated cases of harbours and bays and islets. Hence the only method is by running surveys from seaward and heavy or thick weather both make this impossible, while the low-lying cloud-pall is an objectionable factor.

The South Orkneys are a notable example of this difficulty (they probably endure about the foulest weather in the world); and during our three weeks cruise in the Sandwich group, several days were impossible, and several more unfavourable, for survey work.

Navigation, too, is at times a difficult business, for the erratic courses steered avoiding ice, the incessant heavy swell, and the general bad charting of the high latitude lands, combine with the frequent impossibility of celestial fixes in making land falls often problematical.

With regard to ice at night, a few observations may be of some service. In clear weather, on moonlight nights, with the moon aft, bergs show clear and bright as in daylight. On the other hand, with the moon low in the sky ahead, bergs appear dark and in silhouette while bergy bits and growlers are practically invisible until almost alongside, so closely do they blend with the sea. When the sky is overcast, but the weather clear, we found it usually quite safe for steaming, as bergs usually give good blink on dark nights, though this is not always the case. When the moon is up, a complication arises, for with the moon ahead but obscured and giving hardly any light below the cloud pall, bergs are not visible until quite close, and we found that then they show as a dark shape with a faint blink above them.

In thick weather, at night, bergs are very difficult to pick up, and in mist, with normal visibility 4-5, a berg was usually not seen more than  $\frac{1}{2}$  a mile away, and then only as a faint luminous patch in the mist. Tabular bergs, the commonest in the Southern Ocean, are particularly bad in these conditions, for no reflection of light is given off by their wall sides and by the time the blink from their top surfaces, usually faint, is visible, they are so close that the blink is high off the water, and the first indication of their presence is usually the breaking sea round their bases.

The most deceptive conditions arise at dawn, for with the paling sky and general lightening before sunrise, blink vanishes and the bergs assume the neutral colour of the sky, and often, on occasions when it appeared perfectly clear and safe for steaming, bergs appeared quite close to, which had not been seen perhaps a mile or less away.

Another remarkable fact is that when the sea and air temperatures are considerably above freezing point, bergs appear to become surrounded with a faint impalpable mist at night, which completely obliterates their normal blink, and on dark moonless nights they are very difficult to pick up.

Therefore night steaming in the lower latitudes, though there may be fewer bergs, is more risky than in the colder south where the ice can be discerned.

The worst circumstances in which to navigate a berg-strewn sea are undoubtedly during a gale with heavy snowfall. The snow reduces visibility to a matter of yards at night, and since the ship made headway hove-to and drifted at an alarming speed when stopped, bergs were not very welcome in these conditions.

However, with proper precautions and a good lookout, ice can usually be avoided except in the most exceptional circumstances, and in spite of a certain amount of discomfort from the incessant heavy rolling of a small ship and incidental dampness, the Antarctic Ocean remains an interesting quarter.

## CURRENTS OFF SOUTH ARABIAN COAST.

THE following is an extract from the Meteorological Record of S.S. *British Dominion*, Captain R. J. TAYLOR, Port Said to Abadan.

October 29th to 31st, 1930, when proceeding eastward along South Arabian Coast from 5 miles South of Aden and towards Palinuras Shoal, current was found to be setting W. by S. from 1 to  $1\frac{1}{2}$  knots. Thence from 10 miles east of Palinuras Shoal to about 15 miles east of Ras Fartak and 10 miles South of Coast, current recurved and set E.N.E. at 2 knots, and again from latter position it set W.S.W. 1 knot and continued a little more or less until vessel rounded Ras-al-Hadd into Gulf of Oman. Position of ship was verified frequently by Shore Bearings. It is, I think, generally known, that off Palinuras Shoal, a recurring current exists all the year round, evidently caused by the African current sweeping across the Gulf of Aden to that part of the Arabian Coast.

*Note.*—No mention is made in the Admiralty Pilot of currents in the neighbourhood of Palinuras Shoal. There are probably many similar instances where local currents are known to navigators employed on regular runs, and such reports are welcomed by us, as they enable us to make them known throughout the sea services by publication in THE MARINE OBSERVER. It is hoped to deal fully with the currents in this region and the North Arabian Sea generally in THE MARINE OBSERVER for 1932.

## REGARDING FOG AND SOUND IN NEWFOUNDLAND WATERS.

THE following additional remarks accompanying the Meteorological Log of S.S. *Newfoundland*, Captain A. W. FOXWORTHY, are made by Mr. R. F. HANDLEY, 2nd officer, under date October, 1930.

Through the recent stranding of the S.S. *Caribou*—sometime in July I think—an incident has been brought to my notice which I consider of interest to Navigators. This S.S. *Caribou* went ashore during dense fog on the S.W. corner of Green Island about three miles west of Port au Basque. The fog horn is on Channel Head and the Captain asserts that after running his distance—about seven miles less than the actual distance—he failed to hear the horn, prudently stopped, sounded and proceeded slow. Three miles later still no horn, and whilst taking a second sounding she struck. Crew and passengers put off in boats and everyone vouches that, *no horn was heard at three miles when the fog was down*, but when the fog cleared the horn was very loud and in every way normal. This was proved later by the gentleman who told me of this incident, a practical man and Lloyd's Surveyor. He definitely states that whilst conducting the survey they had fog on more than one occasion and with wind from the direction of the horn but light. From the bridge 26 feet out of the water and from a boat alongside in all positions around the vessel, during the fog no horn was heard, yet as soon as the fog cleared the horn came across booming. During his stay he declared that *the fog was of the black type*, not as we usually get hereabouts a white fog. I record this not essentially because three miles is quite a normal distance to hear a horn but on account of the fog which he asserts was black.



## DISCOLOURED WATER.

## West Coast of Africa.

THE following is an extract from the Meteorological Record of S.S. *Accra*, Captain J. T. TOFT, Liverpool to West Coast of Africa. Observer, Mr. A. B. ELLIS, 2nd officer.

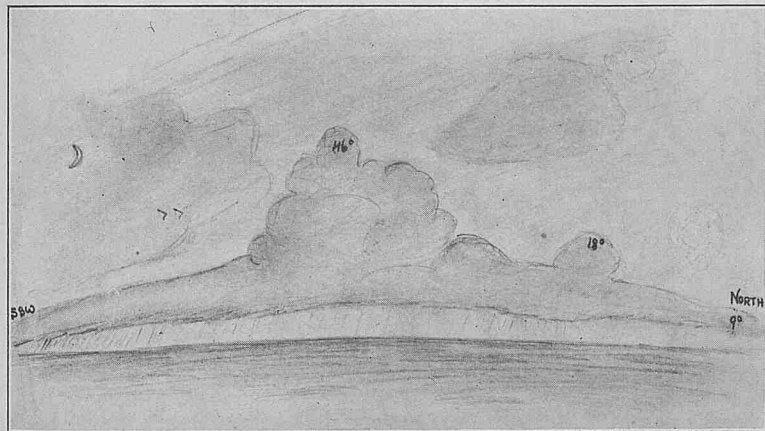
October 19th, 1930, from 2.30 p.m. to 3.15 p.m. passed through many patches of red coloured water. Took samples and found density was 1019, and temperature 80.5° F. It looked quite clear water when on board. The surrounding water had a density of 1026 and temperature of 81°. Ship's Position Latitude 4° 24' N., Longitude 6° 20' W. to 6° 10' W.

## SQUALL.

## North Atlantic.

THE following is an extract from the Meteorological Log of S.S. *Rotorua*, Captain C. B. LAMB, Southampton to Curacao. Observer, Mr. H. HILL, 4th officer.

October 26th, 1930, at 4.00 p.m. wind S.W. force 3, sky Ci-Cu, Ci-St, St-Cu, and Cu, some perfectly formed Ci-Cu to the N.W. At about 5.00 p.m., heavy Cu-Nb commenced working up from W.S.W. and frequent heavy showers passed about 3 miles to N.W. At 6.00 p.m., the formation of a squall was observed extending from S.S.W., through west to north. Altitudes of the highest and lowest parts of the cloud were taken. At 6.05 p.m. the wind veered rapidly to W.S.W. increasing to force 6, and at 6.10 p.m. a very fierce rain squall was experienced, lasting for about five minutes.



The wind then gradually backed to S.W. by W. and remained steady. Shortly after 7 p.m. frequent flashes of sheet lightning were observed and heavy showers passed to N.W. At 8.10 p.m. heavy rain accompanied by thunder and lightning was experienced. Observations at 6 p.m. Wind S.W. force 3. Barometer 1015.2 mb. Air Temperature, Dry 80° Wet 77½°. Position of ship Latitude 24° 06' N., Longitude 55° 45' W.

## THUNDERSTORM AND ST. ELMO'S FIRE.

## North Atlantic Ocean.

THE following is an extract from the Meteorological Record of S.S. *Minnewaska*, Captain F. H. CLARET, O.B.E., R.N.R., London to New York. Observer, Mr. E. PENGELLY.

On Saturday, 18th October, 1930, at 8.0 p.m. ship's time, with fresh to strong southerly wind and heavy rain squalls, barometer 29.75 in. temperature of the air and water 60° F., entered an exceptionally violent thunderstorm.

Although the peals of thunder were rare, and at long intervals, the lightning was extremely vivid and severe throughout. For two hours sheet lightning illuminated the sky in wonderful fashion, continually lighting up the whole horizon, while fierce forked lightning of three to four seconds' duration flashed from cloud to cloud, and from one horizon to the other.

During the storm the ship's aerial became prettily decorated with a display of St. Elmo's Fires, each about the size of a golf-ball. These perched along the aerial (318 ft.) at equidistance of about three feet and would appear and disappear simultaneously at each brilliant flash of lightning.

To watch some hundred of these corposants making such display was indeed interesting.

By 9.00 p.m. the wind had veered to S.W., the barometer was then 29.76 in., but the storm continued with the same activity, and power.

Not until 10.00 p.m. were there any signs of the storm moderating. The wind then shifted to west in a heavy rain squall, the barometer being 29.78 in. With a freshening wind, and a rising glass, the electric disturbance travelled in an easterly direction and the weather cleared.

Position of ship at commencement, Latitude 41° 56' N., Longitude 62° 30' W. and at 10 p.m. Latitude 41° 48' N., Longitude 63° 10' W. (D.R.) in direct line and almost midway between Cape Race and Cape Hatteras.

## NORTHERN LIGHTS.

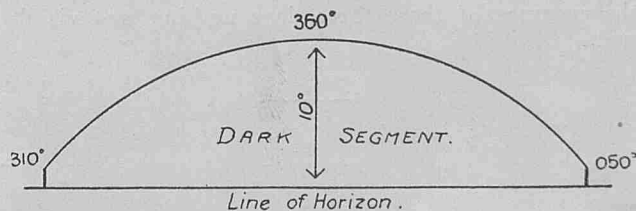
## North Atlantic.

THE following is an extract from the Meteorological Record of S.S. *Ausonia*, Captain P. A. MURCHIE, R.D., R.N.R., Montreal to London. Observer, Lieutenant Commander E. R. TAYLOR, R.D., R.N.R., 2nd officer.

October 4th, 1930, at 2255 sun set bearing 264° in cloudless sector, free from all distortion. At 2304 an arc of illuminated light appeared in the sky, bearing 310° through 000° to 050°. Both ends of this arc appeared as in rough sketch, highest point of arc had altitude of 10° bearing 000°. The whole sky under concave border was a "Dark Segment," upon which close watch was kept by prism glasses and naked eye, and at no time during the display were stars visible through, although bright elsewhere. No audible sounds were heard, and no deflection of magnetic compasses took place.

At 2306 the 310° end of arc upwards, rapidly assumed a perfect curtain display; the apex sector, rays; the 050° end, from horizon, in and through arc in fast moving waves, mostly homogeneous, but ribbons at 45° N.Wly angle could be detected, and dominant colours were white and very faint green on upper side of arc.

At 2315 a halo was observed round the moon, which by independent measurements had 16½° radius, the red and green being apparent, but no other colours. The intensity of auroral display was variable, but by comparison with the moon, which was 3 days



from full, it was at least equal. At 2325 after a period of comparatively steady brightness, the 050° end became violently agitated, and the underside of arc became bright red, and upper side, green, to about centre of arc, width of red portion being 2°. Both the Captain and myself remarked on the pronounced and definite colouring. At the 310° end of arc, pillars of light, as distinct from rays or streaks, rose to an altitude of 24° at right angles to horizon, and at the same time a bar of light seemed to form at 45° angle across the moon in a NW/SE direction (looking at the moon on a bearing of 140° appx.).

This bar extended to within  $3^\circ$  of halo, and was pure white, there being Ci-St. in vicinity. At 2345 auroral arc rapidly sagged to horizon, stars showing above arc as it sagged, and the display ceased at 2350, lunar halo continuing but bar disappearing.

Marked features during display:—

Consistent bearing of ends of arc  $047^\circ$  to  $305^\circ$ .

Consistent bearing of ends of dark segment throughout.

The curtain keeping to western half of arc.

The red and green of lunar halo.

The violent agitation at 2325 and bright colours stated.

The pillars of light and bar of light across the moon.

No audibility; and no deflection of magnetic compasses.

Position of ship at 2300 Latitude  $49^\circ 48' N.$ , Longitude  $65^\circ 03' W.$

### Gulf of St. Lawrence.

On passage London to Montreal.

25th October, 1930, at 2330 an arc of homogeneous auroral light appeared bearing  $057^\circ$  through  $360^\circ$  to  $290^\circ$ . At  $290^\circ$  it appeared as two globes of greenish white light, each about 3 times the size of the moon, apex of arc bore  $015^\circ$  at  $38^\circ$  altitude. At 2340 waves from east to west very rapid and turbulent with rays in close juxtaposition took place, green very dominant. At 2355 between bearings of  $050^\circ$  thro'  $360^\circ$  to  $300^\circ$  rays became parabolic and rose to  $90^\circ$  altitude, intensity being most variable. At 0015 of 26th, sky became nearly overcast, arc sagged to horizon at  $6^\circ$  altitude, then faded, through sky apparently becoming denser. Dark segment existed, and stars were not visible in it, but were visible through and over arc. There was no audibility or magnetic compass deflection. Position of ship was Latitude  $50^\circ 00' N.$ , Longitude  $61^\circ 54' W.$

### ZODIACAL LIGHT.

#### Arabian Sea.

THE following is an extract from the Meteorological Record of S.S. *Razmak*, Captain E. J. THORNTON, London to New Zealand via Suez. Observer, Mr. E. J. SPURLING, 3rd officer.

Between Aden and Bombay on the mornings of October 21st and 22nd, 1930, the zodiacal light was visible to the Eastward. The light first became discernible about 3.45 a.m. on both days, and it steadily increased in brilliance until it was lost to view in the dawning of day. Just before dawn the light was of perfect conical formation leaning slightly to the Southward with its apex situated in the vicinity of the constellation Leo. Its luminosity then might have been compared with the light cast by the rising of the moon. After leaving Bombay the zodiacal light was again seen, about 4.0 a.m. on October 25th, the light appeared to be much fainter than it was on the two previous occasions.

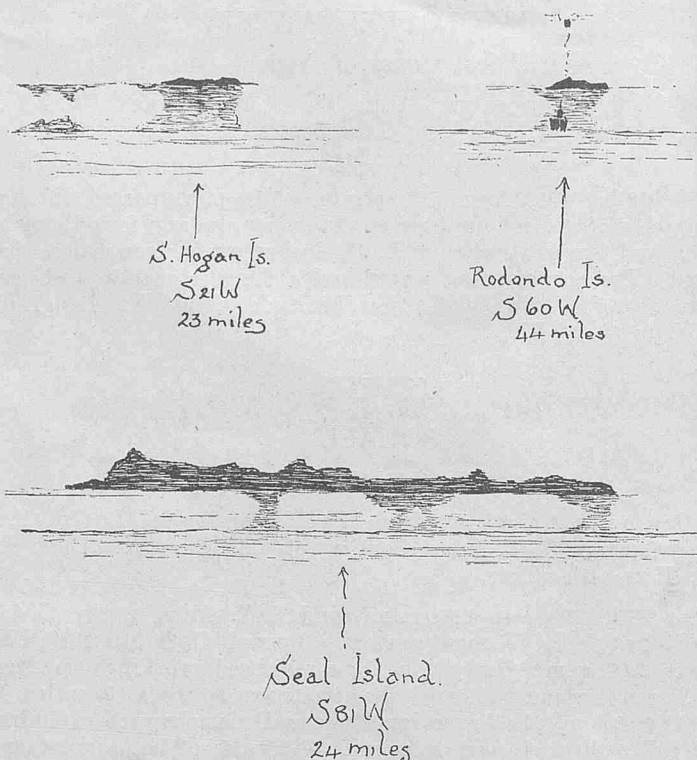
On the evenings of those three days nothing was visible to the Westward.

### MIRAGE.

#### Bass Strait.

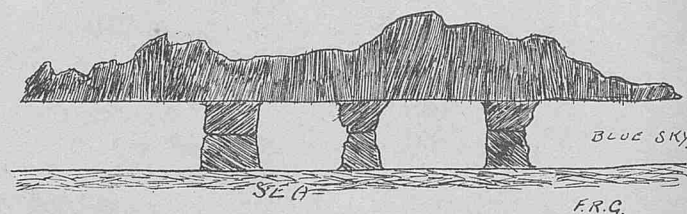
THE following is an extract from the Meteorological Record of S.S. *Moldavia*, Captain C. H. C. ALLIN, Brisbane to London. Observer, Mr. E. J. KERRIDGE, 3rd officer.

On 2nd October, 1930, at 5.30 p.m., while approaching Wilson's Promontory, observed mirage as shown in attached sketch. A faint image appeared on the horizon surmounted by an inverted image, which was again surmounted by a well-defined image showing the land apparently normal.

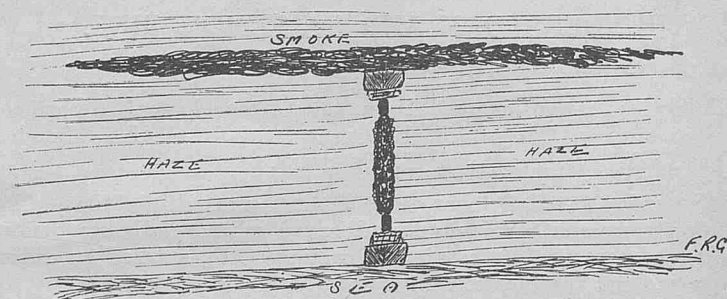


The weather conditions at the time were as follows:—Barometer 30.24 ins., Temperature, air  $61^\circ$ , sea  $56^\circ$ , Wind N.E. by N. 2, Sky covered by thin Ci/Ci-St. The air and sea temperatures taken at 4 p.m. showed a difference of  $10^\circ$ , the air being  $67^\circ$  and the sea  $57^\circ$ .

The following is an extract from the meteorological Record of S.S. *Port Bowen*, Captain G. W. HEARN, Melbourne to U.K. via Suez. Observer, Mr. F. R. GORMAN, 3rd officer.



On October 2nd, 1930, at 4.20 p.m. (Standard Time Victoria) Wilson Promontory was first observed at 3.30 p.m. distant 54 miles. It became greatly distorted as we approached, the formation shown in the above sketch taking place at 4.20 p.m., distant 42 miles. The land was well-defined and clear at this time. The lower formations are islands. At this time a slight haze of an altitude of  $4^\circ$  surrounded the horizon except in the vicinity of the Promontory. A vessel observed astern approximately distant 10-12 miles had the appearance shown below.



Ship's position Latitude  $38^\circ 50' S.$ , Longitude  $147^\circ 17' E.$ , Wind N.E. by N 1. Sky Ci haze/Ci-St., eight-tenths, visibility 9, Temperature, air  $67^\circ$ , sea  $56^\circ$ .



## GREEN FLASH AT SETTING OF VENUS.

## South Indian Ocean.

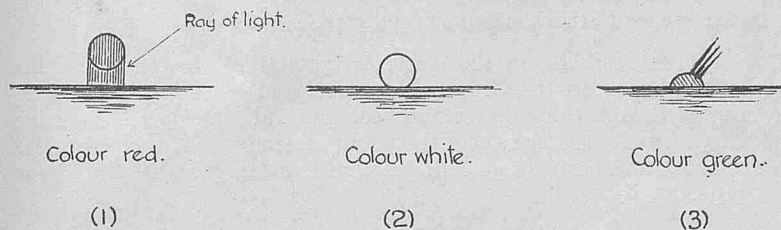
THE following is an extract from the Meteorological Log of S.S. *Nestor*, Captain F. ADCOCK, Fremantle to Durban. Observer, Mr. A. E. STEPHENSON, 3rd officer.

Thursday, 9th October, 1930, 9.42 A.T.S., Venus setting bearing  $241^{\circ}$ , approximate altitude  $3^{\circ}$ . Its upper limb seemed to have a reddish tinge; this prompted its movements to be watched closely through glasses.

As planet's altitude became very small, approximately equal to its diameter it appeared joined to the horizon by a ray of light. The whole phenomenon was a distinct red, the ray being of a lighter shade.

As the lower limb reached the horizon the colour changed to white, then the planet, dipping quickly, suddenly turned a bright green and disappeared.

The changes, though not timed, seemed to take place in a few seconds.



Position of ship, Latitude  $29^{\circ} 40' S.$ , Longitude  $62^{\circ} 44' E.$  Temperature, dry bulb  $61^{\circ}$  wet bulb  $56^{\circ}$ . Sky cloudless except for a bank of St.-Cu. settling to the eastward.

## LUNAR HALO.

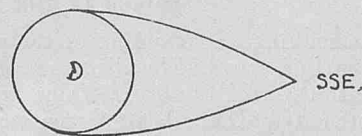
## South African Waters.

THE following is an extract from the Meteorological Record of S.S. *Piako*, Captain E. P. C. ASLIN, Liverpool to Fremantle, via Cape Town. Observer, Mr. A. D. WILSON, 3rd officer.

1st October, 1930, at approximately 1700 G.M.T. or 6.30 p.m. A.T.S. (just after sunset) a lunar halo of  $21\frac{3}{4}^{\circ}$  was noticed, the moon having an altitude of about  $74^{\circ}$  and bearing N.N.E.

As darkness set in, the halo became quite strongly developed and the colours red (inside) and orange could be occasionally seen very faintly. The halo was very distinct and formed a perfect circle.

1945. This phenomenon began to fade slightly.



2015. Two arcs of contact appeared one on each side of the halo. These arcs were visible on only one side and converged into a point of approximately  $10^{\circ}$  altitude and bearing S.S.E. from the observer. The outside edges of these arcs were definite but the insides merged into a pale milky blue.

2035. Sky became overcast. 2044 sky cleared and the arcs of contact had disappeared, while the halo itself had increased in intensity.

2350. Sky became overcast. The phenomenon was not seen again although the sky cleared about half an hour later.

Position of ship, Latitude  $36^{\circ} 35' S.$ , Longitude  $23^{\circ} 55' E.$  Course S.  $68^{\circ} E.$ , speed 10.5 knots. Air temperature  $64^{\circ} F.$  Clouds Cu and Ci-St.

## WATERPOUTS.

## Red Sea.

THE following is an extract from the Meteorological Record of S.S. *Mangalore*, Captain R. MALLETT, Calcutta to Boston, U.S.A. Observers, Messrs. G. E. JAMES, 2nd officer and J. M. MCGILVRAY, 3rd officer.

On October 25th, 1930 (at 0615 G.M.T.) observed two waterspouts form below a dark patch of nimbus cloud. Both waterspouts were well-defined and in each case were visible to within a short distance of the water surface. The sea round the waterspouts became agitated and heaped up over an area roughly five times as broad as the diameter of the columns. At 0620 the northern one gradually decreased in size, whilst the base of the southern one slanted away to the southward and at 0630 suddenly disappeared. Immediately this happened the northern one commenced to extend again and the sea surface, which had in the meantime subsided, again became agitated. At 0635 the northern one slanted away to the northward and gradually disappeared. When it finally disappeared there was a distinct report resembling a clap of thunder. The southern column was of equal diameter from top to base, but the lower part of the northern one was drawn out to a fine point.

Ship's position, Latitude  $17^{\circ} 57' N.$ , Longitude  $39^{\circ} 53' E.$

## SUBMARINE EARTHQUAKES.

PREPARED IN THE MARINE DIVISION BY F. HUSBAND, CLERICAL ASSISTANT.

AN earthquake is the shaking or trembling of the ground caused by disturbances of the earth's crust. The disturbance sets up a series of waves which travels outwards in all directions, with great velocity and diminishing intensity. The vibratory movement imparted to the earth's surface by the passage of these waves produces the sensation of an earthquake.

Ashore, a low rumbling sound is the first indication of an approaching earthquake. At first, it is so low that it is inaudible to some observers, but it grows rapidly louder. The first tremors now become perceptible. Both sound and tremors together increase in strength until the principal vibrations are felt. At this stage, deep explosive crashes are often heard in the midst of the rumbling noise. The conditions then die away together, the sound often continuing for a few seconds after the vibrations have become insensible.

**Causes of Earthquakes.**

The principle cause of earthquake shocks is the sudden slipping of portions of the earth's crust past each other along fractures which are known as faults. In severe earthquakes the amount of slipping may be several feet along a line of fracture extending for hundreds of miles.

Volcanic activity is another cause of earthquakes, but these are generally much less severe and more limited in extent.

A violent eruption often causes the earth in its vicinity to quake. Earthquakes, not accompanied by eruptions in volcanic regions, are the result of the sudden subterranean yielding of the earth's crust under the influence of either increasing pressure of gases generated in volcanoes, or the shifting of molten rocks which, imprisoned within the earth, are trying to escape.

Some earthquakes have their origin in submarine slides. Slight shocks may be due to the falling in of immense cavities in the earth's crust or to the striking of the relatively flat land at the base of a mountain by a great landslide or avalanche.

**Submarine Shocks.**

In the case of submarine earthquakes, there is an additional and probably more frequent cause; the collapse under pressure of large portions of the bottom of the sea. This occurs most frequently in those regions where there are deep troughs in the ocean bed at the foot of mountainous ridges, whose summits may be either above or below the surface of the ocean. Near the Aleutian Islands in the Northern Pacific, the ocean bed slopes steeply downward with a gradient of 1,000 fathoms in 25 miles to a small basin with depths of nearly 4,000 fathoms. This is the breeding ground of some of the greatest earthquakes. Another example of these regions is off the west coast of South America near Valparaiso and Iquique. The sea bed rises gradually to the shore from a trough more than 4,000 fathoms deep in places, and lying 50 or 60 miles from the land. From the coast, the land rises to form the high mountain range of the Andes. Similar regions are situated near the Kurile and Japanese Islands, and the East Indies.

The extent of the subsidences which occur during submarine disturbances may be judged from the fact that after the Filiatra shock in 1886, it was discovered, whilst searching for a broken cable 30 miles from land, that a depth of 900 fathoms existed where previously there had been only 700 fathoms. About 4 miles of the cable was covered with the "landslip."

Submarine shocks or marine disturbances are also the result of volcanic activity under the sea. When an eruption takes place in the ocean bed, gigantic, gently sloping cones are built up, sometimes towering above sea level. The Hawaiian Islands, together with the chain of Aleutian Islands, in the North Pacific (which is over 1,000 miles long), originated in this way. Other examples of islands of submarine volcanic origin are the Azores, Cape Verde and Canary Islands, the eastern portion of the West Indies, the East Indies and several islands of the South Pacific. The majority of these submarine volcanoes occur within areas, shown on the accompanying chart, where earthquakes are most active.

In this chart are shown the main earthquake regions of the world, together with reports of submarine shocks received in the Marine Division during the years 1861 to 1907, and 1922 to 1930.

Several shocks have been felt by vessels in the Atlantic between Cape Palmas, on the west coast of Africa, and Cape St. Roque on the east coast of South America. This region lies in the line of Iceland—the west coast of Scotland—the Azores—Canaries—St. Helena, all of which if not at present in volcanic activity show evidence of having been active within recent years.

The following is an extract of the account of an Atlantic earthquake encountered by Captain W. H. PARKER, O.B.E., R.D., R.N.R., of R.M.S. *Olympic*:—

"At 3.30 p.m. on 18th November, 1929, when in Latitude 42° 12' N., Longitude 56° 56' W., a violent tremor and sustained vibration was felt on the bridge which lasted approximately 2 minutes. For the moment I thought we had cast a propeller blade, but as the engine continued working normally, I began to fear we had struck a submerged wreck.

In the Mail Room the electric lights were shaken out. The look-out man in the Crow's Nest described the sensation of feeling as though the engines had been put full astern. The Junior Engineer in the forward stokehold described it as though the anchors had been let go and the chain rattling out of the hawse-pipe.

The wireless reports during the night confirm our conjecture regarding an earthquake, which I note as follows:—

'Boston. Atlantic Coast line from Rhode Island to Newfoundland was shaken for an hour and a half by earth tremors of considerable intensity'.

Louisburg, Cape Briton, reports:—

'Maximum shock, a severe one, was felt at the station between 4 p.m. and 4.30 Canadian Atlantic time, corresponding to 3.30 p.m. E.S.T.' "

The following report was received from S.S. *Kiwitea*, Captain M. MacKENZIE.

"The above-named vessel on voyage from Hobart to Sydney on 28th December, 1929, at 11.35 a.m. while in Latitude 40° 41' S., Longitude 149° E., 29 miles E.S.E. of Cape Barren, and outside the 100 fathoms line experienced what appeared to be a submarine disturbance. The vessel trembled and vibrated violently from stem to stern for 30 seconds, and appeared to lift bodily in the water.

So violently was it felt in the engine room, that the Engineer rushed to stop the engines, getting the impression that the shaft or propeller had gone. However, the vibrations then ceased, and the ship resumed normal motion."

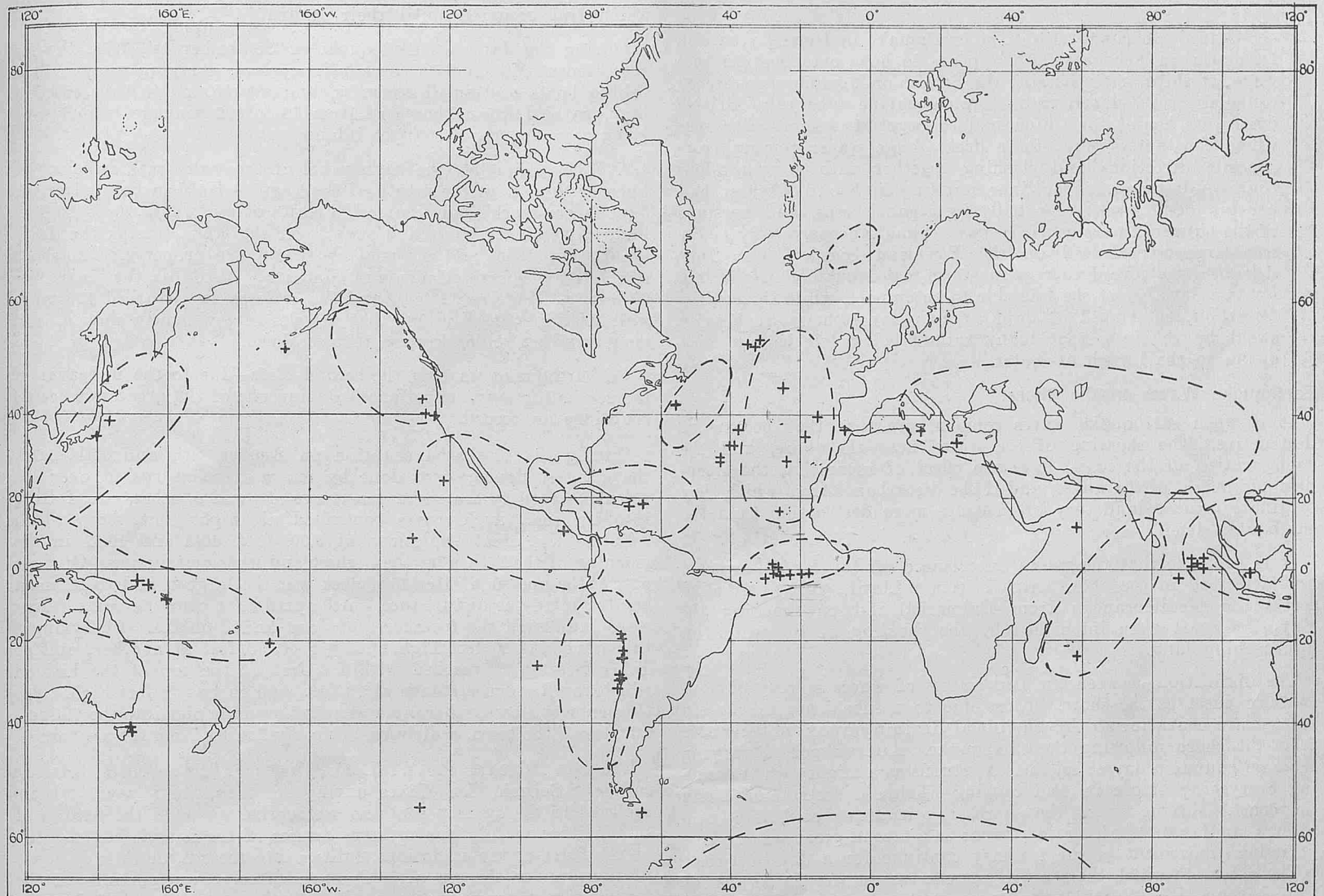
On June 28th, 1831, when passing over the Graham Shoal in the Mediterranean, H.M. Sloop *Rapid*, Commander SWINBURNE, felt several earthquake shocks. On July 19th after an eruption of a high column of water and smoke, a tract of land with a crater mouth rose a few feet above the level of the sea. It was in great activity. Vast volumes of steam and ashes were being emitted. From then on, the crater gradually increased in dimensions and magnificent eruptions of cinders with white vapours rose to heights of from 400 to 1,000 feet, accompanied by a noise like thunder. At night constant shootings of small columns of fire were visible with occasional flashes of lightning. Towards the end of August its circumference was about 1,080 yards, height from 107 to 180 feet. Following various changes, it gradually subsided and had disappeared by December. By January, 1832, there was from 2½ to 3 feet of water over the spot.

On February 28th, 1877, a slight earthquake shock was felt at Kaawaloa (Hawaiian Islands). Steam was observed rising from the sea off Keei Point and lumps of porous lava, some nearly 1 cubic foot in size, were also rising to the surface and sinking again when the contained gas escaped. At the time of the earthquake a crack opened in the ground from Keei Point in an E.S.E.'ly direction extending for more than a mile, in some places 4 inches wide and 50 feet deep.



## EARTHQUAKE CHART OF THE WORLD.

According to Drs. Milne and Davison, supplemented by observations of submarine shocks received in the Marine Division during the years 1861 to 1907 and 1922 to 1925.



+ denotes ship's position when submarine shock was felt.

Earthquake areas are enclosed by pecked lines.

The following report was received from S.S. *Magician*, Captain P. O. NICHOLAS.

"5th November, 1926, at 2.18 ships times (0758 G.M.T.) when in Latitude 10° 25' N., Longitude 88° 10' W., a very severe submarine disturbance was experienced. Two distinct shocks lasting about 10 or 15 seconds, with an interval of 1½ minutes were felt.

The vessel shook violently; a rumbling, grating sensation was experienced. Masts, funnel and superstructure vibrated and rattled alarmingly, giving the impression that the ship was running aground on to hard bottom and buckling fore and aft. She was steaming 11 knots, the weather clear and fine with a light, easterly wind blowing—although seven hours before, a very heavy rain, accompanied by vivid lightning and heavy thunder, had occurred.

The chart shows 1,800 to 1,900 fathoms water in the vicinity.

The American steamship *Eagle* then some 15 miles N.W. of our position was later communicated with by wireless, and her master replied that the shocks had been felt on board his vessel with such severity, that the engines were stopped in the belief that the ship was running over something."

#### Seismic or Earthquake Sea Waves.

Severe earthquakes originating beneath the sea give rise to large sea waves. These are often mis-called "tidal" waves; the correct term is "seismic or earthquake sea waves."

There are two forms of these waves, depending upon whether they are caused by a subsidence or by an elevation of the ocean bed.

The former is the more frequent type. When a large area of the sea-bed subsides, the sea rushes in from all directions to fill the gap, and the waters meeting at the centre are forced upwards under the impact. The collapse under gravity of this heaped-up water sends out the first great wave. It leaves a depression in the level of the water, and the surrounding sea rushing in to fill it, forces up the level a second time. A second wave is sent out on the collapse of the elevation produced. This process may continue with diminishing effect for a day or more.

The second class of seismic or earthquake sea waves is the result of an uplifting of the sea bottom into ridges or submarine plateaux and islands. If the upheaval took place slowly, the water over the centre of the disturbance would flow away radially in all directions. Some upheavals, on the other hand, take place with great rapidity, due to the sudden emission of large volumes of steam generated during the entry of water into the crater of an active volcano.

#### Earthquake Sea Waves in the Ocean.

In the open sea, earthquake waves are not generally dangerous to shipping, because their great length and moderate height gives them a gentle slope, and their period is much longer than that of ordinary sea waves. They travel thousands of miles across the ocean; waves caused by South American earthquakes have been recorded in Japan over 10,000 miles away, and the Krakatoa sea waves of 1883 were recorded at Havre at a distance of nearly 13,000 miles.

When, however, an earthquake wave is encountered near its origin, it is steep and causes damage to shipping.

The following is an extract from Lloyd's List of 21st February, 1927:—

"Cairo. February 20th.—The earthquake in Herzegovina and Dalmatia on February 14th appears to have extended far seaward, as ships, after passing the Straits of Messina encountered convulsive seas, clearly indicating submarine upheavals. British destroyers bound for China had to negotiate tempestuous seas which constantly swept their decks, huge waves coming from opposite directions and clashing together with a tremendous roar. A large passenger liner standing high out of water had her top decks swept repeatedly by gigantic seas, and portions of the bulwarks were carried away. Simultaneously, very heavy seas were experienced on the Egyptian coasts. The liner *Adriatic* was forced to remain storm-tossed outside Alexandria for two days before she was able to enter port, while the cruiser *Dauntless*, entering Port Said on February 15th was so heavily swept by the seas, that many sailors below hurried on deck owing to the inrush of water."

#### Earthquake Waves on the Shore.

It is when earthquake waves come ashore that they become so destructive. The shoaling of the water near the shore, and the configuration of the coast, have the effect of increasing the steepness and height of the waves, and if the disturbance from which they originate is near land they often cause more destruction than the earthquake itself.

It is probable that the waves experienced off the Egyptian coast and described in the above extract from "Lloyd's List," travelled across the Mediterranean from Dalmatia, and on reaching the Egyptian coast were intensified by the shoaling of the water on approaching land.

The distinction between the two classes of waves is very obvious in their effect at the shore. Those due to a subsidence in the sea bottom are characterized by an initial draining away of the water from the shore following the earthquake. After a period varying from an hour to a day or so, the sea returns as a mighty wave, washing everything before it, and causing wholesale destruction along the coast. Having swept the shore, it withdraws as before, and after a similar interval, again returns as a second great wave. This periodical movement of the sea may continue for a day or two.

The extent to which the sea will retreat varies. At Caldera, near Copiapo, on May 9th, 1877, the time when Iquique was devastated, the sea silently drew back for over 200 feet.

In 1696, at time of Catanian earthquake, the sea retreated over 2 miles.

The time taken by the sea to flow back also varies. At the earthquake of Santa on June 17th, 1678, it was stated that the sea retreated as far as the eye could see, and did not rise again for twenty-four hours, when it flooded everything.

In 1690, at Pisco, the sea went back 2 miles, and did not return for three hours. When Acapulco was destroyed on December 4th, 1854, the sea returned as gently as it went out.

The second class of earthquake wave is characterized by a sudden rise of the sea without any previous withdrawal from the shore.

#### Danger to Shipping.

Great loss of life and destruction to property have attended the notable occurrences of seismic sea waves, and many ships have been lost by being carried ashore.

In 1868 an American ship was swept a quarter of a mile inland by the great wave which inundated Arica on the west coast of South America, and she was moved still further inland by the waves of 1877.

On October 28th, 1724, during the great earthquake of Lima, Callao was swept by a wave, reported to be 80 feet high. Twenty-three ships in the harbour were sunk and four were carried far inland.

On June 15th, 1896, a great submarine earthquake occurred in Tuscarora Deep, a trough in the ocean bed off the east coast of Japan. After the usual withdrawal of the water, waves said to

reach 50 feet in height swept the coast for a distance of over 300 miles. Although a two-masted schooner lying close inshore was carried 500 yards inland, the disturbance was not felt by boats some distance out to sea, and fishermen were unaware of the disaster which had occurred until their return.

During the Japanese earthquake of September 1st, 1923, the sea retreated at Misaki with extraordinary force carrying away with it fishing boats and small steamers, and at Itō, a sea wave, 29 feet high, carried fishing boats of from 70 to 100 tonnage, which were lying close in, about 800 feet inland.

At Lisbon in 1755, the withdrawal of the water was sufficient to uncover the bar at the mouth of the Tagus. Half an hour after the most severe shocks had occurred, a series of sea waves 30 to 60 feet high broke on the shore and swept over the land, causing the death of 100,000 persons and enormous destruction to property. The shock was felt at Oporto, Cadiz and Madeira. At Cadiz the wave rose 60 feet, at Madeira 12 feet, and the sea was so disturbed 120 miles west of Cape St. Vincent, that vessels were violently shaken, and men standing on deck were thrown down.

An earthquake wave of the second class—due to the upheaval of the sea bottom—was experienced during one of the greatest volcanic eruptions on record.

During the Krakatoa eruption on August 26th and 27th, 1883, the greatest damage was done by sea waves that rushed over the volcano, aided by the enormous masses of pumice, ashes, etc., falling into the sea. Such waves continued all night, but those which followed the great explosions at 5.30, 6.44, 10.2 and 10.52 in the morning of the 27th were the highest and most destructive. Of these waves, the one soon after 10 o'clock was the largest, and to it, must be attributed the disturbance which spread far over the ocean. This wave inundated the foreshores of Java and Sumatra. At Tytingin this wave was 50 feet high at one spot, 70 feet at another, and at Telok Betong, it reached within 6 feet of the top of the hill on which the Residence stands at 78 feet, and so was 72 feet high. The Government steamer *Berouw* was swept over the pier into the Chinese quarter of the town, a distance of nearly 2 miles from the anchorage.

The late Admiral Sir W. J. L. WHARTON, R.N., F.R.S., writing on the "Seismic Sea Waves during the Eruption," says, "I am inclined to the opinion that the destructive waves in the Straits of Sunda were mainly due to large masses of the island, blown away by the force of the explosions, falling into the sea, or to sudden explosions under the sea after it flowed freely over portions of the former site of the island, possibly to both causes; but that the long wave which was recorded on so many tide gauges had its origin in the upheaval of the sea bottom."

If practicable, immediately after an earthquake, ships in port should proceed to sea, for in the open ocean, earthquake sea waves are not generally so great a danger. If the water in a harbour is found to be draining away after the occurrence of an earthquake, it constitutes a definite warning of approaching danger, which should not be ignored.

The following reports have been received in the Marine Division from ships within the area of the recent disastrous earthquake in the Hawkes Bay district of New Zealand.

M.V. *Taranaki*, Captain C. Wood, D.S.C.

"2nd February, 1931, at 2347 G.M.T. Vessel at anchor in Napier Roadstead. While lying quietly at anchor, vessel was shaken by severe earthquake. Water was observed to be receding rapidly from shore and soundings round vessel showed decrease from 6½ fathoms to 4 fathoms. Hove up anchor and proceeded seaward. Soundings showed a decrease of 15 feet for a distance of approximately 3 miles eastward from the leading beacons.

The weather at time of earthquake was fine and cloudy with light easterly wind, sea was smooth, and there was no swell. There was no disturbance noticeable on the water other than that caused by the receding water."

S.S. *Ruapehu*, Captain F. W. ROBINSON.

"5th February, 1931, 8.58 p.m. N.Z. Summer Time. At single anchor with 45 fathoms cable in 10 fathoms of water off Ahuriri Bluff, Napier (during the embarkation of Refugees as a result of



violent earthquake in Napier on 3rd February), a severe earth tremor was felt shaking the vessel violently, phenomenon lasting about 15 seconds.

The wireless operator on the S.S. *Northumberland*, which was anchored about 1 mile to the eastward of the S.S. *Ruapehu*, was in the act of reporting this tremor to the operator on the *Ruapehu* when the shock was felt on the latter vessel. The former vessel must therefore have experienced this phenomenon at least  $\frac{1}{4}$  minute before the *Ruapehu*, showing that the disturbance originated to seaward of Napier."

S.S. *Norfolk*, Captain J. HOWELL-PRICE, D.S.O., D.S.C.

"February 3rd, 1931, at 10.50 a.m. vessel alongside wharf in Wellington, New Zealand. A violent earthquake shock was felt. All high buildings in Wellington commenced swaying, as did the cranes and shed on the wharf. The motion in the ship was as if the engines had suddenly been reversed. The earthquake which devastated Hawkes Bay seemed to take a straight line through Wellington and Cook Strait to Christchurch in South Island, where a considerable shock was felt."

Reports of earthquake phenomena at sea, received from observing ships, are sent annually to the Bureau Central Internationale de Volcanologie, Naples, and are published in the Bulletin Volcanique of that institute.

The following publications were used in the preparation of the above article:—

"Earthquakes." J. Milne.

"Origin of Earthquakes." C. Davison.

"Memoirs of the Imperial Observatory, Kobe, Japan," August, 1924.

"Report of the Committee of the Royal Society on the Eruption of Krakatoa and Subsequent Phenomena."

"Earthquake Phenomena." U.S.A. Pilot Chart of the North Atlantic Ocean, February, 1923.

"Lloyds List," 21st February, 1927.

## SOUTHERN ICE REPORTS.

During the Years 1929 and 1930.

October.

Year.	Day.	Position of Ice.		Description.	Remarks.	Name of Ship reporting.
		Latitude.	Longitude.			
1929	28	54° 00' S.	35° 19' W.	1 moderate tilted berg .. .. .	.. .. .	R.R.S. <i>William Scoresby</i> .
	27	53° 13' S.	32° 04' W.	1 berg .. .. .	Estimated about $\frac{1}{4}$ mile long, 100 feet high .. .. .	do.
	27	53° 10' S.	31° 50' W.	1 moderate, very irregular berg .. .. .	Estimated about 150 feet high .. .. .	do.
	27	52° 41' S.	30° 59' W.	Fragments, apparently from berg to Southward.	.. .. .	do.
	27	52° 40' S.	30° 51' W.	1 low-lying berg (distant) .. .. .	.. .. .	do.
	27	53° 03' S.	30° 50' W.	1 moderate tabular weathered berg .. .. .	.. .. .	do.
	26	52° 46' S.	29° 12' W.	1 moderate tabular berg .. .. .	.. .. .	do.
	27	51° 07' S.	23° 45' W.	1 moderate tabular berg .. .. .	.. .. .	do.
	24	50° 11' S.	18° 45' W.	1 small weathered berg .. .. .	.. .. .	do.
	24	50° 07' S.	17° 37' W.	1 small weathered berg .. .. .	.. .. .	do.
	23	49° 36' S.	16° 54' W.	1 small weathered berg .. .. .	.. .. .	do.
	21	49° 06' S.	14° 33' W.	1 small irregular berg .. .. .	.. .. .	do.
	14	Bouvet Island		Completely surrounded by pack ice .. .. .	.. .. .	Whaler <i>Norvegia</i> .
1930	20	56° 20' S.	0° 08' E.	6 bergs .. .. .	Within a 15 mile radius. Two large (one tabular), 2 medium size and 2 small. All weathered.	R.R.S. <i>Discovery II</i> .
	20	56° 02' S.	0° 38' E.	7 bergs .. .. .	Within a 15 mile radius, evenly distributed. All of moderate size, weathered and peaked.	do.
	20	55° 43' S.	1° 08' E.	1 berg .. .. .	Much weathered and water worn, smooth all over. About 60 feet high, 250 feet long. 2 small bergs 10 miles to Westward.	do.
	20	55° 28' S.	1° 32' E.	5 bergs .. .. .	Within a 10 mile radius. All of moderate size, with a quality of sameness in weathering and general appearance. Average 80 feet high and about 300 feet long.	do.
	19	48' S.W. of Bouvet Island		2 bergs .. .. .	One much weathered, about 60 feet high, 300 feet long; one long and low, about 15 feet high.	do.
	19	30' S.W. of Bouvet Island		7 bergs .. .. .	Within a 15 mile radius. One large, 150 by 1,000 feet, three medium size, three small. All much weathered, rounded, pinnacled and peaked.	do.
	18-19	Bouvet Island		Bergs and small ice .. .. .	Many bergs, about 30, grounded off the shores of the island, preponderance on Western side, fewest on Southern. All of moderate size or small, ranging from 15 to 70 feet high and up to 200 feet long. One or two of smaller bergs appeared to be of local origin, and parts of the island glacierization could produce small bergs. Two bergs were of very fine sky-blue colour and were obviously of very rotten ice, being crevassed, rifted, and partly honeycombed. All the bergs were weathered and water worn, though a few showed evidence of tabular original form. Much small ice was in evidence round the island, in isolated pieces, apparently remains of disintegrating bergs and fragments from the glacier, but no pack. Within a 15 mile radius of the island, in the offing, 12 bergs were observed, chiefly to the South and West; all of moderate size except two, which were about 150 feet high and more than 1000 feet long.	do.
	17	54° 03' S.	3° 28' E.	4 bergs .. .. .	Within a 15 mile radius. Two small tabular and weathered; two moderate size, rugged.	do.
	17	53° 47' S.	3° 52' E.	4 bergs .. .. .	Within a 15 mile radius. All of moderate size and weathered. One tabular, tilted.	do.
	16	54° 05' S.	3° 57' E.	1 berg .. .. .	Long, but narrow, low level, tabular part 40 feet high, attached to large very rugged hummock, about 150 feet high and much weathered and pinnacled. Several small bergs, growlers and brash in vicinity.	do.
	16	53° 56' S.	4° 00' E.	4 bergs .. .. .	Within a 10 mile radius. All long, low and much weathered, average 400 feet by 50 feet.	do.
	17	53° 46' S.	4° 06' E.	6 bergs .. .. .	Within a 15 mile radius. Four small and very weathered and worn; two moderate sized, tabular, about 100 feet high.	do.

## SOUTHERN ICE REPORTS (continued)

Year.	Day.	Position of Ice.		Description.	Remarks.	Name of Ship reporting.
		Latitude.	Longitude.			
1930	16	53° 52' S.	4° 32' E.	6 bergs .. .. .	Within a 12 mile radius. All of moderate size and weathered. Largest about 600 feet by 130 feet.	R.R.S. <i>Discovery II</i> .
	16	54° 06' S.	4° 45' E.	7 bergs .. .. .	Within a 15 mile radius. All moderate sized, irregular and weathered, two tabular tilted.	do.
	16	53° 48' S.	5° 07' E.	5 bergs .. .. .	Within a 10 mile radius. All weathered and of moderate size.	do.
	16	53° 15' S.	5° 37' E.	1 berg .. .. .	Small and weathered .. .. .	do.
	15	52° 08' S.	6° 22' E.	1 berg .. .. .	About 200 feet long, square tower at one end, middle part awash, pinnacle, vertical. 40 feet, other end. Growlers and brash in vicinity.	do.
	15	52° 16' S.	6° 24' E.	3 bergs .. .. .	Two small, pinnacled and much weathered .. .. .	do.
	15	51° 51' S.	6° 29' E.	Bergy bit .. .. .	Very much weathered and pinnacled, about 15 feet high, 25 feet long.	do.
	15	51° 44' S.	6° 32' E.	1 growler .. .. .	Long and weathered, almost awash, length about 50 feet.	do.
	15	51° 34' S.	6° 42' E.	Small berg .. .. .	Irregular, conical, about 20 feet high and 30 feet long .. .. .	do.
	15	51° 19' S.	7° 06' E.	Brash and fragments and one small growler.	.. .. .	do.
	2	53° 00' S.	38° 35' W.	1 berg .. .. .	25 feet high, 100 feet long .. .. .	S.S. <i>Frango</i> .
	2	52° 35' S.	38° 35' W.	1 berg .. .. .	30 feet high, 250 feet long .. .. .	do.
	9	55° 00' S.	35° 15' W.	Large bergs .. .. .	.. .. .	do.
	9	56° 17' S.	35° 04' W.	Edge of pack ice .. .. .	.. .. .	do.
	31	From 54° 41' S. to 54° 57' S.	26° 53' W. 28° 00' W.	Bergs, growlers and drift ice .. .. .	Drift ice, consisting of broken fragments of heavy floes, growlers and brash, was met with in occasional streams, while detached portions and patches of drift littered the sea in every direction. About 30 bergs were observed, nearly all fairly small; two being tabular but only about 50 feet high and the rest much weathered. Four bottle-green bergs were noted, with the characteristic rounded and smooth appearance of their emerged portions. Two of them were of considerable size for bottle-greens, about 150 feet long and were partly coated with semi-glaciated snow.	R.R.S. <i>Discovery II</i> .
	30	From 54° 39' S. to 54° 42' S.	26° 20' W. 26° 37' W.	Small bergs, growlers, bergy bits, detached floes and brash.	.. .. .	do.
	30	54° 38' S.	26° 04' W.	1 berg .. .. .	Tabular and very level. About 100 feet high, 800 feet long. Sea littered with growlers and fragments.	do.
	30	54° 34 S.	25° 58' W.	3 bergs .. .. .	One with low base, weathered with square topped peak, measured 115 feet high, 400 feet long, one large and tabular, one with rounded whaleback base, 200 feet long almost awash, and bottle green with white hump surmounting it.	do.
	30	54° 33' S.	25° 54' W.	1 berg .. .. .	Low bottle green base, middle awash, bottle green peak one end, white, worn irregular, raised part other end. Line of demarkation definite about 30 feet high, 100 feet long.	do.
	30	51° 30' S.	25° 39' W.	1 berg .. .. .	Much weathered and peaked. About 120 feet high, 700 feet long.	do.
	30	54° 37' S.	25° 33' W.	1 berg .. .. .	Large and tabular .. .. .	do.
	30	54° 41' S.	25° 21' W.	2 bergs .. .. .	Moderate size and weathered .. .. .	do.
	30	54° 44' S.	25° 28' W.	2 bergs .. .. .	Moderate size and weathered. Sea littered with fragments and brash.	do.
	30	51° 19' S.	24° 35' W.	3 bergs .. .. .	Within a 6 mile radius. All moderate size and much weathered.	do.
	30	54° 08' S.	24° 10' W.	4 bergs .. .. .	Within an 8 mile radius. All moderate size; one tabular, three weathered.	do.
	30	54° 01' S.	22° 44' W.	Drift ice .. .. .	Working through streams and patches of drift ice, generally small and broken.	do.
	29	From 54° 48' S. to 54° 03' S.	20° 41' W. 22° 13' W.	Bergs, pack and drift .. .. .	.. .. .	do.
	29	54° 48' S.	20° 41' W.	Bergs, bergy bits and growlers .. .. .	Many growlers, much brash. 14 small bergs in sight, two of them bottle-green.	do.
	29	54° 52' S.	20° 17' W.	Bergs, bergy bits and growlers .. .. .	Innumerable growlers and large fragments. About 20 small weathered bergs within 10'.	do.
	28	54° 37' S.	19° 53' W.	5 bergs, bergy bits and growlers .. .. .	Bergs within a 10 mile radius, all moderate size or small and much weathered. The sea in every direction was studded with growlers and bergy bits, with large fragments of brash, and small streams of small brash, very straggly, were observed. An hour previously, to the Eastward, pack was observed on the southern horizon, and in this position there were indications of pack to the north.	do.
	29	54° 40' S.	19° 19' W.	Bergs, bergy bits and growlers .. .. .	Three bergs, all of moderate size, in sight numerous growlers and bergy bits.	do.
	28	From 55° 30' S. to 54° 37' S.	16° 34' W. 18° 24' W.	Pack drift ice and bergs .. .. .	The vessel on various courses, was worked through alternate belts of ice and open water, the streams of ice were very irregular, varying from a few hundred yards to 2 miles in breadth and usually trending in a general N.E. and S.W.ly direction. The ice composing them was also of very varied quality, some being young ice in fairly large and heavy floes, and some old, heavy, much broken, rafted and hummocked stuff, usually deeply covered with semiglaciated snow. In many of the streams young ice had recently formed over leads and pools, and formed sheets and small circular pans of ice, usually pancaked, and only 2 or 3 inches thick. The streams containing the older floes were full of floebergs and growlers, while about fifty bergs were observed during the day, of which five were large tilted tabular bergs and the remainder mainly of small and much weathered. Two low tabular bergs were seen, and two of the small weathered ones were loaded with morainic matter. Several small bergs were partly of deep blue colour, and one bottle green.	do.
	27	From 55° 42' S. to 55° 35' S.	13° 46' W. 16° 32' W.	Pack ice and bergs .. .. .	Vessel was continually passing through streams of quite heavy compact drift ice, consisting of hummocky rafted and generally broken up floes, which appeared to be of much harder ice than yesterday. The streams ran generally North and South and open water alternated. About sixty bergs were seen during the day, of all sizes and nearly all much weathered. Several of the low, tabular type were noted.	do.
	26	From 55° 54' S. to 55° 49' S.	11° 31' W. 13° 50' W.	Pack ice and bergs .. .. .	From first position, vessel ran S.W. down a lead, passing through streams of drift, later met solid pack, pushing to the S.W. through it to position 56° 00' S., 12° 28' W., when no leads or water sky to S.W. being observed, westing was made, for 2 hours bringing the vessel into comparatively open water, though still passing through occasional streams. The main body of the pack was quite loose and of fairly young ice; though some of the floes were 100 feet across. It had evidently not been subjected to pressure, being of very uniform thickness. Many bergs were embedded in it, nearly all small, but an unusual type was fairly common, however, being low long tabular bergs, only about 30 feet high, and probably from some coastal barrier or ice-tongue.	do.



## SOUTHERN ICE REPORTS (continued)

Year.	Day.	Position of Ice.		Description.	Remarks.	Name of Ship reporting.
		Latitude.	Longitude.			
1930	25	From 55° 55' S. to 55° 40' S.	10° 00' W. 10° 55' W.	Pack ice .. .. .	Between these positions, manoeuvred in and off the edge of pack ice composed of fairly large floes, about 7-8 feet thick, and evidently young ice. To the southward ice blink was strong and heavy pack ice was indicated by the streams and belts of drift that ran out, mainly in a northerly and north-easterly direction.	R.R.S. <i>Discovery II</i> .
	25	55° 57' S.	9° 58' W.	1 berg .. .. .	Large and tabular. About 150 feet high. Passed very close to end, which appeared narrow, the berg stretching away to Nrd apparently, but driving snow the whole night made visibility very bad.	do.
	24	56° 13' S.	9° 39' W.	1 berg .. .. .	Main body tilted and tabular appearing to have crumbled and weathered down one side which was much water worn and pinnacled. Top of tabular part white rest bottle green-streaked and bleached with white, which, however, may possibly have been snow and not part of the original berg. About 100 feet high, 400 feet long.	do.
	24	56° 08' S.	9° 13' W.	1 berg .. .. .	Long, low and much weathered. Flat top, either tabular or overturned. About 60 feet high, 400 feet long.	do.
	24	55° 59' S.	8° 29' W.	1 berg .. .. .	Large and weathered. Too distant for detail. Remarkable horse shoe shaped berg. One arm terminating in square pinnacle and joined to the bow of the horse-shoe by a wash portion 50 feet long. The whole weathered but of tabular origin. About 120 feet high, 400 feet long.	do.
	24	55° 57' S.	7° 50' W.	1 berg .. .. .	Much peaked and rounded. About 100 feet high, 500 feet long.	do.
	24	55° 57' S.	7° 31' W.	2 bergs .. .. .	One long and tabular, much weathered. About 80 feet high, 800 feet long, the other small square and slightly weathered.	do.
	23	56° 10' S.	7° 23' W.	2 bergs .. .. .	One tabular and almost square, 120 feet high, the other of moderate size and much weathered and peaked.	do.
	23	From 56° 20' S. to 56° 13' S.	7° 20' W. 7° 20' W.	Brash ice and loose fragments .. .. .	Met streams of brash ice, consisting of small pieces, much broken by the sea and stained with diatoms running to the northward. Sea generally littered with ice fragments in the vicinity. Strong blink to Srd. indicating probable proximity of the pack.	do.
	23	56° 20' S.	6° 38' W.	1 berg .. .. .	Much weathered. About 100 feet high, 400 feet long.	do.
	23	56° 20' S.	6° 08' W.	1 berg .. .. .	Of tabular origin but much weathered. About 180 feet high, 500 feet long.	do.
	23	56° 21' S.	3° 56' W.	4 bergs .. .. .	Clustered within a 1 mile radius. Moderate size, much weathered and peaked.	do.
	23	56° 31' S.	2° 46' W.	1 berg .. .. .	Moderate size and weathered .. .. .	do.
	23	56° 32' S.	2° 44' W.	1 berg .. .. .	Large and tabular. Visibility too poor for further details.	do.
	21	From 57° 05' S. to 56° 31' S.	1° 12' W. 2° 25' W.	Pack drift ice and bergs .. .. .	Between these positions, skirted the edge, on various courses, of loose ice running out in tongues and streams from the edge of heavier pack, which appeared to be heavy and fairly solid for some distance to the south and west. At the border, the ice consisted of remains of old, rotten and honeycombed floes, much discoloured with diatoms and broken up by the swell. Blink was strong to the Srd. and S'wd. Throughout this time many bergs were passed, and at least 60, some of very large size, were seen in the pack within 10 miles of its border. The majority of these bergs had capsized and were much water worn, but 3 large flat tabular bergs were passed, one being $\frac{1}{2}$ of a mile long about 80 feet high. Back in the pack two very dark bergs were observed peaked and having the appearance of black rocks. They were not examined closely.	do.
	21	57° 04' S.	1° 14' W.	6 bergs .. .. .	Two large and tabular, barrier bergs, 4 moderate size and water worn. Within a 15 mile radius.	do.
	20	56° 46' S.	0° 42' W.	1 berg .. .. .	Large, low tabular and flat topped being evidently of barrier origin about 100 feet high, 10,000 feet long.	do.
	20	56° 40' S.	0° 13' W.	2 bergs .. .. .	Larger about 1,500 feet long and 180 feet high, much water-worn and terraced.	do.
	20	56° 35' S.	0° 19' W.	Pack and drift ice .. .. .	Came up to edge of drift ice, consisting of fragments and floes and pancake ice, much honeycombed and very rotten. Floebergs and bergy bits were observed in the thicker parts of the ice, which was skirted until 1600, when clear water appeared to S.W., and course (225), was resumed. This ice appeared to be merely an advance drift from the main body, for water sky and general appearance of clear sea was seen beyond. Two large bergs were passed, the larger about 1500 feet long and 180 feet high, much water worn and terraced.	do.
	20	56° 36' S.	0° 08' W.	Pack or drift ice .. .. .	Line of pack, visible on S.E'n. horizon. Not examined, but at edge loose but fairly heavy. Much broken up full of floebergs and growlers.	do.
	20	56° 32' S.	0° 12' W.	1 large and 3 moderate bergs.. .. .	Large well preserved tabular berg, triangular in plan and sloping from 150 feet at base to 270 feet at apex in height. About 1000 feet long. Three moderate size weathered bergs within a 10 mile radius.	do.

Reports of Ice previous to October, 1929, will be found in The Marine Observer, Vol. VI, No. 70, p. 228.

## WEATHER SIGNALS.

## I.—SHIPS' WIRELESS WEATHER SIGNALS.

Urgent Meteorological reports should be made at any time. Any ship at any time encountering a tropical revolving storm should report to all ships and the appropriate station, continuing to report at intervals of three hours so long as the ship remains under the influence of the storm.

Ships experiencing gales in which the wind reaches Force 10 or above in the Beaufort Scale should inform all ships within range.

Ships encountering Ice or other navigational dangers should report immediately to all ships and the appropriate station; see instructions for Danger to Navigation Signals for all ships, pages 31 and 32, Vol. VIII, No. 85.

For full particulars of "Selected Ships" Routine Meteorological Reports with Schedule for Communication, see pages 16 to 19, Vol. VIII, No. 85.

See List of W/T Stations detailed to receive reports from **A Selected Ships** with particulars up to date below, also on Chart XI.

In parts of the world where such stations and particulars are not given, British **A Selected Ships** should make their reports to **CQ**

on 2100 metres (143 kc/s) as stated on page 18 Vol. VIII, No. 85 (January, 1931, MARINE OBSERVER).

**B Selected Ships** broadcast their report to C.Q. on 600 m. spark, and these may be intercepted by the stations ringed in on Chart XI. In making these reports to C.Q. "B Selected Ships" should make special endeavour to ensure that the report is received at these shore stations. With a view to assisting Meteorological Services who have provided information and to ensuring that routine reports from all "Selected Ships" within range of certain coast stations may be received by those services a list of stations specially detailed to receive reports from "B Selected Ships" is also given on pages 218 and 219. The procedure given on pages 16 to 19, Vol. VIII, No. 85, should be adhered to as far as possible.

According to agreement reached by the International Meteorological Conference, 1929, all arrangements for the co-operation of shipping in Voluntary Marine Meteorological work are to be made through the Meteorological Services of the different countries in which the ships are registered, in accordance with the agreed upon International plan for all parts of the World, following the International Convention for Safety of Life at Sea, 1929.

## WIRELESS STATIONS DETAILED TO RECEIVE ROUTINE CODED WEATHER REPORTS FROM "A SELECTED SHIPS."

### Request for Information.

THE ATTENTION OF METEOROLOGICAL SERVICES IS INVITED TO THE INVITATION GIVEN ON PAGE 16 OF VOL. VIII, NO. 85, JANUARY MARINE OBSERVER.

Ocean.	Station.	Position.	Call Sign.	Frequency and Wave Length.		Area and limits covered by Station.	Telegraphic address of Meteorological Centre.	Information required—Limit of Groups.	Notes.
				For Station to call up "Selected Ships."	For "Selected Ships" to report to Station.				
North Atlantic and North Sea.	Portishead.	Lat. 51° 28' 41" N. Long. 2° 47' 30" W.	GPU.	149 kc/s. (2013 metres).	143 kc/s. (2100 metres).	North Sea and Eastern North Atlantic East of Longitude 40° W. and North of Latitude 38° N., but not within 300 miles of station. (see Chart XI.)	Weather London.	Weather only, up to seven groups, preferably No. 3 Supplementary Groups.	Control system. "Selected Ships" chosen to report in given order notified by station daily at 2230, 0330, and 1030 G.M.T. Roll call thus—Weather begins—Call signs of chosen "Selected Ships"—Weather ends.
	Chatham Mass. Sayville N.Y. or West Palm Beach.	Lat. 41° 42' N. Long. 70° 00' W. Lat. 40° 42' N. Long. 73° 06' W.  Lat. 26° 42' N. Long. 80° 02' W.	WCC.  WSL.  WMR.	}	142.9 kc/s. (2098 metres).	North Atlantic West of Longitude 40° W.	Observer Washington.	Weather only. First four groups of observations taken at 0000 and 1200 G.M.T. only required.	No control. All British "A Selected Ships" within area to address their 0000 and 1200 G.M.T. observations to Observer Washington and their 1800 G.M.T. observations to CQ in accordance with schedule.
	Horta, Azores.	Lat. 38° 32' N. Long. 28° 38' W.	CTH.						
					125 kc/s. (2400 metres).	North Atlantic South of Latitude 38° N. and East of Longitude 40° W.	Radio Horta.	Weather only, up to seven groups, preferably No. 3 Supplementary Groups.	No control—all British "A Selected Ships" within area should report in accordance with Schedule.



## (Continued.)

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WIRELESS STATIONS DETAILED TO INTERCEPT ROUTINE CODED WEATHER REPORTS FROM  
"B SELECTED SHIPS."

Ocean.	Station.	Position.	Call Sign.	Telegraphic address of Meteoro- logical Centre desiring information.	Information desired.	Notes.
North Atlantic.	Horta, Azores.	Lat. 38° 32' N. Long. 28° 38' W.	CTH.	Radio Horta	Weather only, up to 7 groups, preferably No. 3 Supplementary Groups.	
Indian Ocean.	Calcutta.	Lat. 22° 33' 31" N. Long. 88° 20' 16" E.	VWC.	Weather.	Weather only up to 6 groups, No. 6 Supplement- ary Groups preferred.	
	Rangoon.	Lat. 16° 45' 57" N. Long. 96° 11' 51" E.	VTR.			
	Madras.	Lat. 12° 59' 17" N. Long. 80° 10' 56" E.	VWM.			
	Bombay.	Lat. 19° 04' 55" N. Long. 72° 49' 54" E.	VWB.			
	Karachi.	Lat. 24° 51' 05" N. Long. 67° 02' 32" E.	VWK.			
	Matara.	Lat. 6° 01' 07" N. Long. 80° 35' 39" E.	GZP.			
	Mauritius.	Lat. 20° 23' S. Long. 57° 35' E.	VRS.	Observatory Mauritius.	Weather 4 universal groups and first of No. 6 Supplementary Groups.	



WIRELESS STATIONS DETAILED TO INTERCEPT ROUTINE CODED WEATHER REPORTS FROM  
"B SELECTED SHIPS."

(Continued.)

Ocean.	Station.	Position.	Call Sign.	Telegraphic address of Meteorological Centre desiring information.	Information desired.	Notes.
North Pacific and China Sea.	Cape d'Aguilar, Hong Kong.	Lat. 22° 12' 39" N. Long. 114° 15' 19" E.	VPS.	Royal Observatory.	Weather only, preferably No. 6 Supplementary Groups.	
South Pacific.	Auckland.	Lat. 36° 50' 36" S. Long. 174° 46' 08" E.	ZLD.	Weather Wellington.	Weather only, up to 7 groups.	Apia, Rarotonga and Chatham Island relay to New Zealand. Rarotonga keeps watch 0630 to 1330 G.M.T. Chatham Island 0430 to 1230 G.M.T. Remainder cover schedule. Reports desired through nearest station when "B Selected Ships" are within 1,000 miles of New Zealand.
	Wellington.	Lat. 41° 16' 26" S. Long. 174° 01' 00" E.	ZLW.			
	Awarua.	Lat. 46° 30' 27" S. Long. 168° 22' 21" E.	ZLB.			
	Chatham Island.	Lat. 43° 57' 02" S. Long. 176° 31' 04" W.	ZLC.			
	Rarotonga.	Lat. 21° 11' 54" S. Long. 159° 48' 51" W.	ZKR.			
	Apia.	Lat. 13° 15' 17" S. Long. 170° 49' 42" W.	ZMA.			

## II.—WIRELESS WEATHER SIGNALS.

## WIRELESS WEATHER BULLETINS.

## Australia.

## C.W., I.C.W. and Spark Issues.

WEATHER reports and forecasts issued by the Commonwealth Meteorological Bureau are broadcast *en clair* by Australian W/T stations as follows, special reports and warnings being broadcast immediately on receipt by the W/T Stations serving the area affected, when dangerous weather prevails or is expected.

## Perth W/T Station.

Approximate, Latitude 32° 02' S. Longitude 115° 50' E.

Call sign, **VIP**. Wavelength 600 metres (I.C.W.).

At 0415 and 1100 G.M.T., Mondays to Saturdays, inclusive, weather forecasts are broadcast.

Each forecast is for the following 24 hours, except on Saturdays when it is for 48 hours.

At 0415 and 1100 G.M.T., on Sundays, supplementary forecasts for the following 24 hours are broadcast.

In addition to the above, 0100 and 0700 G.M.T. observations of barometric pressure, wind direction and force, weather, and state of the sea at Fremantle and Cape Leeuwin on week-days and 0100 and 1000 G.M.T. observations of the same elements on Sundays, are broadcast. Other coastal reports and reports from shipping are included when necessary.\*

At 0030 G.M.T., on 2,400 metres (C.W.), weather forecast of the previous evening is broadcast for the information of distant shipping.

## Geraldton W/T Station.

Approximate, Latitude 28° 47' S. Longitude 114° 36' E.

Call sign, **VIN**. Wavelength 670 metres (I.C.W.).

At 0200 and 1200 G.M.T., Mondays to Fridays, inclusive, weather forecasts for the following 24 hours are broadcast.

At 0200 G.M.T. on Saturdays, a weather forecast for the following 48 hours is broadcast.

In addition to the above 0000 and 0600 G.M.T. observations of barometric pressure, wind direction and force, weather and state of the sea, at Fremantle and Cape Leeuwin are broadcast, Mondays to Fridays; 0000 G.M.T. observations on Saturdays; 0000 and 0900 G.M.T. observations on Sundays.\*

## Broome W/T Station.

Approximate, Latitude 17° 58' S. Longitude 122° 14' E.

Call sign, **VIO**. Wavelength 600 metres (I.C.W.).

Weather forecasts are broadcast at 1400 G.M.T.\*

From 16th April to 16th December no separate forecast is broadcast for Sundays; the forecast issued on Saturdays is therefore for the following 48 hours.

## Wyndham W/T Station.

Approximate, Latitude 15° 27' S. Longitude 128° 07' E.

Call sign, **VIW**. Wavelength 720 metres (I.C.W.).

At 0130 and 1130 G.M.T., Mondays to Fridays, inclusive, weather forecasts for the following 24 hours are broadcast.\*

At 0130 G.M.T. on Saturdays, a weather forecast for the following 48 hours is broadcast.

## Darwin W/T Station.

Approximate, Latitude 12° 27' S. Longitude 130° 50' E.

Call sign, **VID**. Wavelength 600 metres (I.C.W.).

At 1200 G.M.T., broadcasts a 24 hours Weather forecast for the N.W. coast of Western Australia, Gulf of Carpentaria and E. coast of Queensland. From 16th December to 16th April the 2300 G.M.T. weather report for the coast of Queensland, and a forecast for the ensuing 24 hours, are issued by Brisbane Weather Bureau on Sunday mornings. During the remainder of the year Sunday forecasts are suspended and the forecast broadcast on Saturdays is therefore for the following 48 hours.

\* When available, the 0000 G.M.T. observations of barometric pressure, wind and weather at Kupang (Timor) are also broadcast from the above four stations.

## Thursday Island W/T Station.

Approximate, Latitude 10° 35' S. Longitude 142° 13' E.

Call sign, **VII**. Wavelength 720 metres (I.C.W.). Ships may obtain the 0500 G.M.T. weather report for the coast of Queensland and a forecast for the ensuing 24 hours upon application to the above W/T Station.

## Cooktown W/T Station.

Approximate, Latitude 15° 28' S. Longitude 145° 16' E.

Call Sign, **VIC**. Wavelength 760 metres (I.C.W.).

Ships may obtain weather information similar to above (Thursday I.) upon application to Cooktown W/T Station.

## Townsville W/T Station.

Approximate, Latitude 19° 16' S. Longitude 146° 50' E.

Call sign, **VIT**. Wavelength 2,400 metres (C.W.).

At 1100 G.M.T. The 0500 G.M.T. weather report for the coast of Queensland and a forecast for the following 24 hours is broadcast daily, except Sundays.

At 1100 G.M.T. on Sundays, from 16th December to 16th April, only, the 2300 G.M.T. weather report for the coast of Queensland, and a 24 hours' forecast issued by the Brisbane Weather Bureau are broadcast. If an atmospheric disturbance is reported the broadcast is made immediately upon receipt of the information from the Weather Bureau. The forecasts on Saturdays from 16th April to 16th December are for the ensuing 48 hours.

## Willis Islets W/T Station.

Approximate, Latitude 16° 18' S. Longitude 149° 59' E.

Call sign, **VIQ**. Wavelength 730 metres (spark).

From about mid November to 30th April this W/T station broadcasts particulars of barometric pressure, wind direction and force, amount of cloud, weather, state of sea and swell at Willis Island, *en clair*, as follows:—

At 0645 G.M.T., containing observations of 0600 G.M.T.

At 1045 G.M.T., " " " 0800 "

At 2330 G.M.T., " " " 2200 "

During stormy weather the 1045 G.M.T. broadcast will contain 1000 G.M.T. observations.

## Rockhampton W/T Station.

Approximate, Latitude 23° 24' S. Longitude 150° 30' E.

Call sign, **VIR**. Wavelength 720 metres (I.C.W.).

Ships may obtain the 0500 G.M.T. weather report for the coast of Queensland and a forecast for the ensuing 24 hours, upon application to the above W/T Station.

## Brisbane W/T Station.

Approximate, Latitude 27° 26' S. Longitude 153° 07' E.

Call sign, **VIB**. Wavelength 600 metres (I.C.W.).

Between 0200 and 0230 G.M.T., broadcasts, the 2300 G.M.T. coastal weather report and a 6 hours' forecast. Ships can also obtain this information on request.

At about 1200 G.M.T. daily (except Sundays), or earlier if requested, the 0500 G.M.T. coastal weather report and a forecast for the ensuing 24 hours are broadcast. On Saturday the forecast is for 48 hours.

## Sydney W/T Station.

Approximate, Latitude 33° 46' S. Longitude 151° 03' E.

Call sign, **VIS**. Wavelengths as given below.

Between 2300 and 0030 G.M.T. this W/T station broadcasts on a wavelength of 600 metres (I.C.W.) a 2300 G.M.T. weather report of coastal conditions and a 24 hours' forecast if the Weather Bureau is in receipt of sufficient information in time; if not, the report and forecast will be broadcast between 0200 and 0300 G.M.T. on a wavelength of 2,400 metres (C.W.). The foregoing broadcasts are made daily, except Sundays.



At 1030 G.M.T., repeated at 2230 G.M.T., on wavelengths of 2,400 metres (C.W.) and 600 metres (I.C.W.), respectively, a summary of the coastal weather reports and a 24 hours' forecast are broadcast. Ships may also obtain this information on application to Sydney W/T Station after 0630 G.M.T. daily, except on Saturdays and Sundays. On Sundays at 1030 G.M.T., repeated at 2230 G.M.T., a 24-hour forecast and coastal weather report are broadcast on 2,400 metres (C.W.) and 600 metres (I.C.W.) respectively.

#### Melbourne W/T Station.

Approximate, Latitude 37° 47' S. Longitude 144° 52' E.

Call sign, **VIM**. Wavelength 600 metres (I.C.W.).

At 0200 G.M.T. (1) The 2300 G.M.T. observations of barometric pressure, wind direction and force, weather, state of the sea at Cape Borda, Cape Northumberland, Wilson's Promontory, Bruni Island and Jervis Bay. Reports from other coastal stations or from ships are on occasion broadcast in lieu of reports from one or more of the usual stations, or may be supplied in addition thereto.

(2) Brief information regarding any disturbance affecting, or likely to affect, weather in the Great Australian Bight, south-eastern Australian waters, or the Tasman Sea.

(3) A forecast for the ensuing 24 hours.

The foregoing broadcasts are made daily except on Sundays.

At 1100 G.M.T. daily, including Sundays, a weather forecast for the ensuing 24 hours is broadcast. In special circumstances this forecast is accompanied by reports from selected coastal stations.

#### King Island W/T Station.

Approximate, Latitude 39° 56' S. Longitude 143° 52' E.

Call sign, **VIK**. Wavelength 760 metres (spark).

Transmits weather report on request.

#### Hobart (Tasmania) W/T Station.

Approximate, Latitude 42° 52' S. Longitude 147° 19' E.

Call sign, **VIH**. Wavelength 720 metres (I.C.W.).

Ships may obtain a summary of 2300 G.M.T. coastal weather reports on application to the W/T Station, after about 0030 G.M.T., daily (Sundays excepted). A 24 hours' forecast may also be obtained on application after about 0330 G.M.T. The forecast issued on Saturdays is for the ensuing 48 hours.

#### Adelaide W/T Station.

Approximate, Latitude 34° 51' S. Longitude 138° 32' E.

Call sign, **VIA**. Wavelength 600 metres (I.C.W.).

Ships may obtain a summary of 2330 G.M.T. coastal weather reports and a 24 hours' forecast on application to the W/T Station, after 0200 G.M.T. daily, except on Sundays.

A later forecast is broadcast at 1130 G.M.T. for the following 24 hours preceded by a statement of meteorological conditions at 0530. On Saturdays the forecast is for 48 hours and the statement omitted.

#### Esperance W/T Station.

Approximate, Latitude 33° 52' S. Longitude 121° 54' E.

Call sign, **VIE**. Wavelength 680 metres (I.C.W.).

At 0300 and 1300 G.M.T., Mondays to Fridays, inclusive; Saturdays at 0300 only; broadcasts weather forecasts for the following 24 hours. Saturday's forecast is for the following 48 hours.

In addition to the forecasts, observations of barometric pressure, wind direction and force, weather, state of the sea at Fremantle and Cape Leeuwin are broadcast. These observations are taken at 0100 and 0700 G.M.T., Mondays to Fridays; at 0100 G.M.T. on Saturdays; and at 0100 and 1000 G.M.T. on Sundays.

### British New Guinea (Papua).

(Spark Issue.)

#### Samarai W/T Station.

Approximate, Latitude 10° 37' S. Longitude 150° 40' E.

Call sign, **VIJ**. Wavelength 720 metres (spark).

Ships may obtain a weather forecast on application to the W/T Station.

#### New Britain—Rabaul (Bitapaka) W/T Station.

Approximate, Latitude 4° 24' S. Longitude 152° 19' E.

Call sign, **VJZ**. Wavelength 2,400 metres (C.W.).

At about 0600 G.M.T., daily. The 2300 G.M.T. weather report for the coast of Queensland and a 24 hours' forecast are broadcast. Ships may also obtain this information on application to the W/T Station. From 16th April to 16th December, no forecast is broadcast on Sundays; the forecast issued on Saturdays is therefore for 48 hours.

### South Pacific Ocean Islands.

#### Fiji Islands.

**Suva W/T Station**, approximate Latitude 18° 09' S., Longitude 178° 28' E., call sign **VPD**, broadcasts a weather bulletin, containing observations taken at 0330 and 2030 G.M.T., at the following stations, on a wavelength of 600 metres (I.C.W.), directly after the Apia broadcast (see below) at 0845 and 2345 G.M.T., Sundays 0845 only:—

	Latitude (approx.).	Longitude (approx.).
Apia, Samoa ... ..	13° 51' S.	171° 48' W.
Nukualofa (Tonga Islands) ...	21° 08' S.	175° 12' W.
Fila (New Hebrides) ... ..	16° 00' S.	168° 00' E.
Norfolk Island ... ..	28° 58' S.	168° 03' E.
Suva (Fiji Islands) ... ..	18° 09' S.	178° 28' E.
Awanui (New Zealand) ... ..	35° 05' S.	173° 15' E.
Vavau (Tonga Islands) ... ..	18° 39' S.	173° 59' W.
Rarotonga (Cook Islands) ...	21° 12' S.	159° 48' W.
Papeete ... ..	17° 29' S.	149° 29' W.

NOTE.—Only the 0330 G.M.T. observations are included from Rarotonga and Papeete.

The bulletin is sent *en clair* and consists of:—

Name of the observation station.

Barometric reading (corrected) in inches and hundredths.

Dry and wet bulb thermometer readings (in whole degrees F.).

Direction (True) and force of the wind (Beaufort Scale).

State of weather by Beaufort Scale.

Example:—

Suva 30.08 79 75 E.N.E. 5 or, break sign (— — — —)

Apia 30.16 80 78 E.N.E. 3 bc, break sign

Nukualofa, etc., etc., the bulletin ending with the observation time, 0330 or 2030 G.M.T., as the case may be.

#### Samoa.

**Apia W/T Station**, approximate Latitude 13° 50' S., Longitude 171° 50' W., call sign **ZMA**, broadcasts a similar bulletin to that explained above at 0830 and 2330 G.M.T. on a wavelength of 2000 metres (spark) (Sundays excepted).

During the period May 1st to October 31st, only one bulletin is broadcast by Apia at 0830 G.M.T. containing observations taken at 0330 G.M.T.

## WIRELESS STORM WARNINGS.

## Australia.

## (C.W., I.C.W. and Spark Issues.)

Storm warnings are broadcast by the Australian W/T stations as follows:—

For approximate positions of the Stations *see* pp. 220-221.

**Perth**, call sign **VIP**, wavelengths 600 metres (I.C.W.) and 2400 metres (C.W.).

**Geraldton**, call sign **VIN**, wavelength 670 metres (I.C.W.).

**Broome**, „ **VIO**, „ 600 „ „

**Wyndham**, „ **VIW**, „ 720 „ „

These W/T Stations broadcast special warnings of the approach of cyclonic storms of tropical origin, including information regarding barometric pressure at stations on the N.W. coast of W. Australia, immediately upon receipt from the Weather Bureau.

**Darwin**, call sign **VID**, wavelength 600 metres (I.C.W.), broadcasts special warnings of the approach of cyclonic storms of tropical origin immediately upon receipt from the Weather Bureau. In the case of cyclonic storms affecting the tropical seaboard of W. Australia the warnings include information of barometric pressure at stations on the N.W. coast of W. Australia.

**Thursday Island**, call sign **VII**, wavelength 720 metres (I.C.W.).

**Cooktown**, „ **VIC**, „ 760 „ „

**Rockhampton**, „ **VIR**, „ 720 „ „

**Brisbane**, „ **VIB**, „ 600 „ „

These W/T Stations broadcast special storm warnings, immediately upon receipt from the Weather Bureau, and thereafter during the regular W/T watches kept by coastal vessels until receipt of later information from Brisbane Weather Bureau.

Special storm warnings may also be obtained, if the information is available, upon application to any of the W/T stations.

**Willis Islets**, call sign **VIQ**, wavelength 730 metres (spark), broadcasts storm warnings during the months November to April inclusive.

**Sydney**, call sign **VIS**, wavelength 600 metres I.C.W., broadcasts special storm warnings, immediately on receipt. They are repeated at intervals until receipt of later information from the Weather Bureau.

**Melbourne**, call sign **VIM**, wavelength 600 metres (I.C.W.), broadcasts special storm warnings immediately on receipt from the Weather Bureau.

**Flinders Island**, call sign **VIL**, wavelength 740 metres (I.C.W.), broadcasts storm warnings immediately on receipt.

**King Island**, call sign **VIK**, wavelength 760 metres (spark), broadcasts storm warnings immediately on receipt.

**Hobart (Tasmania)**, call sign **VIH**, wavelength 720 metres (I.C.W.), broadcasts special storm warnings, immediately on receipt from the Weather Bureau and at hourly intervals thereafter until 1000 G.M.T.

**Adelaide**, call sign **VIA**, wavelength 600 metres (I.C.W.)

**Esperance**, „ **VIE**, „ 680 „ „

broadcast special storm warnings immediately on receipt from the Weather Bureau.

## British New Guinea (Papua).

**Port Moresby**, call sign **VIG**, wavelength 720 metres spark, broadcasts special warnings of disturbances on the Queensland coast on any hour when occasion warrants.

**Samarai**, call sign **VIJ**, wavelength 720 metres (spark), broadcasts special storm warnings immediately on receipt and thereafter in the regular watches kept by coastal vessels, until further information is received from the Brisbane Weather Bureau.

Special storm warnings may also be obtained, if the information is available, upon application to the W/T stations.

## New Britain.

**Rabaul**, call sign **VJZ**, wavelength, 2,400 metres (C.W.) broadcasts special warnings of disturbances on the Queensland coast at any hour when occasion warrants.

## South Pacific Ocean Islands.

During the Hurricane Season (November 1st to April 30th).

## Fiji Islands.

**Suva W/T Station**, call sign **VPD**, broadcasts hurricane warnings, when necessary, immediately after the weather bulletins which are transmitted soon after 0845 and 2345 G.M.T., on a wavelength of 600 metres (I.C.W.).

## Samoa.

**Apia W/T Station**, call sign **ZMA**, broadcasts, when necessary, information concerning hurricanes in addition to the weather bulletins at 0830 and 2330 G.M.T., on a wavelength of 800 metres (I.C.W.). The message is sent *en clair* and commences with the general call to all stations, e.g.:—

**QST.** “Hurricane centre 200 miles N.W. of Suva at noon, 27th February, Apia time and date, travelling south.”

## French Oceania.

**Papeete (Tahiti)**, approximate Latitude 17° 29' S., Longitude 149° 29' W., call sign **FPB**, broadcasts information concerning hurricanes &c. at 0500 and 2200 G.M.T. and at other times when necessary on a wavelength of 2,000 metres (spark). The safety signal **TTT**, repeated at short intervals ten times on full power, is first sent out followed by the message which is repeated three times with intervals of ten minutes.

## III.—WIRELESS TIME SIGNALS.

## Australia.

Station.	Call Sign.	Wave-length (metres).	G.M.T.	System.
<b>Perth</b> Lat. 32° 01' 51" S. Long. 115° 49' 31" E.	VIP	600 (I.C.W.).	0057-0100 1257-1300	(See Time Signal Figure, p. 138, Vol. VIII, No. 90). Controlled by Perth Observatory. (See Fig. as above). Transmitted automatically by the standard clock of the Adelaide Observatory.
<b>Adelaide</b> Lat. 34° 51' 14" S. Long. 138° 31' 55" E.	VIA	600 (I.C.W.).	0027-0030 1227-1230	

**Melbourne W/T Station**, Latitude 37° 46' 56" S., Longitude 144° 52' 09" E., call sign, **VIM**, wavelength 600 metres (I.C.W.).



Wireless time signals are broadcast from Melbourne W/T Station in accordance with the New International System of W/T time signals at the following times:—

G.M.T.			
h.	m.	s.	h. m. s.
1	57	00	to 2 00 00
13	57	00	„ 14 00 00

The transmission of each series of signals is similar, the procedure being as follows:—

G.M.T.				Signal.	
h.	m.	s.	h. m. s.		
13	57	00	to 13 57 50	—	etc.
	57	55	„ 58 00	55 56 57 58 59 60	Time Signal.
	58	08	„ 58 10	—	
	58	18	„ 58 20	—	
	58	28	„ 58 30	—	
	58	38	„ 58 40	—	
	58	48	„ 58 50	—	
	58	55	„ 59 00	55 56 57 58 59 60	Time Signal.
	59	06	„ 59 10	—	
	59	16	„ 59 20	—	
	59	26	„ 59 30	—	
	59	36	„ 59 40	—	
	59	46	„ 59 50	—	
13	59	55	„ 14 00 00	55 56 57 58 59 60	Time Signal.

### New Zealand.

The Dominion Observatory, Wellington, Latitude 41° 17' 04" S., Longitude 174° 46' 04" E., call sign **ZLY**, broadcasts time signals daily, on 600 metres (I.C.W.) as follows:—

The transmitting key at the W/T station is automatically operated by the Standard Time Clock of the Dominion Observatory (Latitude 41° 17' 03.8" S., Longitude 174° 46' 00.0" E.).

The first time signal is at 23h. 00m. 00s., G.M.T., and is repeated at the 1st, 2nd, 4th and 5th minutes.

There is no time signal at 23h. 03m. 00s.

Each time signal commences exactly at the beginning of the minute and lasts for *three seconds*, approximately:—

G.M.T.				Signal.	
h. m. s.	h. m. s.				
22	58	00	to 22 58 55	—	ZLY (every 15 seconds, the dash being of two seconds duration).
22	59	10	to 22 59 50	—	etc.
23	00	00	to 23 00 03	—	Time signal.
23	00	12	to 23 00 50	—	etc.
23	01	00	to 23 01 03	—	Time signal.
23	01	13	to 23 01 50	—	etc.
23	02	00	to 23 02 03	—	Time signal.
23	02	14	to 23 03 50	—	etc.
23	04	00	to 23 04 03	—	Time signal.
23	04	09	to 23 04 50	—	etc.
23	05	00	to 23 05 03	—	Time signal.

AR ZLY VA.

In addition to the above, the undermentioned time signals are broadcast on Tuesdays and Fridays, except on New Zealand Government holidays, by the Dominion Observatory, Wellington.

The conditions governing the transmission are similar to those given above.

The first time signal is at 9h. 00m. 00s. (G.M.T.), and is repeated at the 1st, 2nd, 4th and 5th minutes.

There is no time signal at 9h. 03m. 00s. Each signal commences exactly at the beginning of the minute, and lasts for *three seconds*, approximately.

The signals are transmitted in the following manner:—

G.M.T.				Signal.	
h. m. s.	h. m. s.				
8	58	00	to 8 58 55	—	ZLY (every 15 seconds, the dash being of two seconds duration).
8	59	10	to 8 59 50	—	etc.
9	00	00	to 9 00 03	—	Time signal.
9	00	12	to 9 00 50	—	etc.
9	01	00	to 9 01 03	—	Time signal.
9	01	13	to 9 01 50	—	etc.
9	02	00	to 9 02 03	—	Time signal.
9	02	14	to 9 03 50	—	etc.
9	04	00	to 9 04 03	—	Time signal.
9	04	09	to 9 04 50	—	etc.
9	05	00	to 9 05 03	—	Time signal.

AR ZLY VA.

NOTE.—(1) Other signals which are transmitted by hand in addition to the automatic time signals must *not* be used as time signals.

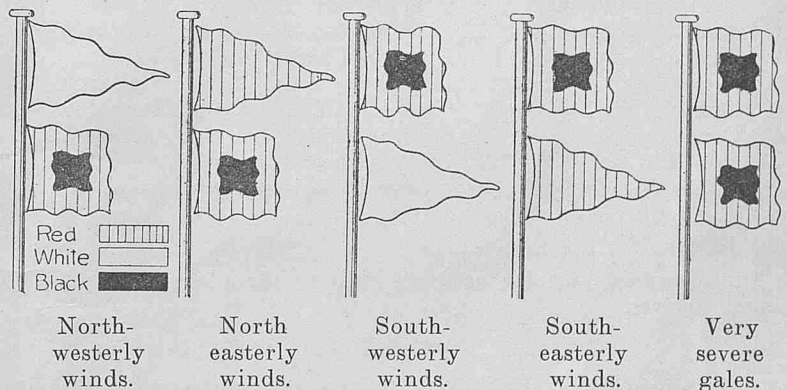
(2) The signals are relayed by **Wellington W/T Station (VLW)**.

(3) All hand Key signals, except in the 58th minute, terminate on the 50th second, to enable the observer to take the signal accurately.

## IV.—VISUAL STORM WARNINGS.

### Australia.

Wind warnings displayed in the Australian capitals.



### New South Wales.

The existence of gales which are likely to endanger shipping will be signalled at the principal lighthouses and signal stations on the coast of New South Wales in the following manner, viz.:—

Day Signals.		Day Signals.	
Signal.	Meaning.	Signal.	Meaning.
▲	Indicates that a gale is expected, or is probable from S.W.	▲	Indicates that a gale is expected, or is probable from N.W.
▲	Indicates that a gale is expected, or is probable from S.E.	▲	Indicates that a gale is expected, or is probable from N.E.
●	"Atmospheric disturbance, be alert and look out for further information."		

One flag displayed with any of the above signals indicates that the wind may be expected to *veer* during the gale.

Two flags displayed with any of the above signals indicate that the wind may be expected to *back* during the gale.

## Night Signals.

Signal.	Meaning.
Two <i>white</i> lights vertical ...	Gale probable from S.W'd.
Two <i>red</i> lights vertical ...	Gale probable from N.W'd.
A <i>white</i> light over a <i>red</i> light ...	Gale probable from S.E'd
A <i>red</i> light over a <i>white</i> light ...	Gale probable from N.E'd.
One <i>red</i> light ...	Indicates the probability of a gale of which the direction of approach is not indicated.

**Numerical Pennants.**—The following pennants are used at the signal stations of New South Wales to indicate the numbers representing the place where a gale is blowing:—

1. Red.
  2. Yellow and blue, horizontal, 2 divisions.
  3. Blue, yellow, red, vertical.
  4. Red and white, in opposite corners.
  5. White, with 5 blue crosses.
  6. Blue and yellow, 6 horizontal stripes.
  7. Blue, with 7 white crosses.
  8. Blue and white, 8 triangles.
  9. Red and white, 10 vertical stripes.
  0. Blue, white ball in centre.
- Substitute, White.

## Numbers representing Ports:

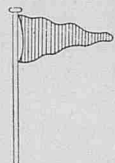
10. Torres strait.	50. Portland bay.	80. Keppel bay.
11. Cleveland bay.	51. South Australia.	81. Port Denison.
37. Wilson promontory.	52. King George sound.	82. Wollongong.
40. Sydney.	53. Western Australia.	83. Wide bay.
41. Moreton bay.	54. Launceston.	84. Port Curtis.
42. Clarence river.	55. Hobart.	88. Port Fairy or
43. Port Macquarie.	56. Gulf of Carpentaria.	Warrnambool.
44. Port Stephens.	61. Shoalhaven.	97. Hawke bay.
45. Newcastle.	68. Richmond river.	98. Kiama.
46. Jervis bay.	70. Macleay river.	99. Wallaroo.
47. Twofold bay.	72. Gabo island.	01. PortMackay.
48. Corner inlet.	75. Manning river.	02. Queensland.
49. Port Phillip.	76. Circular head.	

**NOTE.**—Other numbers signify ports outside the eastern colonies from which a vessel arrives; they are not inserted as they would not be used for storm signals.

These signals are also used to indicate the place from which a vessel arrives.

## Queensland.

A red pennant is hoisted at the various ports and lighthouse signal stations on receipt of a storm-warning.



Red Pennant.

Indicates that a weather report concerning a tropical disturbance or a storm warning is available. (See below.)

Information may be obtained from the postmaster or harbour officials. Storm warnings when made to vessels on demand will consist of the flag signals as displayed at Australian capitals explained above.

## New Zealand.

Storm signals are exhibited from the following Lighthouses: Cape Maria Van Diemen, Tiri Tiri Matangi, Cape Campbell, Farewell Spit, Nugget Point, and Stephens Island. They are not to be considered as covering a distance greater than 200 miles from the place at which they are hoisted, those hoisted with the red pennant below as covering only a distance of 50 miles from the place at which they are hoisted.

## Symbols used and their Meanings.



Northerly gales.

Hoisted when strong winds or gales are probable from N., that is, from about N.E., changing through north towards west.

**NOTE.**—This change of wind is usually followed by strong winds or gales from the southward.



Westerly gales.

Hoisted when strong winds or gales are probable from W., that is from about N., changing through W. towards S.W.

**NOTE.**—After these gales have moderated the wind generally shifts to N.W. or to N.



Easterly gales.

Hoisted when strong winds or gales are probable from E., that is, from about N., changing towards E. and S.E.

**NOTE.**—This change of wind denotes a "black North-Easter" and an approaching cyclone



South-easterly gales.

Hoisted when strong winds or gales are probable from E., changing, through S., towards S.W.



Southerly gales.

Hoisted when strong winds or gales are probable from about W., changing, through S., towards S.E.



Unusual gales.

Hoisted when strong winds or gales are probable from about S., changing, through E., towards N.

**MODERATE WEATHER** is indicated by the International code signals, but only in reply to inquiry and if meteorological conditions admit.

**NOTE.**—(1) A *red* pennant hoisted below any of the above signals made between the hours of 8 a.m. and noon indicates that the signal refers to the previous day.

(2) Signals hoisted without the *red* pennant refer to the day on which they are hoisted.

(3) The red pennant when hoisted alone, indicates that the forecast for the day has not been received at the station from the Meteorological Office, Wellington.

(4) Whenever the wind at any of the signal stations has changed in such manner that the forecast for the previous day will not apply no signal is displayed until the forecast for the day has been received at the station.

(5) When it is observed that the storm signals are not being shown at a storm signal station, the Dominion meteorological forecast for the same day may be obtained by hoisting the signal ZK.

## South Pacific Ocean Islands.

## Fiji Islands.

During the hurricane season (from November 1st to April 30th) storm signals as defined below will be exhibited at the signal station, Suva, and at the Government Wharf, to denote that a dangerous depression in the atmospheric pressure appears to be approaching the group. The signals will be displayed until conditions improve.

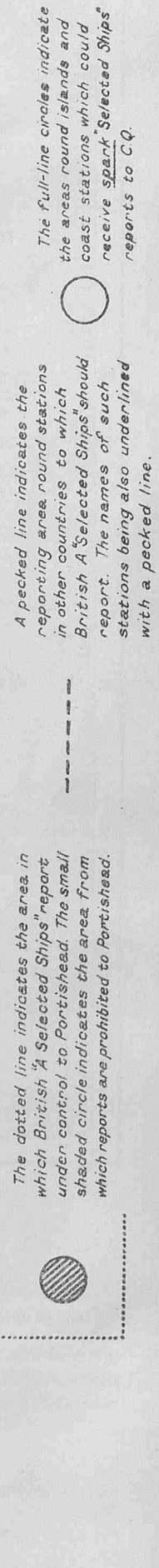
Between sunrise and sunset: Two *black* circles disposed vertically.

Between sunset and sunrise: Two *red* lights disposed vertically.

At the Wharf, Suva, attention will be drawn to the first exhibition of the signals by a detonator being fired twice, with an interval of one minute.

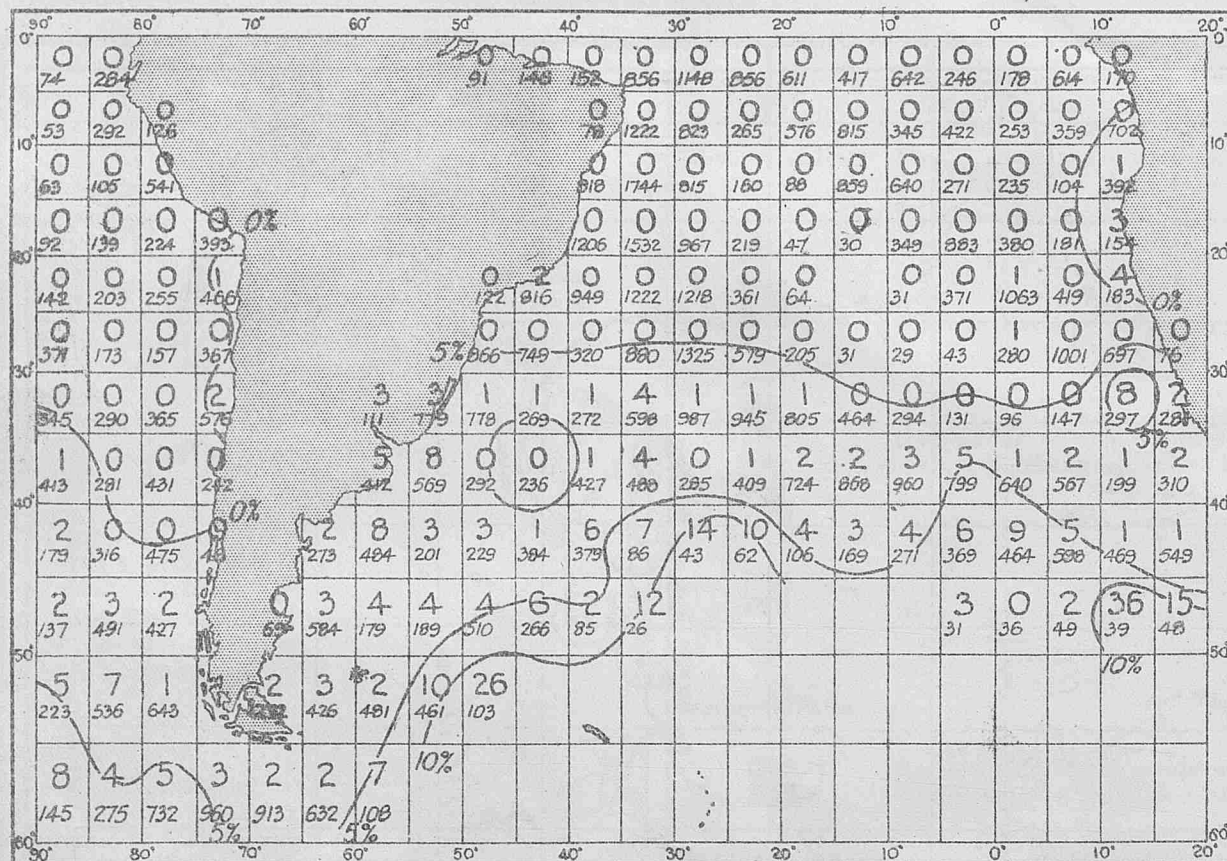
Weather reports are posted up outside the Harbour Master's office during the hurricane season.





OCTOBER,

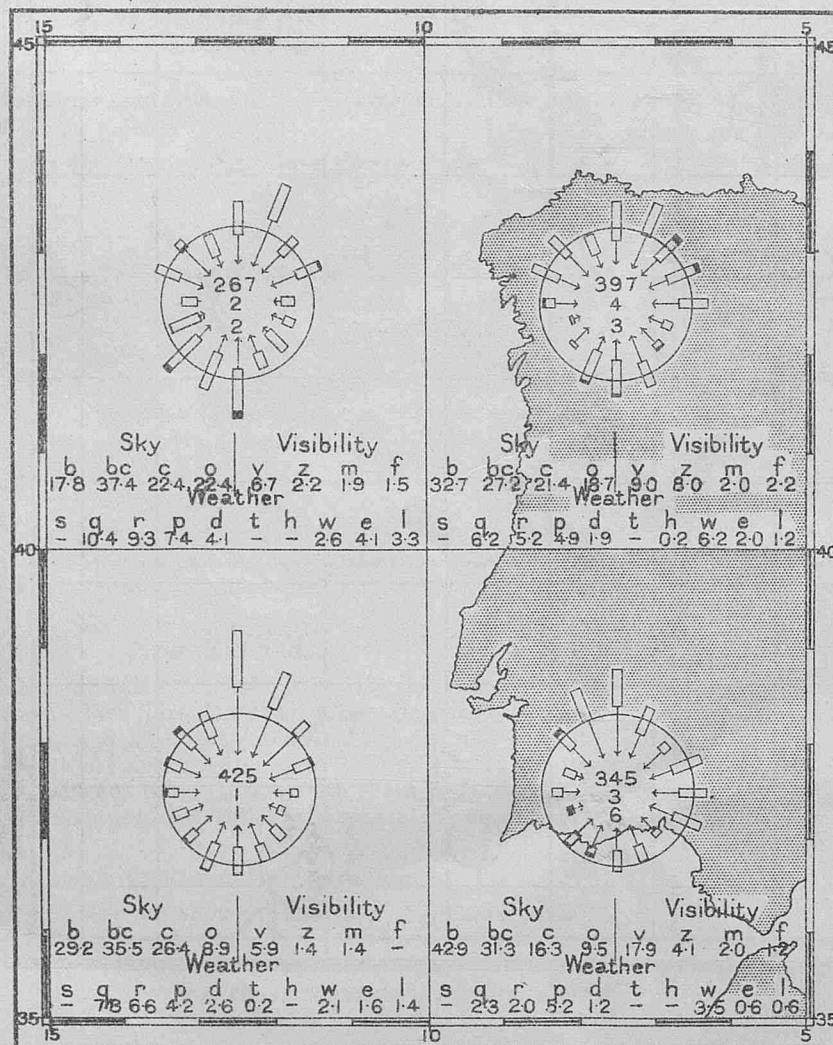
FOG IN THE SOUTH ATLANTIC AND VICINITY OF WEST COAST OF SOUTH AMERICA, PERCENTAGE FREQUENCY.



The upper figures in the 5° squares give the percentage frequency of occasions upon which Fog was logged, the lower figures the total number of observations. Lines are drawn for 0, 5, 10 and 20%. The chart is compiled from observations from British Ships for the period 1855 to 1899.

OCTOBER,

WIND, FOG, MIST AND WEATHER FOR THE REGION OFF THE COAST OF PORTUGAL.



## EXPLANATION.

The Wind roses are drawn from Sea observations within the 5° squares.

Arrows fly with the wind, length represents frequency, thickness strength.

Gales. Moderate. Light.  
8-12 4-7 1-3

Distance from head of arrow to circle represents 5%.  
Scale: 10 20%

The upper figure in the centre of the rose gives total number of observations, the middle figure the percentage frequency of calms and the lower figure the percentage frequency of variable winds.

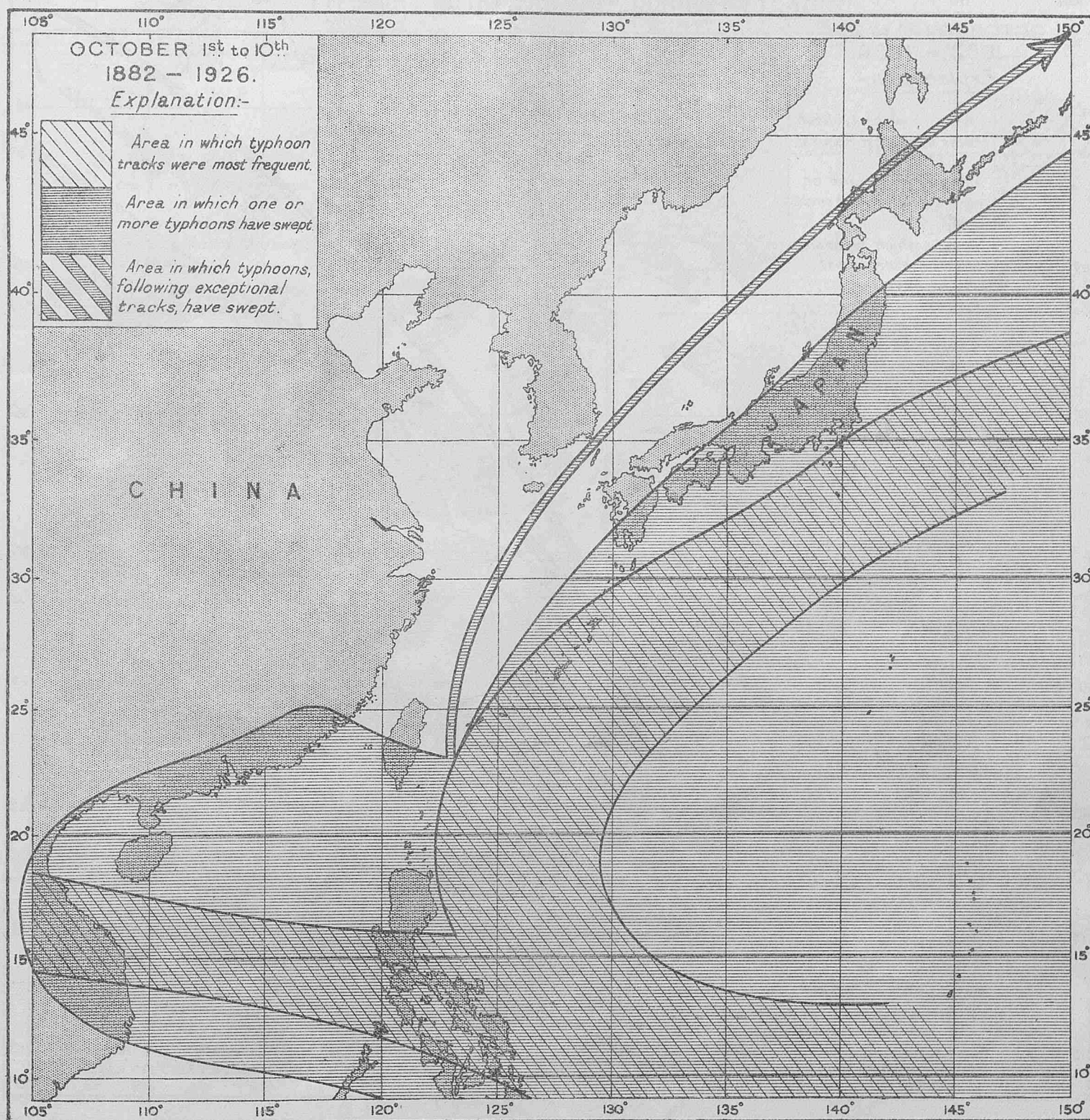
The percentage frequency of types of weather are shown in the lower half of each 5° square by the figures beneath each of the letters of the Beaufort weather notation.

For example, in the 5° square Latitude 35° to 40°N Longitude 5° to 10°W. b was logged 43 times in every 100 observations while m was logged 2 times.

Compiled from observations of British Ships received since the adoption of the Hollerith system of extraction, covering the years 1921-1928.



## TYPHOONS IN THE FAR EAST DURING 45 YEARS.



OCTOBER — Three charts: Total observations of Typhoons for month - 116.

Chart I — October 1<sup>st</sup> to 10<sup>th</sup>

The Coast of China continues to be free from Amoy upwards, also the North of Formosa, the Yellow Sea, the western portion of the East China Sea and all the Sea of Japan. To the South only the coast of Cochin China is safe.

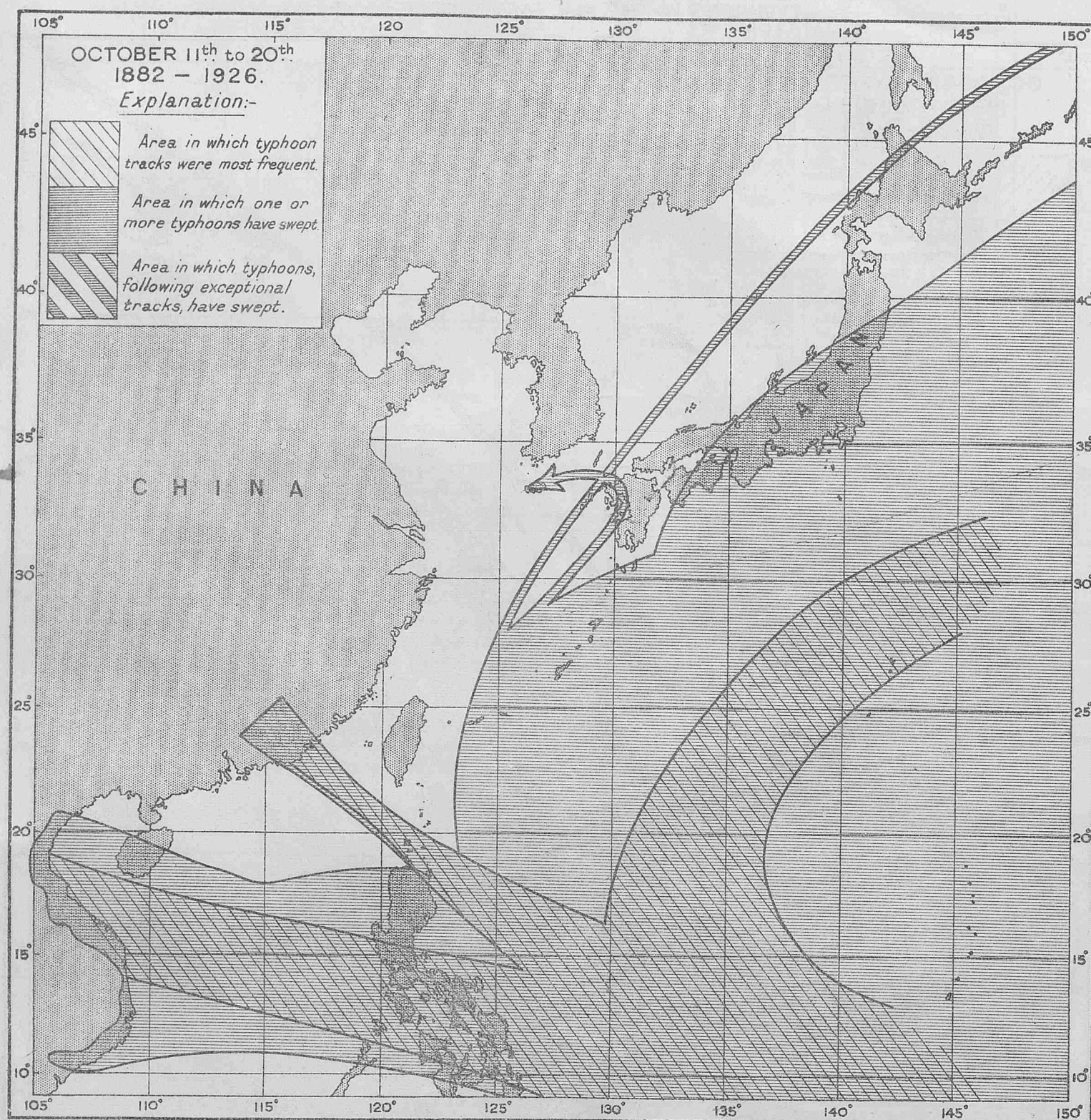
Two tracks. The Northern track has turned entirely Eastwards between Honshiu and Bonin Islands just skirting the neighbourhood of Tokio. Point of inflection over the Riu Kiu islands towards N.E. & E.N.E. The Southern route crosses the Vizayas (Calamianes) islands and the South of Luzon, the centre of the South China Sea and touches the coast of Annam travelling inland.

Starting point: South of Guam and round Yap to a point E. of Mindanao in low latitudes.

(From "Atlas of the Typhoons of the China Seas 1882 to 1926" by the Rev. P.E. Gherzi S.J., Director Zi-ka-wei Observatory near Shanghai China)  
(Published by The Hydrographic Institute of the Royal Marine Genoa.)



## TYPHOONS IN THE FAR EAST DURING 45 YEARS.



OCTOBER — Three charts: Total observations of Typhoons for month - 116.

Chart II - October 11<sup>th</sup> to 20<sup>th</sup>

The entire coast of China is now immune except for a small portion round Swatow. The Sea of Japan, the Yellow and East China Seas are clear, so is Kiushiu except in the two instances marked on the map. In the South only the southernmost portion of the Sea of China would appear safe.

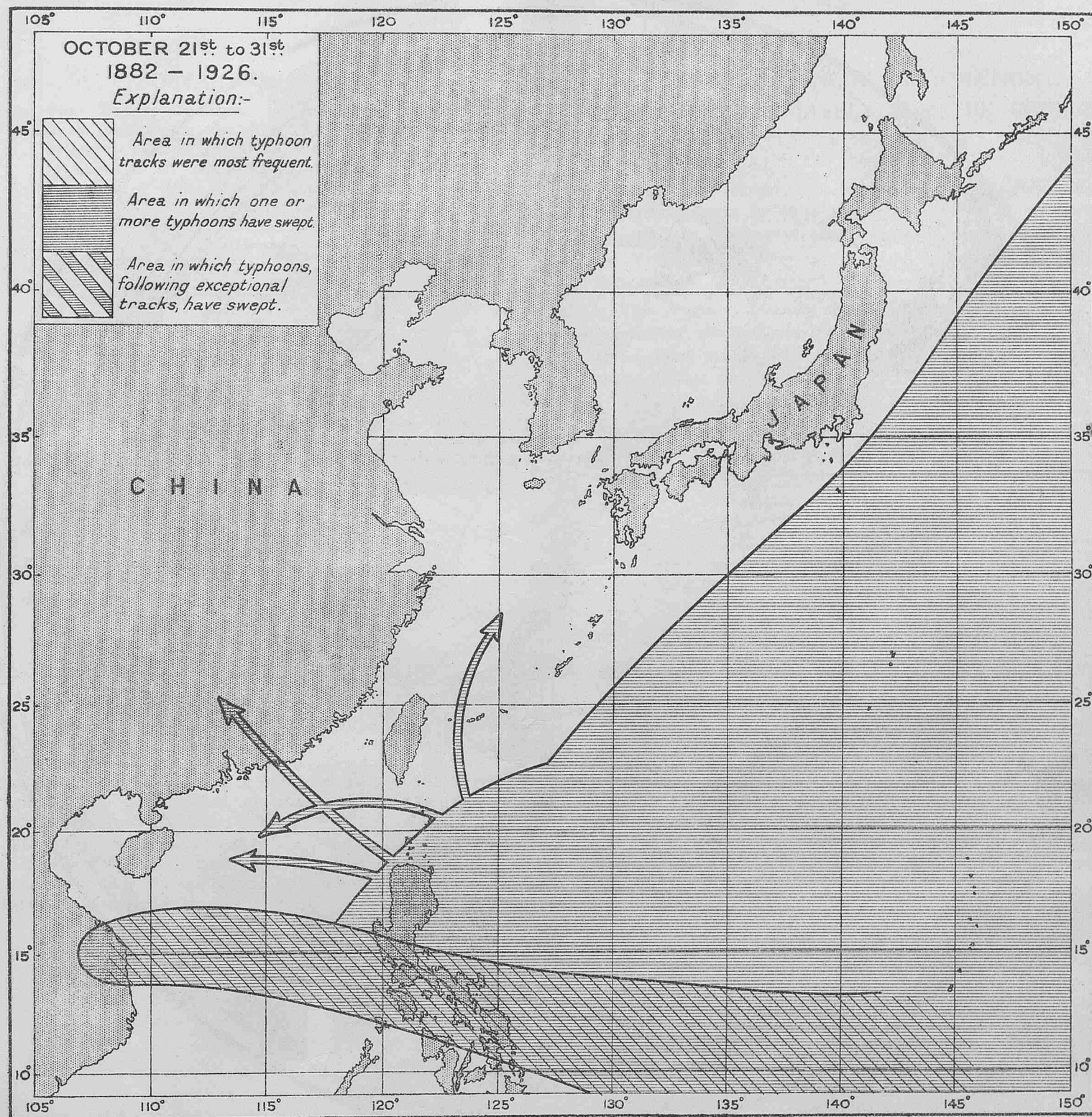
Three tracks. The northern tracks with point of inflection at Long. 130°-135°E., have completely shifted. The central route is rather curious, it narrows down passing over the Balintang Channel and finishes round Swatow. The more important southern track has widened and covers the South of Luzon and all the Vizayas (Calamianes) islands; it continues over all the middle of the South China Sea and ends on the Coast of Annam. China is under the influence of continental high pressure areas which drive off to N.E. all typhoons reaching the latitude of Formosa.

Starting point: South of Guam & Yap and increasingly lower latitudes down to the vicinity of Eastern Mindanao.

(From "Atlas of the Typhoons of the China Seas 1882 to 1926," by the Rev. P.E. Gherzi S.J., Director Zi-ka-wei Observatory, near Shanghai China)  
Published by The Hydrographic Institute of the Royal Marine Genoa.



## TYPHOONS IN THE FAR EAST DURING 45 YEARS.



OCTOBER — Three charts: *Total observations of Typhoons for month - 116.*

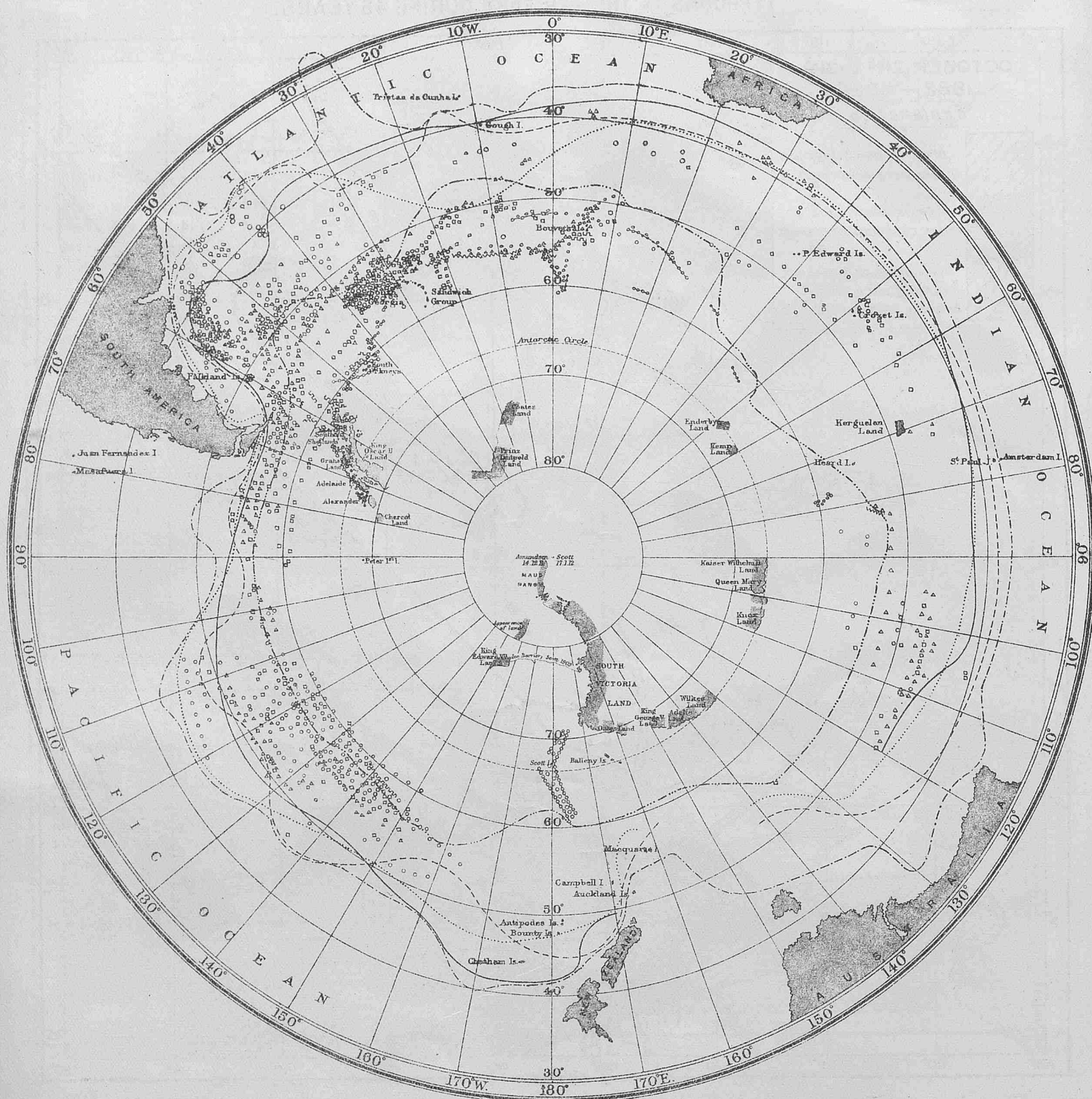
Chart III — October 21<sup>st</sup> to 31<sup>st</sup>

*All the coast and adjacent seas North of parallel 180°N. can now be pronounced clear, as well as all the Japanese islands, also the Gulf of Tonking and island of Hainan.*

*Only one track with a fairly high frequency which crosses the South of Luzon and the Vizayas (Calamianes) Islands passes over the Macclesfield bank and Paracel Island and touches the Annam coast on both sides of Tourane.*

*Starting point: round Yap and at low latitudes of Pelew and Eastern Mindanao.*

*(From "Atlas of the Typhoons of the China Seas 1882 to 1926", by the Rev. P.E. Gherzi S.J., Director Zi-ka-wei Observatory near Shanghai China.)  
(Published by The Hydrographic Institute of the Royal Marine Genoa.)*



## ICE CHART OF THE SOUTHERN HEMISPHERE, 1902—1930. OCTOBER, NOVEMBER, AND DECEMBER.

### EXPLANATION.

The symbols used to distinguish the records of each of the three months represented during the period 1902—1930, are as follows:—October bergs  $\Delta$ , pack ice  $\sim$ ; November bergs  $\square$ , pack ice  $\text{|||||}$ ; December bergs  $\circ$ ; pack ice  $\text{---}$ . Extreme limits are given thus:—October  $\text{---}$ ; November  $\text{---}$ ; December  $\text{---}$ ; these include ice reported since 1772.

Extreme limit (whole year)  $\text{---}$  Limit of pack ice  $\text{---}$

A list of Southern Ice Reports during the years 1917—1928 for the month of October will be found on p.213 of this Number.

Similar lists for the months of November and December will be published in the appropriate issues, Numbers 95 and 96 of this Volume.



## POSTAL ARRANGEMENTS.

THE MARINE OBSERVER is published, when circumstances permit, on the first Wednesday of the month previous to that to which the number refers.

If captains of observing ships will forward to the Meteorological Office the particulars required hereunder, endeavour will be made as far as mails permit to post the latest number for use on their homeward passage.

S.S..... Captain.....

Port of Call.....

Date of Homeward Departure.....

Postal Address.....

When this information is not given THE MARINE OBSERVER is addressed to the Commanding Officer, s.s. ...., c/o the owners, and captains are requested to make their own arrangements for forwarding.

## DESPATCH OF INFORMATION

### REQUIRED IMMEDIATELY FOR THE CONDUCT OF THE WORK AT SEA.

Shipowners, Marine Superintendents and all concerned in the despatch of mails to Ships abroad are asked to kindly facilitate the despatch and delivery of postal matter received at their offices from the Meteorological Office and Air Ministry Publication Depot to their Ships abroad.

This matter addressed to the Commanders of Ships contains information which is required for the Conduct of Marine Meteorological Work at Sea and is most effective if received by the Commanders at the earliest possible date.

Much of the information referred to is published in the Marine Observer and is of a seasonal nature. This journal also contains advice to Regular Observing Ships which enables them to perform voluntary service by Wireless Communication for the benefit of all shipping.

## REQUESTS FOR REPLACEMENTS OF INSTRUMENTS. ETC.

The attention of Marine Observers is invited to the list of Nautical Officers and Agents of the Marine Division, overleaf.

Correspondence, delay and inconvenience may be saved if the Commanders and Officers of observing ships will kindly make their requests for replacements of instruments, logs, etc., to the appropriate Agency.

The Agents have the necessary gear, information and instruction to supply the needs of regular observing ships and to give advice upon questions of Marine Meteorology to any officers of the Merchant Navy who may desire it.

## ILLUSTRATIONS FOR THE MARINE OBSERVER.

When making sketches, charts or plans, Marine Observers will give us great assistance if they will give consideration to reproduction in THE MARINE OBSERVER.

The size of any chart or drawing should not, if possible, exceed that of a page of THE MARINE OBSERVER, and if charts and drawings of all kinds are made with Indian Ink upon white drawing paper their reproduction will be greatly facilitated.

When photographs are sent in it would give us great assistance if they are accompanied by the plate or film, which will be returned if desired.

## GREAT BRITAIN.

### Wireless Telephony (R/T) Issues.

### "Weather Shipping" Bulletin.

### Temporary Arrangement.

During the Promenade Concert Season Aug. 10th to Oct. 3rd, inclusive, it has been found necessary to change the time of broadcasting the parts of the "Weather Shipping" Bulletin broadcast through Daventry, from 2015 G.M.T. to 2055 G.M.T. Sunday remaining 2000 G.M.T.



# ICE CHART.

## WESTERN NORTH ATLANTIC.

LETTERS OF TRANSATLANTIC TRACKS INDICATE.

NOTE.—In case of necessity owing to extreme southerly drift of ice, operative dates will be fixed for Track A.

- (C) From 1st July to 10th April, inclusive.
- (F) From 16th May to Opening of Belle Isle route and to 30th November when not using the Belle Isle route.
- (G) From 16th May to Opening of Belle Isle route and to 30th November when not using the Belle Isle route.
- (F) Westbound, on approaching Cape Race steer a course to pass 10 miles S. of Cape Race.
- (G) Eastbound, steer from position 25 miles S. of Cape Race.
- (G) From the opening of the Straits of Belle Isle to 14th November.

These routes are liable to alteration when, owing to abnormal ice conditions, it is considered advisable by the steamship lines who are parties to the Track agreement.

### ROUTE NOTICES.

For latest information re Tracks see pages 87-88 of Vol. VIII, No. 88, April, 1931, Number, and Notice of Changes on the Ice Chart in May, 1931 number.

### SYMBOLS USED ON THE CHART

- Iceberg.
- Floeberg.
- Growler.
- Field Ice, Floe Ice, Pack Ice.
- Hummocky Ice, Bay Ice.
- Drift Ice, Brash Ice, Sludge Ice.
- Pancake Ice.
- Indicates W/T Ice Warning Station.

### PHENOMENAL POSITIONS OF ICE.

Date.	Ship or Source of Report.	Position.	Remarks.
Oct. 15, 1883	S.S. Elenora ...	37°00' N. 18°00' W.	Piece ice.
" 8, 1912	S.S. Putney Bridge...	35°15' N. 44°50' W.	Small berg 35 ft. long, 6 ft. high.
" 27, 1916	S.S. Montreal ...	51°17' N. 41°17' W.	Small berg.
" 2, 1918	U.S. Hyd. Bulletin	50°10' N. 40°50' W.	Large berg.
" 19, 1920	Do.	45°22' N. 40°09' W.	Berg.
" 17, 1921	S.S. Mt. Vernon ...	48°23' N. 42°10' W.	Berg.
" 6, 1922	S.S. Christian Krogh	50°43' N. 40°42' W.	Berg about 70 ft. high, 400 ft. long.
" 7, 1923	S.S. Eastern Dawn...	40°46' N. 65°54' W.	Large growler about 100 ft. square.
" 23, 1927	Trawler, Grecian Empire.	30 mls. E.S.E. of Outer Skerries, Shetland Is.	Piece of ice 100 ft. long, 6 ft. above water.

Reports of Ice sighted between August 1st and August 31st, 1931, which have been received by the Meteorological Office, are shown by the Symbols plotted in the position reported, the figures indicating the day of the month.

### ICE IN GREENLAND WATERS.

SUMMARY OF INFORMATION FROM CABLEGRAM RECEIVED FROM DANISH METEOROLOGICAL INSTITUTE, COPENHAGEN.

August 21....."Off Nunarssuit—No 'Storis' Northern edge of ice cannot be stated."



## CO-OPERATION OF SHIPOWNERS, MASTERS AND MATES.

Captains and officers who wish to co-operate regularly with the Meteorological Office should apply to the appropriate Port Meteorological Officers or Agents, a list of these gentlemen with addresses is given below. A general description of Marine Meteorological Work, including the particulars desired from intending Marine Observers, is given in Chapter I of THE MARINE OBSERVER'S HANDBOOK, 5TH EDITION, which may be obtained from H.M. Stationery Office direct, or through any booksellers, price 2s. 6d.

The names of vessels regularly observing for the Meteorological Office, London, together with their Commanders and Observing Officers, are given monthly in THE MARINE OBSERVER, which may be obtained from H.M. Stationery Office, price 2s., 2s. 2d. post free.

The Captains and Officers of regular observing ships constitute the Corps of Voluntary Marine Observers. For certain branches of this work tested instruments are lent to the Captains of British ships registered at ports in Great Britain. A certain number of Regular Observing ships are detailed as "Selected Ships" for the purpose of the World Wide Scheme of Routine Ships' Wireless Weather Telegraphy Reporting. These "Selected Ships" are indicated monthly in the "Fleet List" in THE MARINE OBSERVER by a number.

To decode "Selected Ships" reports the pamphlet M.O. 329, price 3d. may be obtained from H.M. Stationery Office.

Only ships registered at Ports in Great Britain will, in future, be included in the Meteorological Office, London, "Fleet List."

Marine Observers are asked to send in their Meteorological Log through the appropriate Port Meteorological Officer or Agent (accompanied by Form 138 in the case of "Selected Ships") at intervals of not more than six months. The Meteorological Record Form 911 (accompanied by Form 138 in the case of "Selected Ships") should be posted direct to the Meteorological Office, London, at the end of each voyage.

When sending in the Meteorological Log or Record, Regular Observing ships will render great assistance if they will notify the Port Meteorological Officer or Agent of their requirements.

The Port Meteorological Officers and Agents inspect official instruments at regular intervals, replacing those which are defective.

Where ships' instruments are found by comparison to be reliable they may be used for the work of "Selected Ships." A reliable mercurial barometer is essential as part of the equipment of a "Selected Ship."

A copy of THE MARINE OBSERVER is sent monthly to the Captain of every observing ship for the information and guidance of the officers doing this work. He is also supplied with THE MARINE OBSERVER'S HANDBOOK and such charts and atlases as are considered necessary as Meteorological equipment for The Work of a Regular Observing ship in a particular trade.

WIRELESS AND WEATHER AN AID TO NAVIGATION, published by H.M. Stationery Office, which affords information and guidance for the practical application of Marine Meteorology to Navigation, may be purchased through any bookseller, price 5s.

Returns made by Regular Observing ships are acknowledged monthly in THE MARINE OBSERVER, and a list of those Commanders and Officers who have performed specially fine work is published yearly in THE MARINE OBSERVER and Excellent Awards are made to them.

The work done by Regular Observing Ships in making written returns, and by "Selected Ships" in broadcasting routine information by W/T, together with "Weather Shipping" Bulletins broadcast from the shore, conforming with the recommendations of the International Convention of Safety of Life at Sea, 1929, provide the necessary information for the use of all shipping. Thus by shipowners encouraging the specialist work in those of their ships whose names appear in THE MARINE OBSERVER, this Voluntary Work under the supervision of the Meteorological Office provides a service to all shipping at minimum cost to the National funds.

Shipowners are asked to facilitate the forwarding of postal matter from the Air Ministry addressed to the Captains of their ships.

## DERELICTS AND FLOATING WRECKAGE.

Date.	Position.		Description.
	Latitude.	Longitude.	
<b>NORTH SEA.</b>			
13.8.31	51°53'N.	3°07'E.	DR mooring buoy adrift—danger to navigation.
14.8.31	53°12'N.	0°49'E.	Large trunk of tree, dangerous to navigation.
<b>ENGLISH CHANNEL.</b>			
4.8.31	49°38'N.	2°54'W.	Drifting new French mud barge marked D2 on bow PC Boulogne-Sur-Mer on stern; on bow was hanging a steel wire. The vessel was empty and supposed in a good state.
5.8.31	49°24'N.	3°35'W.	Steel lighter adrift. Extreme danger to navigation.
11.8.31	48°52'N.	4°35'W.	Thick spar floating about 10 ft. above water, apparently attached to submerged wreckage.
18.8.31	49°06'N.	4°06'W.	Pointed wreckage (? mast) projecting—dangerous to navigation.
20.8.31	49°50'N.	1°19'W.	Wooden lighter—dangerous to navigation.
20.8.31	49°05'N.	4°13'W.	Barrel buoy with diamond shaped grill topmark.
<b>BAY OF BISCAY.</b>			
9.8.31	46°17'N.	8°28'W.	Large log heavily covered with marine growth, dangerous to navigation.
10°8'31	46°23'N.	6°52'W.	Large piece of wood about 30 ft. length and 10 ft. breadth; dangerous to navigation.
16.8.31	7 m S. 58° W. of La Jument, Ushant		White buoy marked No. 1 Brest, flashing light, surmounted with white flag.
18.8.31	7 m S. 45° W. of Penmarch.		Staff buoy adrift.
<b>NORTH ATLANTIC.</b>			
1.8.31	40°55'N.	71°46'W.	Derelict about 100 ft. long and showing 1 ft. out of water.
1.8.31	41°18'N.	67°41'W.	Red pillar type skeleton framework buoy about 15 ft. high and marked H. 2. with floats about 30 ft. long attached.
1.8.31	5m S.W. from Winter Quarter Shoal Light.		Raft of logs about 30 ft. long and 10 ft. wide.
2.8.31	42°14'N.	70°40'W.	Heavy spar floating vertically and projecting about 2 ft. out of water.
4.8.31	42°45'N.	10°31'W.	Large buoy awash, length about 60 feet. Dangerous to navigation.
5.8.31	35°07'N.	75°18'W.	Obstruction which carried one blade of propeller of s.s. City of Chattanooga away.
6.8.31	48°19'N.	5°31'W.	Pieces of timber 6 metres long, 1 metre wide, partly submerged. Dangerous to navigation.
7.8.31	49°31'N.	18°51'W.	Buoy with surmounting staff, danger to navigation.
8.8.31	38°48'N.	69°55'W.	Empty fisherman's dory half filled with water—no marks visible.
9.8.31	45°14'N.	19°20'W.	Large drifting buoy.
9.8.31	Near Gedney Channel, Gas & Whistle Buoy.		{ Three square timbers bolted together, about 25 ft. long and 12 ins. square.
13.8.31	48°30'N.	15°20'W.	Spherical buoy, topmark wooden staff with two cross pieces.
16.8.31	48°28'N.	14°09'W.	Large red spherical buoy with cross topmark, dangerous to navigation.
17.8.31	48°23'N.	12°55'W.	Drifting buoy, size 8 ft. by 4 ft., covered bottom side with heavy marine growth.
<b>CARIBBEAN SEA.</b>			
1.8.31	18°28'N.	86°06'W.	Large piece of wreckage about 25 ft. long and covered with marine growth.
6.8.31	17°02'N.	82°45'W.	Large tree trunk about 35 ft. long and 2½ ft. in diameter
<b>GULF OF MEXICO.</b>			
3.8.31	29°52'N.	86°50'W.	Large log about 60 ft. long awash.
<b>NORTH PACIFIC.</b>			
1.8.31	32°40'N.	124°35'W.	Log about 35 ft. long and 5 ft. in diameter.
2.8.31	40°40'N.	124°40'W.	Log about 30 ft. long and 3 ft. in diameter.
2.8.31	36°50'N.	122°43'W.	Log about 35 ft. long and 2½ ft. diameter.
1.8.31	52°24'N.	146°19'W.	Baulk of timber about 25 ft. long and 3 ft. square

## NAUTICAL OFFICERS AND AGENTS OF THE MARINE DIVISION OF THE METEOROLOGICAL OFFICE, AIR MINISTRY.

LONDON ...	Captain L. A. BROOKE SMITH, R.D., R.N.R., Marine Superintendent. Commander J. HENNESSY, R.D., R.N.R., Senior Nautical Assistant. Room 319, Adastral House, Kingsway, W.C.2. (Telephone No.: Holborn 3434 Extension 421). Nearest station Temple, District Railway.
THAMES ...	Lieut. C. H. WILLIAMS, R.N.R., Port Meteorological Officer, P.L.A. Building, King George V Dock (south side), London, E.16. (Telephone No.: Albert Docks 2659. Telegraphic Address: Barometric Aldock, London).
MERSEY ...	Commander M. CRESSWELL, R.N.R., Port Meteorological Officer, Dock Office, Liverpool. (Telephone No.: Bank 8959. Telegraphic Address: Meteorite, Liverpool).

## Agents.

BELFAST ...	Captain J. MCINTYRE, Harbour Master, Harbour Office. (Telephone No.: Belfast 4090).
BRISTOL CHANNEL	Captain T. JOHNSTON, Technical College, Cathays Park, Cardiff. (Telephone No.: Cardiff 6813).
CLYDE ...	Mr. ROBERT CLEARY, Master Mariner, The Clutha Stevedoring Co., Ltd., Princes Dock, Glasgow. (Telephone No.: 513 Ibrox).
FREMANTLE W. Australia.	Captain J. J. AIREY, Deputy Director of Navigation, Customs House. (Telephone No.: B 1391).

## Agents (contd.).

HONG KONG, China.	Lieut. Commander G.B.R. RUDYERD-HELPMAN R.N., Superintendent, Admiralty Chart and Chronometer Depot, H.M. Dockyard. (Telephone No.: 108 Dockyard).
HUMBER ...	Captain A. M. BROWN, Ellerman Wilson Line Office, Hull. (Telephone No.: Central 2180).
FORTH ...	Captains C. G. BONNER, V.C., D.S.C., and D. AITCHISON, Leith Salvage and Towage Co., Ltd., 2, Commercial Street, Leith.
SOUTHAMPTON	Mr. R. I. T. MCEWAN, Master Mariner, Gilchrist Navigation School, 5, Union Bank Chambers, 1, Bernard Street. (Telephone No. Southampton 4277).
SYDNEY, New South Wales.	Commander G. D. WILLIAMS, D.S.O., R.D., R.N.R., Deputy Director of Navigation. Captain C. LINDBERGH. Customs House. (Telephone No.: B 6421).
TYNE ...	Captain J. J. MCEWAN, Marine School, South Shields.
VANCOUVER, British Columbia.	Mr. T. S. H. SHEARMAN, 61, Leigh Spencer Build- ing, 553, Granville Street. (Telephone No.: Seymour 3309).



## LIST OF VOLUNTARY OBSERVING SHIPS

i

## FLEET LIST.

The following is a complete list of ships regularly contributing observations to the Meteorological Office.

The names of the Captains and Officers, as ascertained from logs and records received, are given with the date and description of last log, register or record received up to the time of going to press.

Marine Observers are requested to take this as complete and grateful acknowledgment for the work they have contributed, as it has been found necessary to reduce as far as possible the correspondence of the Marine Superintendent, which was largely composed of letters acknowledging logs and reports, in order that more time may be devoted to obtaining results from the data received.

Only in special cases will individual letters be sent.

Excellent awards will be made at the end of the financial year. The names of Commanders and Officers gaining these awards will be published in a special list in THE MARINE OBSERVER.

Ships not contributing logs or records within a reasonable period will automatically be removed from the list and the free issue of THE MARINE OBSERVER discontinued; it is, therefore, earnestly requested that changes of service, probable periods of lay up or transfer of Commanders may be notified whenever possible.

A waiting list is kept of the names of vessels whose Commanders have offered to regularly co-operate.

The number of voluntary observing ships is limited to a maximum total of 500.

Commanders are requested to point out any errors which may occur in the list.

## Explanation of Abbreviations.

Unless otherwise stated, vessels on the following list are s.s.—M.V. indicates Motor Vessel; S.T. = Steam Trawler.

M.L. = Equipped with tested Instruments lent by the Meteorological Office for keeping Meteorological Logs.

W.T. = Equipped wholly or partly with tested Instruments lent by the Meteorological Office for reporting in code by W/T in the International Selected Ship system.

No. = No Meteorological Office instrumental equipment on board.

M = Ship's barometer *mercurial*.

A = Ship's barometer *aneroid*.

C.C. = Equipped with tested Instruments lent by the Meteorological Office for making Cross Channel Telegraphic Reports to Weather, London.

To indicate the nature of the wireless apparatus of Selected Ships—

†† preceding ship's name indicates fitted for long range continuous wave transmission and reception.

\*† = Short range transmission and long range continuous wave reception.

\*\* = Short range transmission and reception.

The numbers preceding the names of ships are for identification purposes, when observations are re-transmitted in synoptic messages by wireless or cable, and are not intended for use at sea.

## Selected Ships.

Those ships in this list which have a number and symbols indicating W/T apparatus before their names are "Selected Ships" invited to make by W/T, reports of observations taken at arranged G.M. Times to "All Ships."

Name of Vessel	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Record Contributed. Received up to 14.8.31.	Date Received.
233 †† <i>Aba</i> , M.V. ...	Spence, T. ...	G. L. Donald, B. W. White ...	W.T.	Elder Dempster ...	Forms 911 & 138 18.6.31 to 19.7.31	24.7.31
121 †† <i>Abnisi</i> ...	Sola, F. ...	J. J. Smith, G. Baker, E. Jones	"	" " ...	" " 10.6.31 to 15.7.31	22.7.31
122 †† <i>Accra</i> , M.V. ...	Shooter, J. O. ...	R. B. Ellis ...	W.T.-M.	" " ...	" " 1.7.31 to 4.8.31	6.8.31
155 *† <i>Achilles</i> ...	Cosker, W. ...	C. Broad, J. Simpson, J. S. Stratford.	M.L.	A. Holt " ...	Form 915 28.3.31 to 4.8.31 ...	10.8.31
055 *† <i>Actor</i> ...	Whyte, D. L. ...	G. Penston, E. Pearce, P. Harrow.	No. M.	Harrison ...	Forms 911 & 138 26.2.31 to 1.5.31	21.5.31
123 †† <i>Adda</i> , M.V. ...	Lawson, J. H. ...	J. Boyd, T. A. Langton ...	W.T.-M.	Elder Dempster ...	" " 4.6.31 to 6.7.31	10.7.31
050 †† <i>Adriatic</i> ...	Binks, J. W., R.D., Lt.-Commr., R.N.R.	G. T. Kavanagh, R. S. Walker, O. V. Lucas.	W.T.	White Star ...	" " 29.6.31 to 5.7.31	23.7.31
090 *† <i>Aeneas</i> ...	Wallace, W. K. ...	A. McL. Pilcher ...	M.L.	A. Holt ...	Form 911 13.5.31 to 19.6.31 ...	20.6.31
166 *† <i>Agamemnon</i> ...	Beswick, W., D.S.C., Commr., R.N.R.	W. K. Hole, O. V. Jones ...	W.T.	" ...	" 21.6.31 to 5.7.31 ...	18.7.31
<i>Alaunia</i> ...	Prothero, M. ...	T. O. Ellis ...	No. A.	Cunard ...	" 16.11.30 to 6.12.30	8.12.30
<i>Alban</i> ...	Evans, L. ...	J. G. Tippet ...	M.L.	Booth ...	" 1.3.31 to 23.6.31 ...	6.7.31
<i>Albion Star</i> ...	Hall, J. B. ...	T. Gilchrist ...	No. M.	Blue Star ...	" ...	"
080 †† <i>Alicantara</i> , M.V. ...	Wakeman, E. C. ...	R. H. Pepper ...	W.T.	R.M.S.P. ...	Form 911 21.2.31 to 3.4.31 ...	14.4.31
178 *† <i>Alipore</i> ...	Lyndon, E. F. ...	J. P. McArthur ...	No. M.	P. & O. ...	" 11.6.31 to 11.7.31 ...	10.8.31
175 *† <i>Almanzora</i> ...	Hannam, F. S. ...	G. W. Martin ...	W.T.	R.M.S.P. ...	" 13.6.31 to 28.7.31 ...	30.7.31
012 †† <i>Almida Star</i> ...	Turner Russell, W. ...	E. K. Watkins, H. Metcalf, E. Russell.	No. M.	Blue Star ...	Forms 911 & 138 4.4.31 to 19.5.31	27.5.31
<i>Alondra</i> ...	Scott, L. S. ...	E. W. Thomas ...	" A.	Yeoward ...	Form 911 5.7.31 to 28.7.31	1.8.31
<i>Allynbank</i> ...	Robertson, J. ...	G. E. Beaton ...	" A.	A. Weir & Co. ...	" 11.6.31 to 2.7.31	13.8.31
103 †† <i>Andalucia Star</i> ...	Vernon, R. ...	W. Cumming, P. Clarke, H. Heggen.	" M.	Blue Star ...	Forms 911 & 138 28.4.31 to 9.6.31	13.6.31
<i>Antiloehus</i> ...	Dougall, W. T. ...	C. F. Lock ...	" A.	A. Holt ...	" 20.6.31 to 9.7.31	4.8.31
209 †† <i>Aorangi</i> , M.V. ...	Spring-Brown, J. F. ...	E. Anderson, D. H. Richards, J. Billingham.	M.L.	Canadian-Australasian	Form 915 14.1.31 to 22.5.31	4.8.31
120 †† <i>Apapa</i> , M.V. ...	Beith, A. ...	J. R. Sergiades, V. Feeney.	W.T.-M.	Elder Dempster ...	Forms 911 & 138 21.5.31 to 20.6.31	25.6.31
129 †† <i>Appam</i> ...	Draper, J. M. ...	W. M. M. Hutchings, C. V. Evans, H. O. Forster.	W.T.	" " ...	" " 13.5.31 to 19.6.31	22.6.31
<i>Araby</i> ...	Lee, J., D.S.C. ...	H. Haigh ...	No. A.	MacIver ...	Form 911 15.3.31 to 30.5.31	4.6.31
115 †† <i>Arandora Star</i> ...	Moulton, E. W. ...	C. O. Worth, T. Graham, H. F. Partridge.	" M.	Blue Star ...	Forms 911 & 138 12.7.31 to 31.7.31	4.8.31
278 *† <i>Architect</i> ...	Mowat, I. ...	G. Dewar ...	" M.	Harrison ...	Forms 911 & 138 20.4.31 to 19.6.31	28.6.31
293 *† <i>Ariguani</i> ...	Scudamore, J. H. H., D.S.C., R.D., Commr., R.N.R.	J. Hillman, " A. Crone, G. Binks.	M.L.	Elders & Fyffes ...	Form 915 28.12.30 to 28.4.30	1.5.31
<i>Ariosto</i> ...	Biggins, R. L. ...	N. F. Hewetson, R. W. Holdsworth.	No. A.	Ellerman Wilson ...	Form 911 25.2.31 to 30.5.31	9.6.31
144 †† <i>Arlanza</i> ...	Clarke, E., R.D., Commr., R.N.R.	S. A. Gammon, H. V. Todd, F. T. Brett.	W.T.	R.M.S.P. ...	Forms 911 & 138 9.5.31 to 23.6.31	24.6.31
091 †† <i>Armada Castle</i> ...	Whitfield, G. J. ...	W. Pace, C. Lloyd, A. H. Parry.	M.L.	Union Castle ...	Form 915 6.12.30 to 28.4.31	29.4.31
296 *† <i>Arracan</i> ...	Thomson, S. ...	K. Currie, G. Davidson, H. H. Brown.	"	P. Henderson ...	" 14.11.30 to 15.4.31	18.4.31
<i>Arundel</i> ...	Shaw, B. ...	E. Hill ...	C.C.	Southern Rly. ...	Telegraphic Report 1.7.31...	1.7.31
095 †† <i>Arundel Castle</i> ...	Morton Betts, W. ...	G. L. Clarke, " O Pitts, H. Baty.	M.L.	Union Castle ...	Form 915 10.1.31 to 3.5.31...	14.5.31
280 *† <i>Astronomer</i> ...	Richards, J. ...	W. P. Baker ...	No. M.	Harrison ...	Form 911 12.1.31 to 24.5.31	17.6.31



Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Record Contributed. Received up to 14.8.31.	Date Received.
065 †† <i>Asturias</i> M.V. ...	LeBrecht, H. A. ...	H. G. Whittle, S. J. Hill, T. W. Stevens	W.T.	R.M.S.P. Co. ...	Forms 911 & 138 24.5.31 to 2.7.31	6.7.31
281 †† <i>Atrous</i> ...	Wilcox, J. H. ...	E. A. H. Gepp ...	No. A.	A. Holt ...	Form 911 25.12.30 to 12.4.31	17.4.31
281 †† <i>Auditor</i> ...	Owen, W. T. ...	L. Richardson, A. H. Thompson	" M.	Harrison ...	Forms 911 & 138 15.12.30 to 24.6.31	16.7.31
212 †† <i>Ausonia</i> ...	Carr, L. R., R.D., Commr., R.N.R.	E. R. Taylor, P. G. Britten, A. G. Cuthill	" A.	Cunard ...	Form 911 8.7.31 to 10.7.31	15.7.31
212 †† <i>Australia</i> ...	Scutt, W. ...	H. Falkner, E. H. Lidstone, L. Smith	M.L.	British India ...	Form 915 28.3.31 to 28.7.31	4.8.31
010 †† <i>Avelona Star</i> ...	Thomas, R. J. ...	F. N. Johnson ...	No. M.	Blue Star ...	Forms 911 & 138 9.5.31 to 25.6.31	6.7.31
124 †† <i>Avila Star</i> ...	Hopper, G. E. ...	W. J. Stratta, C. Barratt, R. C. Freaker	" M.	" ...	" " 23.5.31 to 8.7.31	18.7.31
179 †† <i>Balranald</i> ...	Short, C. E. ...	J. A. Stewart ...	" M.	P. & O. Branch	Form 911 16.6.31 to 6.7.31	10.8.31
051 †† <i>Baltic</i> ...	Davies, E. ...	J. Law, N. E. Banks, S. Fieldwood	W.T.	White Star ...	Forms 911 & 138 6.7.31 to 25.7.31	28.7.31
248 †† <i>Banffshire</i> ...	Page, W. J. ...	A. Banks, N. Stewart	No. M.	Turnbull Martin	" " 12.3.31 to 17.4.31	30.4.31
180 †† <i>Baradine</i> ...	Elliot Smith, H. ...	C. B. Roche, L. A. Hill, C. F. Halliday	M.L.	P. & O. Branch	Form 915 10.4.31 to 17.7.31	21.7.31
037 †† <i>Baronesa</i> ...	Compton, R. W. ...	H. N. Sherwell, F. W. Kent, J. G. Freeman	No. M.	Houlder ...	Forms 911 & 138 4.5.31 to 26.6.31	1.7.31
213 †† <i>Baron Forbes</i> ...	Cairns, W. ...	J. Maclean ...	" A.	H. Hogarth & Sons...	Form 911 4.2.31 to 26.2.31	9.3.31
181 †† <i>Barpeta</i> ...	Partridge, H. ...	M. F. Harvey ...	" M.	British India ...	Forms 911 & 138 27.5.31 to 24.6.31	13.7.31
181 †† <i>Barrabool</i> ...	Sheepwash, J. S. ...	F. N. Mosey, G. Hussey, J. Jones	" M.	P. & O. Branch	" " 17.1.31 to 23.4.31	28.4.31
294 †† <i>Barranca</i> ...	Edwards, A. C. ...	L. J. Mott... ..	M.L.	Elders & Fyffes	Forms 911 & 138 8.7.31 to 9.8.31	12.8.31
070 †† <i>Bayano</i> ...	Harvey, A. E. ...	L. J. Mott... ..	W.T.	Hudson Bay Co	Form 911 8.7.30 to 29.9.30	6.11.30
059 †† <i>Baychimo</i> ...	Cornwell, S. A. ...	J. R. Loe, J. H. A. Mackie, W. A. Fletcher	No. A.	Red Star ...	Forms 911 & 138 14.6.31 to 3.7.31	7.7.31
183 †† <i>Bendigo</i> ...	Wyatt, F. N. ...	H. Morgan, R. S. Frost, G. C. Forrest, G. du Fosse	No. M.	P. & O. Branch	Forms 911 & 138 26.5.31 to 26.6.31	3.7.31
233 †† <i>Bengore Head</i> ...	Milligan J. ...	C. J. Rea ...	" A.	Ulster S.S. Co.	Form 911 22.7.31 to 27.7.31	29.7.31
233 †† <i>Berwickshire</i> ...	Evens, E. H. ...	J. O. Woodall, R. Frankish, C. Allister	W.T.	Turnbull Martin	Forms 911 & 138 23.4.31 to 20.6.31	22.6.31
057 †† <i>Bhutan</i> ...	Lawrie, J., D.S.O., D.S.C.	N. Ross ...	No. A.	Hain, S.S. Co	Form 911 18.6.31 to 28.6.31	5.8.31
057 †† <i>Brenda</i> ...	Wright, J. ...	J. W. Peters, B. Harrison, A. Thompson	" A.	Scottish Fishery Bnd.	" " 3.7.31 to 31.7.31	4.8.31
057 †† <i>Britannic</i> M.V. ...	Vaughan, P. R., D.S.C., R.D., Commr., R.N.R.	J. W. Peters, B. Harrison, A. Thompson	W.T.	White Star ...	Forms 911 & 138 19.7.31 to 8.8.31	11.8.31
269 †† <i>British Admiral</i> ...	Futt, R. O. ...	J. E. Jones ...	No. M.	British Tankers	Forms 911 & 138 29.5.31 to 9.8.31	11.8.31
283 †† <i>British Dominon</i> ...	Taylor, R. J. ...	T. Snowling ...	" M.	" "	" " 4.7.31 to 23.7.31	7.8.31
286 †† <i>British Lantern</i> ...	Penton, P. M. ...	G. P. Hansard ...	" M.	Anglo-Saxon	" " 2.7.30 to 10.9.30	22.9.30
040 †† <i>Bulysses</i> M.V. ...	Head, B. P. ...	P. McMillan, S. W. Brown, F. C. Doyle	M.L.	Petroleum Co. Turnbull Martin	Form 915 20.4.30 to 24.8.30	12.9.30
219 †† <i>Buteshire</i> ...	Gibb, A. W. P. ...	P. McMillan, S. W. Brown, F. C. Doyle	M.L.	Turnbull Martin	Form 915 20.4.30 to 24.8.30	12.9.30
031 †† <i>Caledonia</i> ...	Munro, D. ...	W. Harvey, J. MacWalters, D. Blair	W.T.	Anchor... ..	Forms 911 & 138 5.7.31 to 25.7.31	1.8.31
156 †† <i>Calgarie</i> ...	Jackson, W. ...	J. W. Paine ...	"	White Star ...	Form 911 2.2.31 to 10.3.31	12.3.31
139 †† <i>California</i> ...	Frank, F. A., D.S.O., R.D., Commr., R.N.R.	D. Morrison, A. C. Johnston, J. F. Adams	"	Anchor... ..	Forms 911 & 138 14.6.31 to 8.8.31...	12.8.31
026 †† <i>Cambria</i> ...	Smart, R. W. ...	O. W. Li Jones ...	C.O.	L.M. & S. Rly ...	Telegraphic Report 14.8.31	14.8.31
295 †† <i>Camito</i> ...	Copland, C. P. ...	T. Farrar... ..	No. A.	Federal ...	Forms 911 & 138 28.6.31 to 19.7.31	23.7.31
101 †† <i>Canonesa</i> ...	Gemmell, W. ...	R. Blake, G. Sinclair, L. McPhail	W.T.	Anchor ...	Form 915 20.2.31 to 13.6.31	17.6.31
282 †† <i>Cape of Good Hope</i> ...	Forrester, W. T., O.B.E.	H. H. Dunning, W. A. Calderhood, W. Ireland	M.L.	Elders & Fyffes	Forms 911 & 138 27.4.31 to 17.5.31	19.5.31
092 †† <i>Carnarvon Castle</i> M.V.	Brodie, W. H. ...	F. E. Flint, A. Hurry ...	No. M.	Furness Houlder	Form 911 4.5.31 to 28.5.31	24.6.31
273 †† <i>Carnarvonshire</i> ...	Jacobson, T. A. ...	J. Chapman, A. B. Fastig, G. S. Hutchinson	" A.	Lyle S.S. Co. ...	Forms 911 & 138 4.7.31 to 11.7.31	8.8.31
034 †† <i>Caronia</i> ...	Murchie, P. A., R.D., Capt., R.N.R.	Morton Betts, W. ...	W.T.	Cunard ...	" " 30.6.31 to 9.8.31	11.8.31
184 †† <i>Casanare</i> ...	Gulston, H. S. ...	S. W. Spencer ...	No. M.	Glen ...	" " 8.7.31 to 18.7.31	25.7.31
052 †† <i>Cathay</i> ...	Dolphin, G. R., R.D., Commr., R.N.R.	W. B. Tanner, R. D. McCallum, P. O. Davis	W.T.	Cunard ...	" " 20.6.31 to 27.6.31	1.7.31
157 †† <i>Centaur</i> M.V. ...	Browne, S. ...	A. M. Askin ...	No. A.	Elders & Fyffes	Form 911 11.2.31 to 13.3.31	23.3.31
056 †† <i>Ceramic</i> ...	Niven, J. D. ...	B. R. Coe ...	" M.	P. & O ...	Forms 911 & 138 16.5.31 to 26.6.31	29.6.31
052 †† <i>Cedric</i> ...	Riseley, A. D. ...	R. Hawkins, H. R. Wilkinson, A. E. Harvey	" A.	Elders & Fyffes	Form 911 2.6.31 to 6.7.31	8.7.31
157 †† <i>Centaur</i> M.V. ...	Freeman, C. P., R.D., Commr., R.N.R.	B. L. Brind, D. M. McAdam, D. R. Bannerman	W.T.	White Star ...	Forms 911 & 138 10.4.31 to 17.5.31	21.5.31
056 †† <i>Ceramic</i> ...	Ward Hughes, J. ...	R. H. Shaw, W. F. Denison ...	M.L.	Hadley Shipping	Form 915 14.3.31 to 17.6.31	25.6.31
034 †† <i>Caronia</i> ...	Lloyd, W. ...	E. Allen, C. L. Seaman, V. H. Kirkland	No. A.	Elders & Fyffes	Form 911 20.10.30 to 22.11.30	28.11.30
184 †† <i>Cathay</i> ...	Hammond, M. J. ...	H. K. Houghton ...	" A.	Henderson ...	" " 9.5.31 to 25.7.31	7.8.31
052 †† <i>Cedric</i> ...	Thorburn, R. A., R.D., Commr., R.N.R.	J. A. Wilson ...	" A.	Elders & Fyffes	" " 19.4.31 to 26.6.31	6.7.31
157 †† <i>Centaur</i> M.V. ...	Paterson, G. ...	S. Waddington, C. E. Gardiner	" M.	P. & O. ...	Forms 911 & 138 26.6.31 to 3.7.31	25.7.31
056 †† <i>Ceramic</i> ...	Cossentine, R. M. ...	T. D. Forbes, N. H. Thompson, S. H. Gerrans	W.T.	Ellerman ...	Form 915 28.2.31 to 19.4.31	12.8.31
192 †† <i>Chitral</i> ...	Siggers, O. ...	H. G. Williams, R. W. Leese, E. Bonfield	No. A.	" ...	Form 911 30.5.31 to 13.7.31	18.7.31
265 †† <i>City of Baroda</i> ...	Bremner, D. M. ...	H. H. Asher ...	" A.	" ...	Form 915 5.6.31 to 20.6.31	30.6.31
089 †† <i>City of Hereford</i> ...	Wilson, E. G. ...	F. Deighton, A. J. Tyrrell, E. Brook-Williams	M.L.	" ...	Forms 911 & 138 3.7.31 to 14.7.31	23.7.31
271 †† <i>City of Roubaix</i> ...	Mordue, J. A. ...	J. F. Lindell, F. Tibbetts ...	No. M.	" ...	" " 3.3.31 to 3.4.31	9.4.31
089 †† <i>City of Hereford</i> ...	MacMillan, J. ...	H. Saunders ...	" A.	" ...	" " 14.10.30 to 3.11.30	15.12.30
271 †† <i>City of Roubaix</i> ...	Ricketts, R. J. ...	J. A. Williams, J. L. Robertson, A. N. G. Jones	No. M.	" ...	" " 14.10.30 to 3.11.30	15.12.30

## LIST OF VOLUNTARY OBSERVING SHIPS

iii

Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Record Contributed. Received up to 14.8.31.	Date Received.
272 *† City of Singapore	Kendall, J. W. ...	F. Wrigley ... ..	No. M.	Ellerman ... ..	Forms 911 & 138 15.4.31 to 10.5.31	20.5.31
City of Sydney ...	Mason, E. ... ..	C. Humphries ... ..	" M.	" ... ..	Form 911 27.7.31 to 1.8.31...	13.8.31
City of Yokohama ...	Singleton, J. G. ...	J. Kinley, N. Dawson, H. Nish	" A.	" ... ..	" 20.10.30 to 20.11.30	25.1.30
Clan Alpine ...	Young, A. H., R.D., Commr., R.N.R.	K. A. Elkins ... ..	" A.	Clan ... ..	" 19.7.31 to 30.7.31	5.8.31
Clan Kenneth ...	Brown, R. H. ...	T. A. Pearson ... ..	" A.	" ... ..	" 4.4.31 to 4.7.31	22.7.31
Clan Macalister ...	Stenson, F. J., A.D.C., R.D., Capt., R.N.R.	T. M. Rees Davis ... ..	" A.	" ... ..	" 28.6.31 to 25.7.31	1.8.31
Clan MacBean ...	Boag, J. ... ..	L. Thomson ... ..	" A.	" ... ..	" 21.2.31 to 20.5.31	28.5.31
Clan Macbeth ...	Giles, H. J., R.D., R.N.R.	W. R. Woodriffe, L. W. Gibbins.	" A.	" ... ..	" 25.4.31 to 18.5.31	13.7.31
Clan Macfadyen ...	Laird, C. ... ..	W. C. Dalzell ... ..	" A.	" ... ..	" 21.5.31 to 30.5.31	27.7.31
Clan Macfarlane ...	Redford, L. F., Lieut.- Commr., R.N.R.	W. H. Simpson, W. Wright, H. F. Town, J. R. Moss.	" A.	" ... ..	" 20.12.30 to 5.4.31	14.4.31
Clan Macgillivray ...	Mackinlay, A. ...	S. R. J. Woods ... ..	" A.	" ... ..	" 2.5.31 to 25.5.31...	22.7.31
Clan Macindoe ...	Scott-Smith, H. F. G.	J. C. Dunphy, B. H. Magill.	" A.	" ... ..	" 8.4.31 to 11.5.31...	16.6.31
Clan Mackellar ...	Lyall, A. B. ... ..	A. V. Howard ... ..	M.L.	" ... ..	" 23.1.31 to 7.2.31	7.3.31
001 *† Clan Macphee ...	Gourlay, J. B. ...	E. H. Stone, G. Drake, A. Pollock.	"	" ... ..	Form 915 19.12.30 to 30.3.31	4.5.31
004 *† Clan MacNair ...	Holman, W. G. ...	F. H. Petheridge A. Wood- row, J. Napier.	W.T.	" ... ..	Forms 911 & 138 10.4.31 to 11.6.31	15.6.31
Clan Macquarrie ...	West, W. F. ... ..	J. H. Thorpe ... ..	No. A.	" ... ..	Form 911 4.1.31 to 17.4.31	21.4.31
002 *† Clan Macwhirter ...	Low, A. ... ..	M. J. Lewis, H. Whitehead, C. Rodger.	M.L.	" ... ..	Form 915 31.1.31 to 12.5.31	1.6.31
003 *† Clan Malcolm ...	George, L. S. ... ..	A. Lynch, J. W. Innes, B. Hind.	"	" ... ..	" 19.12.30 to 21.3.31	10.4.31
Clan Morrison ...	Porterfield, W. M. Lt.- Commr., R.N.R.	H. W. Peters, A. G. Beynon, R. K. Phillips.	No. A.	" ... ..	Form 911 11.6.31 to 7.7.31	4.8.31
Clan Murdoch ...	Wynne, R. H. ... ..	P. S. Evans, R. B. Linsley ...	" A.	" ... ..	" 5.4.31 to 21.5.31...	30.6.31
Clan Ronald ...	Hawley, F. J. ... ..	H. C. Carter ... ..	" A.	" ... ..	" 25.5.31 to 17.6.31	27.4.31
Clan Ross ...	Calderwood, W. ...	R. C. Steel ... ..	" A.	" ... ..	" 3.7.31 to 1.7.31...	22.7.31
Clan Sinclair ...	Cater, H. ... ..	D. Mc Alister ... ..	" A.	" ... ..	" 27.4.31 to 5.7.31...	9.7.31
017 *† Colonial ...	Baird, W. ... ..	W. Moore ... ..	" M.	Harrison ... ..	" 31.5.31 to 1.7.31	6.7.31
298 *† Comedian ...	Cadogan, A. ... ..	" ... ..	" M.	" ... ..	" 22.3.31 to 20.5.31	3.7.31
185 *† Comorin ...	Cartwright, C. W., D.S.C.	R. E. Tucker ... ..	" M.	P. & O. ... ..	Forms 911 & 138 20.5.31 to 24.6.31...	25.6.31
198 *† Contractor ...	Harraden, W. E. ...	" ... ..	" M.	Harrison ... ..	Form 911 10.5.31 to 4.6.31...	6.7.31
049 ** Coptic, M.V. ...	Williams, G. ... ..	R. E. Nicholson, T. H. Davies, W. Burt.	W.T.	Shaw, Savill & Albion	Forms 911 & 138 4.3.31 to 6.4.31...	9.4.31
100 *† Cornwall ...	Almond, J. G. ... ..	W. H. G. Timberlake... ..	M.L.	Federal ... ..	Form 911 17.4.31 to 21.5.31	28.5.31
006 †† Coronado ...	Legge, A. W. ... ..	A. Orchard, A. Magill, G. Binks.	W.T.	Elders & Fyffes ...	Forms 911 & 138 10.6.31 to 11.7.31...	16.7.31
214 *† Counsellor ...	Jackson, J. ... ..	G. C. Heaton ... ..	No. M.	Harrison ... ..	" ... ..	"
301 *† Culebra ...	Rathkins, E. C., Commr., R.N.R.	H. D. Hooper, T. Powell, R. J. Finch.	M.L.	R.M.S.P. Co. ... ..	Form 915 14.2.31 to 28.4.31	5.5.31
285 *† Custodian ...	O'Connor, T. ... ..	W. F. O'Neill, W. H. Corlett, J. L. Williams.	No. M.	Harrison ... ..	Forms 911 & 138 2.4.31 to 16.6.31	20.6.31
Cyclops ...	Glossop, S. ... ..	R. A. Hanney ... ..	" A.	A. Holt ... ..	Form 911 18.4.31 to 14.6.31	27.7.31
Dakotian ...	Atkinson, W. H. ...	R. J. S. Pope ... ..	" A.	Leyland ... ..	" 10.11.30 to 17.12.30	24.12.30
Dardanus ...	Christie, W. ... ..	J. S. Ogilvie ... ..	" A.	A. Holt ... ..	" 11.7.31 to 4.8.31	12.8.31
Darian ...	Hannafor, W. ... ..	W. R. Vaughan ... ..	" A.	Leyland ... ..	" 20.4.31 to 24.6.31	6.7.31
302 †† Darro ...	Green, J. ... ..	J. M. Phillip ... ..	W.T.-M.	R.M.S.P. Co. ... ..	Forms 911 & 138 4.2.31 to 25.3.31...	18.4.31
Davistan ...	Trickey, J. ... ..	P. M. Ralston ... ..	No. A.	Leyland ... ..	Form 911 29.8.30 to 22.10.30	28.10.30
303 †† Demerara ...	Matthews, G. P. ...	H. H. Treweek, E. N. Gillet, F. Crankshaw.	W.T.-M.	R.M.S.P. Co. ... ..	Forms 911 & 138 27.10.30 to 17.12.30	22.12.30
003 *† Denis ...	Harris, F. C. P. ...	A. W. Hanchett, J. H. Stoker.	M.L.	Booth ... ..	" 6.5.31 to 21.5.31	29.5.31
304 †† Desado ...	Buret, J. ... ..	C. A. Steel ... ..	W.T.-M.	R.M.S.P. Co. ... ..	" 26.4.31 to 19.6.31	22.6.31
117 †† Desna ...	Huff, G. ... ..	G. L. Elliott, H. Lang... ..	"	" ... ..	" 2.3.31 to 23.4.31	14.5.31
252 *† Devon ...	Kinnell, G. ... ..	G. Chaplin, J. D. Marks, M. Willinott.	No. M.	Federal ... ..	" 7.4.31 to 14.7.31	16.7.31
Dieppe ...	Lidbetter, W. ... ..	E. A. Biles ... ..	C.C.	Southern Railway ...	Telegraphic Report 18.7.31	18.7.31
284 *† Director ...	Worthington, B. ...	M. G. O'Brien, A. M. Hughes, A. E. Rogers.	No. M.	Harrison ... ..	Forms 911 & 138 27.4.31 to 1.8.31...	8.8.31
Dominia, C.S. ...	Campos, V., O.B.E., Lt.-Commr., R.N.R.	W. E. Allen, A. S. Muir, W. F. Anderson.	M.L.	Telegraph Construc- & Maintenance.	Form 915 5.9.30 to 24.11.30	6.12.30
Dorelian ...	Hugan, C. ... ..	J. A. Kendall ... ..	No. A.	Leyland ... ..	Form 911 20.3.31 to 25.5.31	1.6.31
251 †† Doric ...	Jackson, W. H. P. ...	T. Pratt, F. W. Laws, A. Fisher.	W.T.	White Star ... ..	Forms 911 & 138 4.7.31 to 25.7.31	27.7.31
136 *† Doric Star ...	Mills, D. H. ... ..	— Anderson ... ..	No. M.	Blue Star ... ..	" ... ..	"
275 *† Dramatist ...	Meek, A. J. ... ..	G. H. Howard ... ..	" M.	Harrison ... ..	Form 911 23.6.31 to 10.7.31	29.7.31
Dromore Castle ...	Heanly, T. W. ... ..	P. Swan ... ..	" A.	Union Castle ... ..	" 18.1.30 to 3.7.30	9.9.30
142 †† Duchess of Atholl...	McQueen, D. S. ...	G. Mowatt, C. D. Watt, E. Glennie.	W.T.-M.	Canadian Pacific ...	Forms 911 & 138 11.7.31 to 14.7.31	4.8.31
152 †† Duchess of Bedford	Sibbons, H. ... ..	A. Mawsey, J. Stewart, J. Roche.	"	" ... ..	" 19.7.31 to 6.8.31	10.8.31
151 †† Duchess of Richmond,	Freer, A., Capt., R.N.R.	W. A. Stanley ... ..	"	" ... ..	" 20.7.31 to 23.7.31...	28.7.31
143 †† Duchess of York ...	Stuart, R. N., V.C., D.S.O., Commr., R.N.R.	N. Scallan, D. Parsons ...	"	" ... ..	" 30.5.31 to 10.7.31...	17.7.31
098 †† Dunbar Castle, M.V.	Vincent, E. S., R.D., Commr., R.N.R.	J. Daziel, T. W. McAllen, P. G. MacIver.	W.T.	Union Castle ... ..	" 30.6.31 to 18.7.31	21.7.31
Dunluce Castle ...	Hutchings, A. H. ...	A. C. M. Black ... ..	No. A.	" ... ..	Form 911 16.4.31 to 22.6.31	27.6.31
Dunrobin ...	Ramsay, J. D. ... ..	" ... ..	" A.	Glen & Co. ... ..	" 1.6.31 to 29.6.31	14.8.31
Dunster Grange ...	Wilson, G. F. ... ..	J. Allerton ... ..	" M.	Houlder ... ..	" ... ..	"
102 *† Duquesa ...	Owen, R. ... ..	F. D. Jones ... ..	" M.	Furness Withy ... ..	Forms 911 & 138 18.5.31 to 24.7.31	27.7.31
215 *† Durenda, M.V. ...	Moon, J. ... ..	H. Stott ... ..	" M.	British India ... ..	" 11.6.31 to 5.7.31	8.7.31
077 †† Edinburgh Castle ...	Gilbert, E. F. ... ..	C. Harvey, J. Ferguson, E. F. Day.	W.T.	Union Castle ... ..	Form 911 25.4.31 to 14.6.31	18.6.31
Egori ...	" ... ..	R. Mercer ... ..	No. A.	Elder Dempster ...	" 16.9.30 to 3.10.30	6.10.30
107 *† El Argentino, M.V.	Ellis, F., D.S.C. ...	W. Findlay, J. Burch, C. G. Adlard.	" M.	Houlder ... ..	Forms 911 & 138 11.5.31 to 15.7.31	13.8.31
009 *† Elmworth, M.V. ...	Wilson, T. P. ... ..	J. M. Whyte ... ..	" M.	R. S. Dalgleish ...	" 26.2.31 to 23.3.31...	8.4.31
158 *† Elpenor ...	Wilson, R. J. ... ..	E. Roberts, J. Macfarlane, G. Rowlands.	M.L.	A. Holt ... ..	Form 915 14.3.31 to 7.7.31	16.7.31
108 *† Elstree Grange ...	Williams, W. E. ...	P. A. Hawkesworth ... ..	No. M.	Houlder ... ..	Forms 911 & 138 2.2.31 to 27.4.31	30.4.31
109 *† El Paraguay ...	Frost, C. R. ... ..	G. Fletcher, F. J. G. Rice, R. L. Aldridge.	" M.	" ... ..	" 15.6.31 to 6.8.31	11.8.31
110 *† El Uruguayo ...	McNamara, T. ... ..	F. E. Hailstone ... ..	" M.	" ... ..	" 11.4.31 to 10.6.31	16.6.31



Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Record Contributed. Received up to 14.8.31.	Date Received.
027 *† <i>Elysia</i> ...	Henderson, F. M. ...	C. Mitchell, J. Herbert, W. A. Beveridge.	M.L.	Anchor ...	Form 915 19.1.31 to 23.5.31 ...	19.6.31
088 *† <i>Empire Star</i> ...	Owen, G., R.D., Lieut.-Commr., R.N.R.	... ..	"	Blue Star ...	... ..	...
086 †† <i>Empress of Australia</i>	Griffiths, E., Lieut.-Commr., R.N.R.	A. Tippet, M. Williams, O. F. Pennington.	W.T.	Canadian Pacific ...	Forms 911 & 138 1.7.31 to 18.7.31	21.7.31
154 †† <i>Empress of Canada</i>	Hailey, A. J., Lieut.-Commr., R.N.R.	C. W. G. Patterson, G. M. Fawcett, A. M. Barff, G. O. Baugh.	M.L.	" "	Form 915 27.11.30 to 20.3.31 ...	18.4.31
061 †† <i>Empress of France</i>	Turnbull, J., C.B.E., R.D., Capt., R.N.R.	E. Roberts, R. Newson, W. T. Brookes.	W.T.	" "	Forms 911 & 138 4.6.31 to 19.6.31	23.6.31
153 †† <i>Empress of Japan</i>	Robinson, S., C.B.E., R.N.R.	R. Goss, R. Wolfenden, A. Le Maistre.	M.L.	" "	Form 915 7.8.30 to 13.1.31 ...	16.2.31
<i>Eumaeus</i> ...	Hodgson, R. N. ...	W. G. Coxshall... ..	No. A.	A. Holt ...	Form 911 17.2.31 to 8.5.31 ...	14.5.31
<i>Euryades</i> ...	Ewan, W. B. ...	D. S. Bruce ... ..	" A.	" ...	" 21.1.31 to 26.1.31 ...	17.2.31
<i>Explorer</i> ...	Allan, J. ...	A. Stout ... ..	" A.	Scottish Fishery Bld.	" 3.7.31 to 10.7.31 ...	24.7.31
067 *† <i>Ferndale</i> ...	Beighton, J. N. ...	L. J. Hopkins, H. C. Hone ...	" M.	Aberdeen Common-wealth.	Forms 911 & 138 18.2.31 to 1.6.31	6.6.31
074 *† <i>Fordsdale</i> ...	Avern, J. ...	F. H. E. Vaughan ... ..	" M.	Aberdeen Common-wealth.	" " 11.5.31 to 16.6.31	27.7.31
030 †† <i>Franconia</i> ...	Gibbons, G., R.D., Capt., R.N.R.	W. M. Stewart, W. B. Tanner, R. Pollitt.	W.T.	Cunard ...	" " 2.7.31 to 30.7.31	14.8.31
<i>Freya</i> ...	Lamont, A. ...	W. Pirrie ... ..	No. A.	Scottish Fishery Bld.	Form 911 17.6.31 to 29.6.31 ...	6.7.31
159 ** <i>Gascoyne</i> ...	Johnson, L. ...	J. S. Macbryde, C. O. Melson, W. Uttley.	M.L.	A. Holt & Co....	Form 915 2.5.30 to 22.9.30 ...	13.1.31
125 *† <i>Glenamoy, M.V.</i> ...	Ings, W. J. ...	F. Laycock, L. Eccles, A. C. Radley.	"	Glen Line ...	" 2.2.31 to 8.5.31 ...	16.5.31
<i>Glenbeg, M.V.</i> ...	Newing, L. ...	G. A. C. Barnard ... ..	No. A.	" ...	Form 911 20.1.31 to 1.3.31 ...	7.4.31
126 *† <i>Glenegarr, M.V.</i> ...	Angier, J. ...	J. Tyler, J. W. Leslie, S. W. Bell.	" M.	" ...	Forms 911 & 138 29.3.31 to 10.4.31	14.4.31
<i>Gleniffer</i> ...	Baker, W. H. ...	A. H. D. Shaw ... ..	" A.	" ...	Form 911 17.5.31 to 28.7.31 ...	31.7.31
<i>Glenluce, M.V.</i> ...	Kennett, W. H. ...	J. A. Evans ... ..	" A.	" ...	" 4.2.31 to 3.6.31 ...	7.7.31
<i>Glenworth</i> ...	Aitchison, D.M. ...	A. Bone ... ..	" A.	R. S. Dalgleish ...	" 16.5.31 to 28.5.31 ...	4.6.31
<i>Gloucester Castle</i> ...	MacMahon, J., R.D., Commr., R.N.R.	C. Black ... ..	" A.	Union Castle... ..	" 26.2.31 to 3.5.31 ...	20.5.31
085 *† <i>Governor</i> ...	Windsor, G. R. ...	A. Watson, J. Stanhope ...	" M.	Harrison ...	Form 911 & 138 28.3.31 to 11.5.31	16.6.31
<i>Halestus</i> ...	Steel, R. ...	— Browne, A. S. P. May ...	" A.	R. P. Houston ...	Form 911 21.4.31 to 17.5.31 ...	8.6.31
111 *† <i>Hardwicke Grange</i>	Fowler, W. H. ...	W. L. Baker, A. W. Seybold, W. E. Ellis.	" M.	Houlder ...	Forms 911 & 138 27.4.31 to 30.6.31	8.7.31
<i>Harmonides</i> ...	Elwell, F. R. ...	L. Pogson... ..	" A.	R. P. Houston ...	Form 911 30.5.31 to 22.6.31 ...	21.7.31
262 ** <i>Hauraki, M.V.</i> ...	Norton, A. T. ...	D. McLeish, A. W. Rabbitts, R. Kendall.	M.L.	Union S.S. Co., N.Z. ...	Form 915 15.8.29 to 31.10.30 ...	8.1.31
<i>Hermintus</i> ...	Roberts, T. V., R.D., Lieut.-Commr., R.N.R.	F. W. Gilroy ... ..	No. A.	Aberdeen Common-wealth.	Form 911 6.3.31 to 12.4.31 ...	18.4.31
<i>Herschel</i> ...	Watson, W. W. ...	S. Ranson ... ..	" A.	Lampert & Holt ...	" 9.1.31 to 18.3.31 ...	20.3.31
253 *† <i>Hertford</i> ...	Burton Davies, J. ...	P. Shakespeare, P. Block, P. M. Devitt.	M.L.	Federal ...	Form 915 14.2.31 to 24.6.31 ...	6.7.31
<i>Hibernia</i> ...	Williams, E. R. ...	C. A. Marsh ... ..	O.C.	L.M. & S. Railway ...	Telegraphic Report 8.8.31	8.8.31
182 †† <i>Highland Brigade</i>	Lloyd, H. ...	W. Stephen, N. Hersee, C. Morgan.	No. M.	Nelson ...	Forms 911 & 138 31.5.31 to 22.7.31	25.7.31
116 †† <i>Highland Chieftain, M.V.</i>	Robinson, R. H. ...	W. J. Presland, W. Irving, J. H. Cables.	" M.	" ...	" " 7.5.31 to 22.6.31	28.6.31
099 †† <i>Highland Monarch, M.V.</i>	Ashby Graves, F. ...	R. Polden ... ..	" M.	" ...	" " 18.4.31 to 10.6.31	13.6.31
250 †† <i>Highland Princess, M.V.</i>	Collins, D. ...	I. Shearer ... ..	" M.	" ...	" " 21.5.31 to 6.7.31	20.7.31
079 *† <i>Hildebrand</i> ...	Buck, R. H., R.D., Capt., R.N.R.	W. H. Cross ... ..	W.T.	Booth ...	" " 17.5.31 to 22.6.31	28.6.31
075 *† <i>Hobson's Bay</i> ...	Roberts, T. V., R.D., Lt.-Commr., R.N.R.	J. Worrall, C. C. Good, C. Carroll.	M.L.	Aberdeen Common-wealth.	Form 915 4.2.31 to 10.5.31 ...	22.6.31
054 †† <i>Homerie</i> ...	Bulman, J. B. ...	H. G. Morgan, M. Bennett, W. Poustie.	W.T.	White Star ...	Forms 911 & 138 4.6.31 to 1.7.31 ...	13.7.31
<i>Hubert</i> ...	Briscoe, W. ...	R. Parry, G. G. Westhorp, L. A. Sterling.	M.L.	Booth ...	Form 915 17.5.31 to 25.7.31 ...	28.7.31
261 *† <i>Huntingdon</i> ...	Field, H. G. B. ...	M. J. Broadhead, P. S. Calcutt, J. H. Strand Jones.	W.T.	Federal... ..	Forms 911 & 138 17.11.30 to 3.3.31	14.3.31
200 *† <i>Huntsman</i> ...	Russell, H. ...	H. Wells ... ..	No. M.	Harrison ...	... ..	...
289 *† <i>Inanda</i> ...	Gibbins, W. H. ...	D. C. Brown, R. L. Williams	" M.	" ...	Forms 911 & 138 22.6.31 to 25.7.31	29.7.31
*† <i>Ingoma</i> ...	Richardson, — ...	S. M. Smith, D. Douglas Kerr, R. Sutcliffe.	" M.	" ...	" " 27.3.31 to 6.5.31	11.5.31
160 *† <i>Ixton</i> ...	Stewart, J. A. ...	G. L. Oldrich, W. H. Deans, F. G. Brown.	M.L.	A. Holt ...	Form 915 9.10.30 to 18.3.31 ...	29.5.31
<i>Jamaica Merchant</i>	Bach, L. G., R.D., Lieut.-Commr., R.N.R.	B. W. Smith, D. T. Sharrock, S. G. Scrutton.	"	Jamaica Direct Fruit	" 15.1.31 to 30.5.31 ...	6.6.31
072 ** <i>Jamaica Planter</i> ...	Towell, W. C. ...	R. D. Willsdon ... ..	W.T.	" "	Forms 911 & 138 30.6.31 to 31.7.31	5.8.31
<i>Jamaica Producer</i> ...	Allen, P. D. ...	H. C. Braine ... ..	No. A.	" "	Form 911 18.6.31 to 29.6.31 ...	24.7.31
<i>Jamaica Settler</i> ...	Rodick, J. M. ...	H. Davies ... ..	" A.	" "	... ..	...
<i>Javanese Prince, M.V.</i>	Smith, J. ...	C. E. Edney ... ..	" A.	Prince ...	" 21.5.31 to 5.7.31 ...	18.7.31
187 *† <i>Jeypore</i> ...	Harris, W. L. ...	A. G. Edwards ... ..	" M.	P. & O. ...	Forms 911 & 138 28.6.31 to 28.7.31	7.8.31
188 †† <i>Kaisar-i-Hind</i> ...	Headlam, P. C., R.D., Commr., R.N.R.	T. T. Ferguson, H. Flint, L. Irons.	" M.	" ...	" " 12.4.31 to 19.5.31	30.5.31
189 *† <i>Kalyan</i> ...	Cooper, C. P., O.B.E., R.D., Capt., R.N.R.	M. G. Morris ... ..	" M.	" ...	" " 7.6.31 to 17.7.31...	4.8.31
041 *† <i>Karamea, M.V.</i> ...	Kenworthy, — ...	N. S. Milne, C. Sendall, H. M. Clark.	M.L.	Shaw, Savill & Albion	Form 915 4.3.31 to 11.6.31 ...	22.6.31
217 *† <i>Karapara</i> ...	Maclean, A. ...	J. B. Walker, G. P. King ...	No. M.	British India... ..	Forms 911 & 138 9.5.31 to 1.6.31	29.6.31
235 *† <i>Karmala</i> ...	McBride, — ...	A. Storr ... ..	" M.	P. & O. ...	Forms 911 & 138 4.5.31 to 7.8.31...	11.8.31
190 *† <i>Kashgar</i> ...	Sudell, F., R.D., Commr., R.N.R.	R. P. Eddy ... ..	" M.	" ...	Forms 911 & 138 4.4.31 to 29.5.31	29.6.31
191 *† <i>Kashmir</i> ...	Axford, R. G. ...	T. Webb, F. C. Fairburne ...	" M.	British India ...	" " 8.5.31 to 19.6.31	20.7.31
114 †† <i>Kenya</i> ...	Grant, W. E. ...	W. H. Brown, R. Lord, A. Ralph.	" M.	" ...	" " 27.2.31 to 10.4.31	4.5.31
218 *† <i>Khandalla</i> ...	Baird, S. K. ...	W. Gordon Jones ... ..	" M.	P. & O. ...	" " 13.3.31 to 26.5.31	24.6.31
186 *† <i>Kidderpore</i> ...	Wright, C. S., R.D., Commr., R.N.R.	R. H. Hand ... ..	" M.	" ...	Form 915 26.11.30 to 1.5.31 ...	29.6.31
169 ** <i>Kwanchow</i> ...	Stringer, C. B. L. ...	B. C. Finch, E. J. Cox ...	M.L.	China Nav. Co. ...	Form 915 26.11.30 to 1.5.31 ...	29.6.31

# LIST OF VOLUNTARY OBSERVING SHIPS

V

Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log. Register, or Record Contributed. Received up to 14.8.31.	Date Received.
147 †† <i>Laconia</i> ...	Townley, J. C., R.D., Capt. R.N.R.	J. D. Archer, R. V. Youd, M. Boston.	W.T.	Cunard...	Forms 911 & 138 13.7.31 to 27.7.31	10.8.31
193 †† <i>Lahore</i> ...	Dunn, R.E., O.B.E. ... Hollow, J. H. ...	W. Billington ... J. G. K. Gregory, F. Hull, S. R. Eva.	No. A. " M.	Pacific S.N. Co. P & O. ...	Form 911 16.5.31 to 2.6.31 ... Forms 911 & 138 29.3.31 to 20.6.31	5.6.31 24.6.31
036 †† <i>Lalande</i> ...	Symons, P. ...	C. Legg ...	" A.	Lamport & Holt	Form 911 30.1.30 to 24.2.31	4.3.31
036 †† <i>Lancastria</i> ...	Murchie, P. A., R.D., Capt., R.N.R.	J. S. Glendenning, S. Troo- man, N. Kingscote.	W.T.	Cunard ...	Forms 911 & 138 20.4.31 to 8.5.31	12.5.31
082 †† <i>Laomedon</i> ...	Davidson, T. W. ...	A. E. Martin ...	No. A.	A. Holt...	Form 911 30.6.31 to 17.7.31	23.7.31
082 †† <i>La Paz, M.V.</i> ...	Morgan, D. R. ...	R. W. Hanson, J. Sutherland, G. Pattison.	" M.	Pacific S.N. Co.	Forms 911 & 138 15.3.31 to 13.4.31	16.4.31
134 †† <i>Laplace</i> ...	Hickman, V. G. ...	N. R. Perons ...	" A.	Lamport & Holt	Form 911 10.2.31 to 4.5.31...	11.5.31
134 †† <i>Lapland</i> ...	Harvey, H. ...	W. Jenkins, H. Patterson, R. Fairner.	W.T.	Red Star ...	Forms 911 & 138 28.6.31 to 16.7.31	18.7.31
076 †† <i>Largs Bay</i> ...	Jermyn, W. M. ...	F. B. Marsden ...	No. M.	Aberdeen Common- wealth.	" " 14.12.30 to 21.2.31	30.4.31
112 †† <i>La Rosarina</i> ...	Webb, C. ...	W. S. Hamblin... ..	" M.	Houlder ...	" " 22.3.31 to 14.5.31	22.5.31
084 †† <i>Lassell</i> ...	Lindsay, J. ...	P. Casey ...	" A.	Lamport & Holt	Form 911 11.2.31 to 6.5.31...	14.5.31
084 †† <i>Laurentie</i> ...	Hume, R. ...	C. Cochran, R. Crangle ...	W.T.	White Star ...	Forms 911 & 138 18.7.31 to 7.8.31	10.8.31
083 †† <i>Lautaro, M.V.</i> ...	Kite, E. ...	J. Lloyd Jones ...	No. M.	Pacific S.N. Co.	" " 22.5.31 to 10.6.31	29.6.31
254 †† <i>Limerick</i> ...	Molyneux, P. L. ...	A. M. Dowman, N. A. Thomas	" M.	Federal...	" " 22.2.31 to 3.4.31	8.4.31
093 †† <i>Llandaf Castle</i> ...	Attwood, J. ...	T. E. R. Wilford ...	W.T.	Union Castle ...	Form 911 26.3.31 to 30.5.31	3.6.31
097 †† <i>Llangibby Castle, M.V.</i> ...	Nicholl, D. ...	H. S. Warren ...	"	" " ...	Forms 911 & 138 25.4.31 to 26.6.31	17.7.31
094 †† <i>Llandoverly Castle</i> ...	Morgan, A. O., R.D., Commr. R.N.R.	T. C. Goldstone, F. R. Pope, R. C. J. Hatt.	M.L.	" " ...	Form 915 1.5.31 to 5.7.31 ...	27.7.31
216 †† <i>Llanstephan Castle</i> ...	Bickford, C. N. ...	T. Campbell, H. Bunn, I. Duncan.	W.T.	" " ...	Form 911 9.3.31 to 7.5.31...	14.5.31
084 †† <i>Lobos, M.V.</i> ...	Leyne, R. W. ...	R. H. Sissons ...	No. M.	Pacific S.N. Co.	Forms 911 & 138 21.4.31 to 10.8.31	14.8.31
084 †† <i>Lochgail, M.V.</i> ...	Schlanbusch, O. V. ...	P. Burrell ...	" A.	" " ...	Form 911 24.12.30 to 21.3.31	27.3.31
084 †† <i>Loch Katrine</i> ...	Cocks, A., D.S.C., R.D., Captain, R.N.R.	J. E. Pardoe Matthews ...	" A.	" " ...	" " 26.1.31 to 24.4.31	7.5.31
137 †† <i>Lochmonar, M.V.</i> ...	Purvis, A. ...	F. G. Dawson, A. Yeatman.	" A.	Harrison ...	Forms 911 & 138 8.2.31 to 14.5.31	19.6.31
084 †† <i>Logician</i> ...	Herschel, R. J. ...	T. Winstanley, E. L. Stockley.	" M.	Furness Withy ...	Form 911 20.5.31 to 24.6.31	27.6.31
084 †† <i>London Citizen</i> ...	Westgarth, W. A. ...	H. Richardson ...	" A.	" " ...	" " 21.9.30 to 4.10.30	7.10.30
084 †† <i>London Exchange</i> ...	Griffiths, J. ...	C. T. V. Rixham ...	" A.	Ulster S.S. Co. ...	" " 15.6.31 to 6.7.31	8.7.31
084 †† <i>Lord Antrim</i> ...	Jarvis, F. E. ...	C. A. Milligan ...	" A.	Pacific S.N. Co. ...	Forms 911 & 138 9.6.31 to 26.6.31	16.7.31
084 †† <i>Loriga, M.V.</i> ...	Grant, F. H. ...	J. D. Richards, W. Horsfall...	" A.	" " ...	" " ...	"
008 †† <i>Losada</i> ...	Clapham, E. C. ...	D. W. Hutchinson ...	" M.	" " ...	" " ...	"
013 †† <i>Macharda</i> ...	Hanna, R. G. ...	C. Lindsay Miller, C. Parry, G. A. Jackson.	No. M.	Brocklebank ...	" " 1.7.31 to 17.7.31	10.8.31
232 †† <i>Madura</i> ...	Parker, A. A. ...	A. Usher, D. S. Hutton, F. C. Conolly.	" M.	British India...	" " 9.1.31 to 14.3.31	17.3.31
078 †† <i>Magician</i> ...	Bury, E. R. ...	W. E. Shotton ...	" M.	Harrison ...	Forms 911 & 138 1.3.31 to 15.6.31	22.6.31
141 †† <i>Mahia</i> ...	Andrews, C. M. ...	G. Sangwin, M. P. Congdon, J. Jackson.	W.T.	Shaw, Savill & Albion	" " 11.6.31 to 3.7.31	27.7.31
140 †† <i>Mahratta</i> ...	Williams, E. R. ...	T. C. Eddy, H. F. Scoins, A. McPhee.	No. M.	Brocklebank ...	" " 16.4.31 to 20.5.31	5.6.31
014 †† <i>Mahronda</i> ...	Sharpe, G. ...	W. Le Brocq ...	" M.	" " ...	" " 10.12.30 to 10.3.31	20.4.31
015 †† <i>Mahsud</i> ...	Kershaw, R. W. ...	S. Richardson, E. Walker, J. R. Paisley.	" M.	" " ...	" " 26.2.31 to 8.5.31	12.5.31
016 †† <i>Maidan</i> ...	Ison, W. A. ...	F. Moore, F. L. Attwood, L. E. Jeans.	" M.	" " ...	Form 915 18.1.31 to 15.5.31	19.5.31
042 †† <i>Maimoa</i> ...	Johnson, J. W. ...	A. Winton, E. Sainsbury, D. O. V. Pickersgill.	M.L.	Shaw, Savill & Albion	Form 911 5.3.31 to 21.4.31	27.4.31
018 †† <i>Maimyo</i> ...	Smith, G. C. ...	J. L. Rodgers ...	No. A.	Brocklebank ...	Forms 911 & 138 4.1.31 to 1.4.31	7.4.31
025 †† <i>Makalla</i> ...	Maughan, J. W. ...	E. Williams ...	" M.	Canadian-	Form 915 24.12.30 to 12.4.31	9.7.31
225 †† <i>Makura</i> ...	Spring Brown, J. F. ...	A. P. Cousin, S. H. Crawford, A. H. Morgan.	M.L.	Australasian	Forms 911 & 138 26.11.30 to 4.3.31	1.4.31
019 †† <i>Malakuta</i> ...	Martin, W. J. ...	H. Simpson ...	No. M.	Brocklebank ...	" " 6.6.31 to 6.7.31	4.6.31
020 †† <i>Malancha</i> ...	Adamson, F. L. ...	R. Humble, J. H. Chadwick, M. Mackenzie.	" M.	" " ...	Form 138 23.2.31 to 18.5.31	3.7.31
219 †† <i>Malda</i> ...	Denne, G. H. A. ...	R. E. Baldwin - Wiseman, C. H. Hand, G. R. Peters.	" M.	British India	Forms 911 & 138 29.4.31 to 12.6.31	15.6.31
195 †† <i>Maloja</i> ...	Browning, J. B., R.D., Commr. R.N.R.	P. G. Lawrence...	" M.	P. & O. ...	" " 26.4.31 to 18.6.31	25.6.31
96 †† <i>Malwa</i> ...	Townshend, W. P., R.D., Capt. R.N.R.	A. L. Harrop, J. Robinson, R. G. Widdon.	" M.	Brocklebank ...	" " 7.5.31 to 25.5.31	24.6.31
053 †† <i>Manaar</i> ...	Thowless, E. ...	E. E. Bonnaud, J. Eccles, W. E. Hardman.	M.L.	Manchester Liners ...	Form 915 14.3.31 to 1.8.31	10.8.31
<i>Manchester Brigade</i>	Stott, C. H. ...	R. O. Jones ...	No. M.	British India...	Form 911 11.11.30 to 16.12.30	1.1.31
<i>Manchester Hero</i> ...	Mitchell, G. M. ...	W. E. F. Powell ...	" M.	" " ...	Forms 911 & 138 24.3.31 to 12.6.31	16.6.31
028 †† <i>Mandala</i> ...	Kinnear, A. D. ...	F. C. Madden, T. S. Cullen, J. Alexander.	" M.	Brocklebank ...	" " 15.6.31 to 15.7.31	21.7.31
146 †† <i>Mandasor</i> ...	Longhurst, J. H. ...	T. M. Robertson, L. W. Kerton, F. C. Conolly.	" M.	British India ...	" " 24.4.31 to 29.6.31	6.7.31
220 †† <i>Manela</i> ...	Maples, S. H. ...	L. F. Dodson, R. Penston, A. Hill.	" M.	Brocklebank ...	" " 4.7.31 to 16.7.31	10.8.31
022 †† <i>Manipur</i> ...	Cochran, G. N. ...	W. Brawn, F. Scott, J. Toms	" M.	British India...	" " 21.6.31 to 19.7.31	5.8.31
221 †† <i>Manora</i> ...	Hudson, H. T., R.D., Commr. R.N.R.	M. Sharp ...	" M.	P. & O. ...	Forms 911 & 138 23.5.31 to 15.7.31	22.7.31
177 †† <i>Mantola</i> ...	James, D. F. ...	J. D. Homidge, E. J. Spurling	W.T.-M.	Burns Philp ...	Form 915 2.9.30 to 21.12.30	19.2.31
197 †† <i>Mantua</i> ...	Hignett, R.D., Commr. R.N.R.	M. Pemberton, W. D. Col- quhoun, A. G. W. Thomas.	M.L.	Ellerman Wilson ...	" " 21.10.30 to 16.3.31	19.3.31
299 †† <i>Marella</i> ...	Donaldson, A. ...	H. Bryan, G. W. Revell, W. L. Hepson, F. Brown.	"	" " ...	" " 19.4.31 to 12.7.31	16.7.31
<i>Marengo</i> ...	Aspinall, A. E. ...	C. Newton, J. E. Dobson.	W.T.	British India...	Forms 911 & 138 25.5.31 to 31.7.31	6.8.31
222 †† <i>Margha</i> ...	Hemmings, W. H. ...	P. Wright, H. Watkins ...	No. M.	Furness Houlder	" " 22.3.31 to 10.6.31	20.6.31
104 †† <i>Marquesa</i> ...	Smiles, R. S. ...	J. Wetherall ...	" M.	British India ...	" " ...	"
021 †† <i>Masula</i> ...	Fitt, W. A. ...	E. B. Cutlack, J. E. Jones, A. L. F. Bell.	" A.	Shaw, Savill & Albion	Form 915 3.1.31 to 12.4.31	18.4.31
044 †† <i>Matakana</i> ...	Gordon, H. ...	F. Eadon, H. A. Hill, F. C. Charnley, W. West, K. Owen.	M.L.	" " ...	" " ...	"
023 †† <i>Matheran</i> ...	Mulcahy, J. J. ...	S. S. Slade, J. F. Butter- worth, W. Cowrie.	No. M.	Brocklebank ...	Forms 911 & 138 5.7.31 to 15.7.31	22.7.31
223 †† <i>Matiana</i> ...	Green, F. V. ...	L. A. Bunn, J. W. F. Daly, P. M. Wilson.	" M.	British India...	" " 24.6.31 to 29.7.31	31.7.31
024 †† <i>Matra</i> ...	Cornish, N. P. ...	C. Shaw, W. Robertson, J. G. Nuttall.	" M.	Brocklebank ...	" " 30.3.31 to 17.6.31	30.6.31
032 †† <i>Mauretania</i> ...	Peel, R. V., R.D., Capt., R.N.R.	R. H. C. Crawford, H. V. Clarke, W. L. Cox.	W.T.	Cunard ...	" " 12.7.31 to 27.7.31	29.7.31
287 †† <i>Melita</i> ...	Stewart, A. ...	L. N. Outram, S. W. Keay ...	No. A.	Canadian Pacific	" " 10.7.31 to 31.7.31	4.8.31
021 †† <i>Mercian</i> ...	Manning, C. H. ...	F. P. Sheerbad ...	"	Leyland ...	Form 911 14.3.31 to 26.5.31	29.5.31



Name of Vessel.	Captain.	Observing Officers	Meteoro-logical Equipment.	Line.	Last Log, Register, or Record Contributed Received up to 14.8.31.	Date Received.
270 *† <i>Minderoo</i> ...	Macphedran W. J. ...	A. J. Perry ...	No. M.	Western Australian S.N. Co.	Forms 911 & 138 12.3.31 to 19.4.31	2.6.31
Minna ...	Mackenzie, G. G. ...	A. M. Campbell ...	" A.	Scottish Fishery Brd.	Form 911 14.7.31 to 7.8.31	10.8.31
068 †† <i>Minnetonka</i> ...	Gates, T. F., C.B.E. ...	H. E. D. McCartney ...	No. M.	Atlantic Transport ...	Forms 911 & 138 6.7.31 to 25.7.31	29.7.31
069 †† <i>Minnewaska</i> ...	Claret, F. H., C.B.E., Commr., R.N.R.	E. Pengelly, D. Davies, F. Mummery.	W.T.-M.	" " ...	" " 20.7.31 to 8.8.31	11.8.31
Mississippi, M.V. ...	Finch, E. ...	A. C. Clay ...	No. A.	" " ...	Form 911 10.2.31 to 28.3.31	2.4.31
224 *† <i>Modasa</i> ...	Gilchrist, J. W. ...	W. Ascroft, H. C. Pearson	" M.	British India ...	Forms 911 & 138 18.3.31 to 1.6.31	6.6.31
199 †† <i>Mongolia</i> ...	Rhodes, H. R. ...	H. Tee, H. C. Stinn, W. S. Joliffe.	" M.	" " ...	" " 16.5.31 to 23.7.31	25.7.31
Monowai ...	Toten, A. T. ...	L. B. Ehler, T. W. Gibson, L. J. Drew.	M.L.	Union S.S. of N.Z. ...	Form 915 22.1.31 to 9.5.31	4.8.31
148 †† <i>Montcalm</i> ...	Rothwell, A. ...	T. L. Gillette, A. Mackie	W.T.-M.	Canadian Pacific ...	Forms 911 & 138 19.7.31 to 8.8.31	11.8.31
149 †† <i>Montclare</i> ...	Carr-Jones, D. J. ...	A. Watt, J. Sharples, J. Soames.	W.T.	" " ...	" " 31.5.31 to 18.6.31	27.6.31
150 †† <i>Montrose</i> ...	Dott, J. F. ...	K. Hutchings, E. A. Shergold, L. L. Thornton.	"	" " ...	" " 7.6.31 to 25.6.31	28.6.31
164 †† <i>Mooltan</i> ...	Morton, A. J. ...	R. M. Richardson, J. C. Ablewhite, H. Fitz Marshall.	No. M.	P. & O. ...	" " 7.2.31 to 14.5.31	19.5.31
226 †† <i>Mulbera</i> ...	Caffyn, F. ...	C. W. E. Furze ...	" M.	British India ...	" " 1.6.31 to 29.6.31	27.7.31
290 *† <i>Musician</i> ...	Bostock, O. ...	K. H. Davies, H. Philpott, S. H. Diamond.	" M.	Harrison ...	" " 9.5.31 to 26.7.31	28.7.31
073 *† <i>Nagara</i> ...	Cocks, A. ...	R. L. Matheson ...	" M.	R.M.S.P. Co. ...	Forms 911 & 138 7.6.31 to 30.7.31	7.8.31
201 †† <i>Naldera</i> ...	Harrison, R., D.S.O., R.D., Capt. R.N.R.	H. J. Mann, G. D. Copeland, L. J. Brown.	M.L.	P. & O. ...	Form 915 4.4.31 to 8.7.31	14.7.31
227 *† <i>Nardana</i> ...	Reilly, J. V. ...	H. Goater, H. Grace, A. Woodward.	"	British India ...	" " 1.11.30 to 1.3.31	4.3.31
118 ** <i>Narenta</i> ...	Falconer, A. C. ...	G. S. Grant, G. D. Bonner, M. A. Murch.	No. M.	R.M.S.P. Co. ...	Forms 911 & 138 3.1.31 to 26.3.31	2.4.31
202 †† <i>Narkunda</i> ...	Biggs, J. H., R.D. Commr., R.N.R.	C. H. Moulton, J. C. Davies.	" M.	P. & O. ...	" " 26.6.31 to 6.8.31	8.8.31
305 *† <i>Nebraska</i> ...	Falconer, A. C. ...	H. D. Bowker, H. Collinson, P. R. Cocks.	" M.	R.M.S.P. Co. ...	" " 12.6.31 to 10.7.31	24.7.31
203 †† <i>Nellore</i> ...	Gordon, A. S. ...	L. J. Dixon, J. F. M. Heddle, H. E. Nuzum.	M.L.	E. & A. S.S. Co. ...	Form 915 31.1.31 to 29.4.31	29.6.31
162 *† <i>Nestor</i> ...	Adcock, F. ...	W. T. Harris, P. Elder, W. Pearse.	"	A. Holt ...	" " 4.1.31 to 8.5.31	23.5.31
Newfoundland ...	Foxworthy, A. W.	R. F. Handley, E. Sainty, J. L. Macklin.	"	Furness Withy ...	" " 13.2.31 to 5.8.31	12.8.31
210 ** <i>Niagara</i> ...	Hill, T. V. ...	G. H. Kime, D. A. Menlove L. P. Bourke.	"	Canadian-Australasian	" " 5.3.31 to 24.4.31	2.8.31
Ningehov ...	Ewan, W. B. ...	E. Butler ...	No. A.	A. Holt ...	Form 911 20.7.31 to 30.7.31	6.8.31
256 *† <i>Norfolk</i> ...	Howell - Price, J., D.S.O., D.S.C.	G. C. Hocart, H. Cockerell, H. Dash.	M.L.	Federal ...	Form 915 4.4.31 to 11.7.31	21.7.31
Norna ...	Angus, W. ...	T. R. Ness ...	No. A.	Scottish Fishery Brd.	Form 911 16.7.31 to 3.8.31	6.8.31
297 *† <i>Northumberland</i> ...	Upton, H. L., D.S.C., R.D., Commr., R.N.R.	H. Rogers, G. B. Cathie, H. I. Phillips.	" M.	Federal ...	Forms 911 & 138 24.4.31 to 9.8.31	13.8.31
267 *† <i>Novara</i> ...	Dene, R. C. ...	N. W. Leach ...	" M.	P. & O. ...	Form 911 6.6.31 to 20.6.31	4.8.31
Nova Scotia ...	Furieux, S. J. ...	J. E. Wilson, A. Hender, N. Forsythe.	M.L.	Furness Withy ...	Form 915 8.10.30 to 12.3.31	20.3.31
Novasota ...	Miles, A. G. ...	F. G. Dawson ...	No. A.	R.M.S.P. Co. ...	" " 11.1.31 to 11.1.31	11.1.31
230 *† <i>Nowshera</i> ...	Longhurst, J. H. ...	R. Burch, B. H. Bentall	" M.	British India ...	Forms 911 & 138 18.1.31 to 29.1.31	11.5.31
231 *† <i>Nuddea</i> ...	Beeching, P. H. ...	D. A. Jones, W. Monk, W. G. Pitcher.	" M.	" " ...	" " 16.4.31 to 7.6.31	13.7.31
Oaklands Grange ...	Phillips, A. G. M. ...	J. C. Thomas ...	" A.	Houlder Bros. ...	Form 911 30.5.30 to 18.9.30	4.10.30
243 *† <i>Opawa</i> ...	Robinson, F. W. ...	J. W. Pring ...	" M.	New Zealand S.S. Co.	" " 1.1.31 to 1.1.31	1.1.31
170 †† <i>Orama</i> ...	Staunton, H. G., C. B.E., R.D., Commr., R.N.R.	W. Elliot, K. Morrison, R. W. Roberts.	W.T.	Orient ...	Forms 911 & 138 2.2.31 to 5.5.31	8.5.31
Oranlian ...	Gittings, R. P. ...	H. O. Quinn ...	No. A.	Leyland ...	Form 911 26.11.30 to 17.1.31	29.1.31
011 †† <i>Orbita</i> ...	Ross, J. ...	J. S. Wardman ...	W.T.-M.	Pacific S.N. Co. ...	Forms 911 & 138 26.5.31 to 29.7.31	4.8.31
086 †† <i>Oreoma</i> ...	Benson, E. W. ...	W. J. Rutter, G. H. Pilling.	"	" " ...	" " 10.3.31 to 18.5.31	28.5.31
087 †† <i>Orduna</i> ...	Ridyard, A., O.B.E. ...	T. J. Naylor, R. F. A. Cox, E. B. James.	"	" " ...	" " 10.1.31 to 23.3.31	2.4.31
258 *† <i>Oregon Star</i> ...	Lewis, G. ...	E. T. Blaxland ...	No. M.	Blue Star ...	" " 17.2.30 to 16.5.31	9.6.31
171 †† <i>Orford</i> ...	Owens, A. L., Commr., R.D., R.N.R.	B. W. Gorman, B. H. Jones, C. H. Denton.	" M.	Orient ...	Forms 911 & 138 17.2.30 to 16.5.31	9.6.31
174 †† <i>Ormonde</i> ...	James, L. V., D.S.C.	T. L. Shurrock, N. Smith, C. Blake.	W.T.	" " ...	" " 29.3.31 to 1.7.31	9.7.31
172 †† <i>Cronsay</i> ...	Cameron, E. P., R.D., Commr., R.N.R.	E. M. Mackay, D. Madeley	"	" " ...	" " 3.5.31 to 25.5.31	4.6.31
173 †† <i>Orontes</i> ...	O'Sullivan, F. R. ...	J. M. Swanson ...	No. M.	Orient ...	" " 19.5.31 to 7.6.31	13.6.31
105 †† <i>Orsova</i> ...	Thorne, G. G., R.D., Commr., R.N.R.	R. B. Stannard ...	W.T.	" " ...	" " 27.4.31 to 26.6.31	5.8.31
237 *† <i>Otaki</i> ...	Maltby, T. L. ...	A. V. Pearce, N. Baddeley, J. H. Underwood.	M.L.	New Zealand S.S. Co.	Form 915 31.8.30 to 6.2.31	17.2.31
Pacific Enterprise, M.V. ...	Newman, G. W. A. ...	C. G. White ...	No. A.	Furness Withy ...	Form 911 9.4.31 to 1.7.31	16.7.31
279 *† <i>Pacific Exporter</i> ...	Holland, C. E., R.D., Commr., R.N.R.	A. L. Knapp ...	W.T.	" " ...	Forms 911 & 138 13.3.31 to 4.6.31	8.6.31
Pacific Shipper, M.V. ...	Goodwin, J. ...	S. Porter ...	No. A.	" " ...	Form 911 24.2.31 to 28.5.31	2.6.31
Paneras ...	Barlow, F. P. ...	L. A. Sayers, S. Adams ...	M.L.	Booth ...	Form 915 9.2.31 to 16.7.31	29.7.31
Paroera ...	Evans, J. O. ...	C. Parry ...	No. A.	" P. Steamers, Ltd.	Form 911 15.7.30 to 6.8.30	23.9.30
Paris ...	Hill, A. ...	T. Mahoney ...	C.C.	Southern Rly. ...	Telegraphic Report. 14.5.31	14.8.31
Patia ...	Sapsworth, S. A. ...	R. O. Laycock, R. S. Howlett.	No. A.	Elders & Fyffes ...	Form 911 15.6.31 to 18.7.31	22.7.31
Patrician ...	Low, J. ...	W. E. Williams ...	" M.	Harrison ...	" " 3.2.31 to 23.4.31	12.5.31
Paisander ...	Findlay, J. ...	C. T. Morgan ...	" A.	A. Holt ...	Form 911 3.2.31 to 23.4.31	12.5.31
058 †† <i>Pennland</i> ...	Making, V. L. ...	J. C. Flett, C. Otterson, Cross	W.T.	Red Star ...	Forms 911 & 138 6.7.31 to 25.7.31	27.7.31
204 *† <i>Peshawar</i> ...	McBryde, A. M. ...	D. Meikle, J. T. Sheffield, T. E. Wrigley.	M.L.	P. & O. ...	Form 915 1.2.31 to 16.6.31	24.6.31
238 *† <i>Plako</i> ...	Aslin, E. P. C. ...	A. D. Wilson, A. W. Marshall, R. H. Carter.	No. M.	New Zealand S.S. Co.	Forms 911 & 138 11.6.31 to 30.7.31	13.8.31

## LIST OF VOLUNTARY OBSERVING SHIPS

vii

Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Record Contributed. Received up to 14.8.31.	Date Received.
039 *† <i>Planter</i> ...	Packe, M. G. ...	W. S. Eustance, J. J. Devereux, W. H. Slaughter.	No. M.	Harrison ...	Forms 911 & 138 2.6.31 to 2.8.31	13.8.31
<i>Polyearp</i> ...	Furner, F. S. ...	A. S. Richardson ...	" A.	Booth ...	Form 911 16.2.31 to 26.3.31	13.4.31
255 *† <i>Port Alma</i> ...	Hayter, S. W. ...	G. Dean ...	M.L.	Commonwealth Dominion.	... ..	...
128 *† <i>Auckland</i> ...	Kippins, T. ...	R. Forrest, A. Brown, E. Mickleburgh.	"	" " "	Form 915 14.1.31 to 16.5.31	27.5.31
268 *† <i>Bowen</i> ...	Brown, A. H. ...	F. R. Gorman ...	M.L.	" " "	Form 911 3.1.31 to 28.4.31...	5.5.31
129 *† <i>Campbell</i> ...	Gregory, S. E. A. ...	J. C. Goddard, N. M. Muzzell, C. Midwinter.	"	" " "	Form 915 8.3.31 to 18.7.31	23.7.31
130 *† <i>Caroline</i> ...	Hearn, G. W. ...	V. G. Battle, E. W. R. Young, R. E. Garner.	"	" " "	" 16.12.30 to 23.4.31	1.5.31
131 *† <i>Darwin</i> ...	Lewis, J. G. ...	K. D. Morgan, W. R. Johnson, A. J. Knell.	"	" " "	" 19.10.30 to 22.3.31	1.4.31
132 ** <i>Denison</i> ...	Hall, G. S. ...	A. G. Newbury, R. A. Holloway, H. Duckling.	"	" " "	" 4.11.30 to 10.3.31	1.4.31
133 *† <i>Dunedin</i> , M.V.	Mason, W. S., D.S.C.	H. M. Post, C. A. Hodson, R. W. Chamberlain.	"	" " "	" 7.12.30 to 30.3.31	9.4.31
<i>Fairy</i> ...	Farmar, F. ...	J. Stannard, W. G. Jones, P. J. Howe.	No. A.	" " "	Form 911 12.4.31 to 30.7.31	10.8.31
<i>Fremantle</i> , M.V.	Gilling, W. ...	" " " " " "	" A.	" " "	" 27.2.31 to 5.2.31	13.4.31
176 *† <i>Gisborne</i> , M.V.	Higgs, W. G. ...	" " " " " "	M.L.	" " "	" 28.1.31 to 20.5.31	27.5.31
135 *† <i>Hunter</i> ...	" " " " " "	G. T. C. Harris, C. K. Townshend, P. A. Munday.	"	" " "	Form 915 13.3.31 to 27.6.31	8.7.31
138 *† <i>Pirie</i> ...	Jack, J. ...	G. W. Horton, H. E. Braine, R. C. H. Webb.	"	" " "	" 6.12.30 to 26.4.31	11.5.31
<i>Wellington</i> ...	Jones, C. N. ...	W. B. Hopkins ...	No. A.	" " "	Form 911 24.10.30 to 12.2.31	16.2.31
106 *† <i>Princesa</i> ...	Friend, A. B. ...	" " " " " "	" M.	Houlder " " "	Forms 911 & 138 2.6.31 to 18.6.31	2.3.31
163 *† <i>Protestant</i> ...	Holden, W. R. F. ...	J. Cooper, J. Holden, H. N. Hardie.	M.L.	A. Holt ...	Form 915 17.5.30 to 30.11.30	2.2.31
<i>Pyrrhus</i> ...	Wilkinson, T. G. ...	J. C. Podmore ...	No. A.	" " " " "	Form 911 9.6.31 to 27.7.31	28.7.31
205 †† <i>Rajputana</i> ...	Jask, H. M. ...	G. A. Wild, D. Buckley, H. V. Williamson.	" M.	P. & O. ...	Forms 911 & 138 22.2.31 to 28.5.31	8.6.31
063 *† <i>Rancher</i> ...	McCullum, J. ...	G. Harvey, C. F. Minshall, A. L. Lewis.	" M.	Harrison ...	" " 30.4.31 to 3.6.31	6.6.31
228 †† <i>Ranchi</i> ...	Brooks, C., D.S.O., R.D., Capt. R.N.R.	T. A. Sergeant, H. E. Holt ...	" M.	P. & O. ...	" " 5.7.31 to 22.7.31	10.8.31
236 †† <i>Rangitane</i> M.V. ...	Holland, E. ...	A. Brown, R. C. Aldridge, C. J. P. Guille.	M.L.	New Zealand S.S. Co.	Form 915 13.2.31 to 28.5.31	2.6.31
257 †† <i>Rangitata</i> M.V. ...	Hunter, J. L. B. ...	J. Oxnard, D. Chadwick, S. Leggett.	W.T.-M.	" " "	Forms 911 & 138 17.1.31 to 29.4.31	16.5.31
240 †† <i>Rangitiki</i> M.V. ...	Barnett, H. ...	H. Hill, L. F. Malcounonne, C. Orutenden.	"	" " "	" " 13.4.31 to 21.7.31	28.7.31
207 †† <i>Ranpura</i> ...	Furlong, G. H. S. ...	G. M. MacLean, R. A. Perry	No. M.	P. & O. ...	" " 18.4.31 to 21.7.31	28.7.31
071 †† <i>Rawalpindi</i> ...	Stringer, O. B. E., R.D., Commr., R.N.R.	H. J. M. Perry, F. G. Davies, D. Wist.	" M.	" " " " "	" " 28.5.31 to 7.6.31	30.6.31
247 *† <i>Recorder</i> ...	Egerton, J. J. ...	G. Morrice ...	" M.	Harrison ...	" " 24.1.31 to 30.4.31	8.5.31
306 *† <i>Reina del Pacifico</i> , M.V.	Roberts, E. ...	E. C. Hicks ...	" M.	Pacific S.N. Co.	Form 911 14.4.31 to 3.6.31	11.6.31
239 *† <i>Remuera</i> ...	Wilde, H. J. ...	A. J. Angell, J. R. Vincent, H. N. Lawson.	M.L.	New Zealand S.S. Co.	Form 915 13.3.31 to 26.6.31	4.7.31
<i>Rhexenor</i> ...	Stout, G. L. ...	J. S. Parry ...	No. A.	A. Holt... ..	Form 911 1.6.31 to 26.6.31...	11.8.31
<i>Rhodesian Trans-</i>	Bowen, A. C. ...	H. S. Butler ...	" A.	Houlder Bros. ...	" 5.4.31 to 5.7.31	30.7.31
<i>Ripley Castle</i> ...	Goodacre, R. W. ...	J. A. Ferguson ...	" A.	Union Castle ...	" " 10.3.31 to 31.3.31	8.4.31
<i>Ross, S.T.</i> ...	Johnson, H. ...	" " " " " "	" A.	W. Grant & Sons ...	" " 10.4.31 to 1.6.31...	9.6.31
<i>Rother</i> ...	Woodhead, T. H. ...	H. Robinson ...	" A.	Goole Steam Shipping	Form 911 27.6.31 to 1.8.31	4.8.31
241 *† <i>Rotorua</i> ...	Lamb, C. B. ...	L. W. Fulcher, K. L. Jones, J. G. Gould.	M.L.	New Zealand S.S. Co.	Form 915 3.4.31 to 22.7.31	29.7.31
062 *† <i>Royal Star</i> ...	Walsh, W. ...	A. F. Day, J. Hoggin ...	No. M.	Blue Star ...	Forms 911 & 138 16.12.30 to 10.3.31	18.3.31
246 *† <i>Ruahine</i> ...	Urquhart, D. ...	A. Hocken, R. Warren, R. Hamilton.	W.T.	New Zealand S.S. Co.	" " 20.12.30 to 6.4.31	9.4.31
300 ** <i>St. Albans</i> ...	Diamond, S. L. ...	F. O. Colvin, C. Stratford, R. Millington.	M.L.	Eastern and Aus-tralian.	Form 915 8.12.30 to 29.3.31	29.5.31
<i>St. Helier</i> ...	Pitman, R. ...	A. C. Ricketts ...	C.C.	G.W. Railway ...	Telegraphic Report 13.8.31	13.8.31
<i>St. Julien</i> ...	Richardson, L. ...	A. E. Ricketts, H. D. Freeman.	"	" " " " "	" " 12.8.31	12.8.31
<i>St. Minver</i> , S.T. ...	Hatton, A. ...	" " " " " "	No. A.	Crampian Steam Fishing Co.	... ..	...
<i>St. Patrick</i> ...	" " " " " "	F. E. Martin ...	C.C.	G. W. Railway ...	Telegraphic Report 10.9.30	10.9.30
038 †† <i>Samaria</i> ...	Malin, R. G., Lieut-Commr., R.N.R.	A. MacKellar, F. G. Watts, J. A. Myles.	W.T.	Cunard ...	Forms 911 & 138 6.7.31 to 24.7.31...	28.7.31
<i>Sardinian Prince</i> ...	Pearson, F. T. ...	G. E. Harris ...	No. A.	Prince ..	Form 911 5.6.31 to 20.6.31	1.7.31
<i>Saxon</i> ...	Jackson, C. R. ...	A. H. D. Cambridge ...	" A.	Union Castle ...	" " 10.4.31 to 1.6.31...	9.6.31
291 *† <i>Scholar</i> ...	Peterkin, A. G. ...	J. Richardson, A. Robertson	" M.	Harrison ...	Forms 911 & 138 20.3.31 to 24.5.31	2.6.31
<i>Scotia</i> ...	O'Neill, J. ...	W. H. Hughes ...	C.C.	L.M. & S. Railway	Telegraphic Report 6.8.31	6.8.31
033 †† <i>Scythia</i> ...	Oram, B. B., R.D., Commr., R.N.R.	F. P. Collins, A. Bridgewater, H. L. Pryse.	W.T.	Cunard ...	Forms 911 & 138 29.6.31 to 17.7.31	21.7.31
211 *† <i>Shropshire</i> , M.V. ...	English, G. L. ...	C. F. Hicks, E. W. Jefferies, D. Hetherington.	M.L.	Bibby ...	Form 915 18.4.31 to 27.6.31	1.7.31
<i>Silksworth</i> ...	Blacklock, G. ...	F. J. Mullett ...	No. A.	R. S. Dalgleish ...	Form 911 22.6.31 to 30.6.31	21.7.31
<i>Somali</i> ...	Kemp, T. H. ...	" " " " " "	" A.	P. & O. ...	" " " " " "	...
<i>Somerset</i> ...	" " " " " "	C. Edgecombe ...	" A.	Federal ...	" " " " " "	...
277 *† <i>Spero</i> ...	Montgomery, H. ...	H. W. Vickers, A. Kirk ...	M.L.	Ellerman Wilson	Form 915 3.1.31 to 21.3.31...	27.3.31
<i>Stephen</i> ...	Jones, W. C. H., R.D., Commr., R.N.R.	J. Whayman, G. H. Daniels	"	Booth ...	" 25.1.31 to 3.6.31	17.6.31
259 *† <i>Surrey</i> ...	Lettington, A. E. ...	R. Rees, D. J. Murray, — Lock, — MacRillican.	"	Federal... ..	" 24.11.30 to 7.4.31	15.4.31
<i>Sutherland Grange</i>	Matthews, S. ...	J. R. Faulkner ...	No. A.	Houlder Bros. ...	Form 911 26.12.30 to 23.4.31	6.5.31
<i>Sylvafield</i> , M.V.	MacDonald, W. ...	J. Johnson ...	" A.	Hunting & Son ...	" 18.5.31 to 20.6.31	24.6.31
<i>Tacoma City</i> ...	Paul, H. ...	H. Small ...	" A.	Reardon Smith ...	" " " " " "	...
299 *† <i>Tactician</i> ...	Trinick, F., O.B.E. ...	E. P. Simmons ...	" M.	Harrison ...	" " " " " "	...
045 †† <i>Tainui</i> ...	McIntosh, A. ...	G. A. Harvey, E. Baker, A. G. Collins.	M.L.	Shaw, Savill & Albion	Form 915 30.1.31 to 15.5.31	23.5.31
081 *† <i>Tairoa</i> ...	Christie, D. ...	M.H. Vincent, T.G. Hardy, E. Potter.	W.T.-M.	British India ...	Forms 911 26.12.30 to 3.5.31	8.6.31
234 *† <i>Taina</i> ...	Harley, G. J. ...	" " " " " "	"	" " " " " "	" " " " " "	...
046 †† <i>Tamaroa</i> ...	Hartman, W. H. ...	L. R. Bull, R. R. Roseman, F. Lutyen.	"	Shaw, Savill & Albion	Forms 911 & 138 18.5.31 to 7.6.31...	13.6.31
264 ** <i>Tanda</i> ...	Pilcher, E. T., Lieut-Commr., R.N.R.	R. Lloyd-Harry, G. C. Smith, B. M. Dun.	M.L.	E. & A. S.S. Co. ...	Form 915 28.2.31 to 23.5.31	23.7.31
165 *† <i>Tantalus</i> , M.V. ...	Melling, C. F. ...	A. C. H. Jones, J. J. Daniell, W. C. Angus.	"	A. Holt... ..	" 2.2.31 to 4.6.31 ...	25.6.31



Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Record Contributed. Received up to 14.8.31.	Date Received
047 *† Taranaki, M.V. ...	Wood, C., D.S.C. ...	R. K. Bolton, R. Bitmead, S. P. Wallis.	M.L.	Shaw, Savill & Albion	Form 915 11.4.31 to 7.7.31 ...	14.7.31
Tarantia ...	Caithness, J. B. ...	J. M. Cherry ...	No. A.	Anchor ...	Form 911 24.6.31 to 15.7.31 ...	5.8.31
Tasmania ...	Williams, J. V. ...	R. J. Coffey ...	" A.	New Zealand S.S. Co. ...	" 2.12.30 to 2.5.31 ...	8.5.31
Tetresias ...	Wilkinson, W. H. ...	F. Stott ...	" A.	A. Holt & Co. ...	" 18.3.31 to 6.6.31 ...	10.6.31
Telamon ...	Brown, R. ...	G. Edge ...	" A.	A. Holt ...	" 26.10.30 to 23.11.30 ...	10.12.30
Tetela ...	Brice, E. H. ...	G. M. Roberts ...	" A.	Elders & Fyffes ...	" 17.6.31 to 17.7.31 ...	23.7.31
Teucer ...	Davies, J. ...	C. C. L'Estrange ...	" A.	A. Holt ...	" 15.3.31 to 7.4.31 ...	1.5.31
Themistocles ...	Young, A. D. ...	... ..	W.T. M.	Aberdeen Common-wealth.	... ..	...
007 *† Thistleleglen ...	Whitfield, G.A., O.B.E.	S. B. Davis, H. B. Meek, G. L. Hetherington.	M.L.	Allan Black & Co. ...	Form 915 12.2.31 to 14.5.31 ...	18.5.31
235 *† Tilawa ...	Coleborn, E. ...	F. R. Kent Langdon, F. Haigh, J. W. Walker.	No. M.	British India... ..	Form 911 18.4.31 to 14.6.31 ...	13.7.31
168 *† Tinhow ...	Chicken, W. E. ...	G. W. Seth, P. Aydon, E. Smith.	"	A. Weir & Co. ...	Forms 911 & 138 28.11.30 to 10.2.31	21.3.31
161 *† Titan ...	Elford, W. J. ...	F. B. Smith, A. K. Sanderson, J. Gould.	M.L.	A. Holt... ..	Form 915 27.10.30 to 24.3.31 ...	2.4.31
244 *† Tongarivo ...	Hamilton, F. S. ...	G. Dibley, D. Baldwin, W. M. Glover.	"	New Zealand S.S. Co. ...	" 22.2.31 to 17.6.31 ...	24.6.31
025 †† Transylvania ...	Bone, D. W. ...	A. Middleton J. A. Lefevre, T. Greene.	W.T.	Anchor ...	Forms 911 & 138 20.6.31 to 10.7.31	13.7.31
288 *† Traveller ...	Barrow, W. T. C. ...	R. Ledger ...	No. M.	Harrison ...	15.2.30 to 11.5.31	18.5.31
Trecarrell ...	Old, E. G. ...	W. E. McEwan, G. A. Solly	" A.	Hain S.S. Co. ...	Form 911 28.3.31 to 29.4.31 ...	19.5.31
242 *† Trematon ...	Cundy, F. ...	J. Jenkyn, C. M. Quick, T. M. Meakin.	M.L.	" " ...	Met. Log. 16.9.29 to 8.3.30...	25.3.30
119 *† Trojan Star ...	Griffin, G. A. ...	A. Emerson, L. S. Hassell ...	No. M.	Blue Star ...	Forms 911 & 138 18.1.31 to 8.4.31...	4.5.31
245 *† Turakina ...	Laird J. ...	A. Weatherall E. G. Williams J. Reeve.	" M.	New Zealand S.S. Co. ...	" 4.3.31 to 12.6.31	17.6.31
276 †† Tuscania ...	Rome, W. B. ...	D. Blair, G. Noble, H. Campsie.	W.T.	Anchor... ..	" 3.5.31 to 24.5.31	27.5.31
167 *† Tyndareus... ..	McClure, W. ...	J. R. C. Evans, W. F. Lockheed, E. B. Sandon.	M.L.	A. Holt... ..	Form 915 23.12.30 to 25.5.31 ...	4.7.31
113 *† Uffington Court ...	Clarke, E. J. ...	T. Glover ...	No. A.	Haldin & Co. ...	Form 911 25.3.31 to 8.6.31 ...	23.6.31
Upwey Grange, M.V.	Goodrick, H. P. ...	P. J. Walker ...	" M.	Houlder ...	Forms 911 & 138 1.5.31 to 20.5.31	26.5.31
292 †† Viceroy of India ...	Thornton, E. J. R.D., Capt., R.N.R.	W. R. B. Noall, C. S. Cooke	" M.	P. & O. ...	" 7.7.31 to 27.7.31...	4.8.31
Vigilant ...	Simpson, E. S. S. ...	J. Wilson ...	" A.	Scottish Fishery Brd.	Form 911 2.7.31 to 30.7.31 ...	4.8.31
206 ** Waitapu ...	Hender, W. H. ...	... ..	" M.	Union S.S. Co. of N.Z.	" 16.11.30 to 10.12.30 ...	28.1.31
283 ** Wairuna ...	Stewart, A. R. ...	J. E. Warwick, C. T. Robb, G. M. Coote.	M.L.	" "	Form 915 4.7.30 to 6.10.30 ...	28.11.30
Warfield ...	Steele, R. ...	J. Gunning ...	No. A.	Union Castle "	Form 911 7.6.31 to 17.6.31 ...	20.7.31
005 †† Warwick Castle ...	Owens, G. ...	P. Clissold ...	W.T.	Union Castle "	Forms 911 & 138 6.6.31 to 26.7.31	28.7.31
060 †† Westernland ...	Trant, A. W. V., O.B.E.	W. L. Wood, J. L. McLaren, G. P. Boyle.	"	Red Star ...	" 19.7.31 to 8.8.31	11.8.31
William Scoresby, R.R.S.	Irving, J. J. C., Lieut. Commr., R.N.	W. A. Ellison L. C. Hill, C. A. Millward.	M.L.	Falkland Islands Government.	Form 915 17.11.30 to 1.4.31 ...	8.6.31
208 †† Winchester Castle M.V.	Gardner, G. F., O.B.E., Lieut.-Commr., R.N.R.	G. F. Moon, A. G. Parey ...	W.T.	Union Castle ...	Forms 911 & 138 2.5.31 to 21.6.31	23.6.31
096 †† Windsor Castle ...	Chave, Sir B., K.B.E.	E. H. Dixey, J. L. Goatley, J. Trayner	M.L.	" " ...	Form 915 20.9.31 to 15.3.31 ...	30.3.31
Worthing ...	Marmery, S. ...	C. Munton, E. Balcombe ...	C.C.	Southern Railway ...	Telegraphic Report 13.8.31 ...	13.8.31
043 ** Zealandic, M.V. ...	Elford, H. C. ...	P. Horwood, J. Thompson, B. Morris.	W.T.	Shaw, Savill & Albion	Forms 911 & 138 16.4.31 to 9.7.31	13.7.31
Zent ...	Moore, J. A. ...	W. Pearce ...	No. A.	Elders & Fyffes ...	Form 911 16.6.31 to 14.7.31 ...	17.7.31
Conway, H.M.S. ...	Richardson, F. A., D.S.C., Commr., R.N.	The Senior Cadets ...	Cadets' M.L.	...	Cadets' Met. Log. 3.5.31 to 24.7.31	1.8.31
Pangbourne Nautical College	Tracy, A. F. G., Commr., R.N.	" "	"	...	Cadets' Met. Log. 26.4.31 to 23.7.31	28.7.31
Worcester, H.M.S.	Steele, G. C., V.C., Lieut.-Commr., R.N.	" "	"	...	Cadets' Met. Log. 8.5.31 to 29.7.31	4.8.31
Abaco ...	...	The Keepers ...	Lighthouse Register.	...	Lighthouse Register 1.7.30 to 31.12.30	22.5.31
Cay Lobos ...	...	"	"	...	Lighthouse Register 1.1.31 to 30.6.31	10.8.31
Double Headed Shot	...	"	"	...	Lighthouse Register 1.1.31 to 30.6.31	10.8.31
Inagua ...	...	"	"	...	Lighthouse Register 15.8.30 to 22.2.31	22.5.31
Sombrero ...	...	"	"	...	Lighthouse Register 1.1.31 to 30.6.31	4.8.31
Watling Island ...	...	"	"	...	Lighthouse Register 1.1.31 to 30.6.31	10.8.31
Cape Pembroke (Falkland Is.)	...	"	"	...	Lighthouse Register 1.1.31 to 30.6.31	13.8.31

LIST OF SHIPS CO-OPERATING THROUGH THE METEOROLOGICAL OFFICE WITH THE MINISTRY OF AGRICULTURE AND FISHERIES (FISHERIES LABORATORY, LOWESTOFT) IN THE COLLECTION OF WATER SAMPLES, ETC.

Name of Vessel.	Captain.	Observing Officer.	Line.	Last Case of Water Samples, Reports, etc., received up to 31.7.31.	Date Received.
Dartan ...	Hannaford, W. ...	W. R. Vaughan ...	Leyland	Water Samples ...	4.7.31
Darro ...	Green, J. ...	J. M. Phillips... ..	R.M.S.P. Co. ...	" " ...	12.6.31
Davistan ...	Trickey, J. ...	F. Steventon ...	Leyland	" " ...	30.4.31
Dorelian ...	Hughan, C. ...	F. R. Hatton ...	"	" " ...	8.6.31
Hildebrand... ..	Buck, R. H., R.D., Capt. R.N.R.	W. H. Cross ...	Booth ...	" " ...	2.7.31
Mercian ...	Hughan, C. ...	W. Parry ...	Leyland	... ..	7.10.30
Nevistan ...	McCormick, J. ...	T. J. Jones ...	"	Water Samples ...	24.4.31

October, M.O., 1931.