Met.O. 814

The Marine Observer

A quarterly journal of Maritime Meteorology

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THE MARINE OBSERVER

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

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Editorial

The completion of the first 15 months of the British Meteorological Office venture into the weather routeing of ships from ashore—which coincides with the writing of this editorial—seems to provide a convenient opportunity for taking stock. What have the results been?

During these 15 months weather-routeing advice from the Meteorological Office at Bracknell has been provided to the Masters of ships on 164 North Atlantic crossings, 61 of which have been eastbound. Ships of 17 different shipping companies have been involved. Seventy-three of the crossings occurred during the winter months, October to March inclusive. These simple figures are interesting in themselves. The fact that 33% of the crossings were eastbound seems to indicate that the Masters and Marine Superintendents of the companies concerned know their Atlantic meteorology and were able to persuade their owners that, although the prevailing North Atlantic wind is westerly, a ship can, on an eastbound passage, get involved in as much unfavourable weather, on occasions, as when westbound—particularly if her speed happens to be similar to that of an eastbound depression. And most of us with North Atlantic experience know the frustration of seemingly interminable easterly winds at times when homeward bound in that ocean.

The figures also tell us that there is not much difference between the number of crossings involved in winter and those in summer; it works out at about twelve a month in each case. About 15% of the crossings were of ships going to and from the Caribbean. The average resultant steaming time of the ships which were routed was 236 hours (about ten days) so that on the average it can be said that we have four ships on the North Atlantic being routed at any one time. The weather-routeing team are on duty from 0800 to midnight, seven days a week, on a 'watch' system. They are generally kept pretty busy, both with the routeing itself and with preparing the 'hindcast' charts and other statistics for the information of the owners and Master of each ship at the completion of a routed passage. The team, consisting of three meteorological and two Nautical Officers, has now acquired a considerable amount of experience and expertise in this weather-routeing business, and there is no doubt that they could easily provide routeing facilities to many more ships if the need arose. One might say that the weather-routeing team have, in effect, between them, experienced the meteorological conditions of over 160 trans-Atlantic crossings with none of the accompanying discomforts or pleasures, as the case may be—and have thereby acquired experience that an officer serving in an average North Atlantic cargo ship would take about seven years to accumulate!

On nearly every occasion one of the Nautical Officers has had a personal interview with the Master, either aboard his ship or at Bracknell, before routeing his ship for the first time and has, as a result of studying her deck logbooks, been able to prepare the necessary curves showing the ship's speed performance in waves of various heights and to get from her Master other data about the ship herself and her likely cargoes and sailing draughts. Initial routeing advice is given by telephone or by signal before sailing, followed up by radio advice as and when necessary, but at least every 48 hours. Each routed vessel is given individual attention by the routeing team throughout the passage. On completion of every crossing a letter has been sent to the Master and shipowner giving any details of the routeing and accompanied by a chart showing the ship's position each day on the route she was advised to take and the position where it is estimated she would have been had she followed the route normally taken. The ship's positions on the advised route are taken from her radio weather messages and those on the comparison route are estimated from a study of the wind and wave conditions taken from the synoptic weather charts. A specimen of one of these 'hindcast' charts is shown in Fig. 1. As the ship in question was carrying racehorses on deck it was important that she avoided very heavy weather. The Master commented in a letter, "The horses arrived in very good condition . . . the weather-routeing advice received was of great value".

The communication arrangements between the routeing team and the ships, after some initial teething troubles, seem to be working smoothly apart from the occasional delays due to unavoidable propagation difficulties. To make sure that the ship does get each message, special arrangements have been made whereby routed ships call Portishead Radio daily at 1150 and 2100 GMT to find out if there is any routeing message for the ship. This seems convenient for the radio officer and he can, of course, clear a radio weather message ashore at the same time. Routeing messages are also included in the appropriate traffic list broadcast by Portishead. For this particular purpose the evidence is that the cessation of the area reporting system for British ships has made it somewhat easier to ensure that this scheme works smoothly.

From the shipowner's point of view it seems that the aim of weather routeing should be to ensure that when the ship is at sea she does the quickest and most economical passage with the least risk of damage to herself and her cargo; in short, the aim is to achieve prompt delivery of cargo with the minimum of handling charges. The more cargo the ship can carry and the more voyages she can make during the year the better return the owner will get for his investment. If weather routeing can help to achieve this, it has served its purpose. It is difficult to arrive at any exact figure as to the success of this project, but a system has been evolved whereby the ship's actual performance on the advised route can be compared with her estimated performance on the route her master would normally have followed, termed the 'comparison route'.

As from 1st September 1968 a tabular statement has been prepared by the routeing officers for every routed ship at the end of her voyage; specimen extracts are shown in Table 1.

Table 1. Summary of ships routed westbound in April 1969

	Geog. Distance	Weather Distance	Effective Distance	Steaming Time (hrs)	Gen. Av. Speed	Time Saved (hrs)
Liverpool to Kingston, Jamaica (Service speed 16 kt)	Advised route					
	4,299	+360	4,659	288	14·92	12
	Comparison route					
	4,429	+417	4,846	300	14·73	
Dublin to New York (Service speed 16 kt)	Advised route					
	2,961	+217	3,178	227	13·04	3
	Comparison route					
	2,991	+229	3,220	230	13·00	

In this table 'weather distance' may be defined as 'the difference between that actually covered by a vessel in 24 hours and the distance she would have covered had there been no speed reduction due to bad weather—i.e. at full service speed'. Weather distances are normally calculated for each 24 hours for the crossing—on the 'comparison' routes from data derived from the surface synoptic weather charts and on the 'actual' routes from the radio weather messages received from the routed ship. The figures for time saved on each passage is derived from the difference between the steaming time of the actual and comparison routes.

During the period September 1968 to May 1969 inclusive, the summarized results for all routed ships, derived from those tables, are given in Table 2.

One might say that on westbound passages an average saving of about 3 hours is not spectacular but it is nevertheless significant and could help a ship to keep to a schedule, which may result in a saving of stevedores' waiting time. Even in a British port a saving of an hour's waiting time for five gangs would more than pay for the

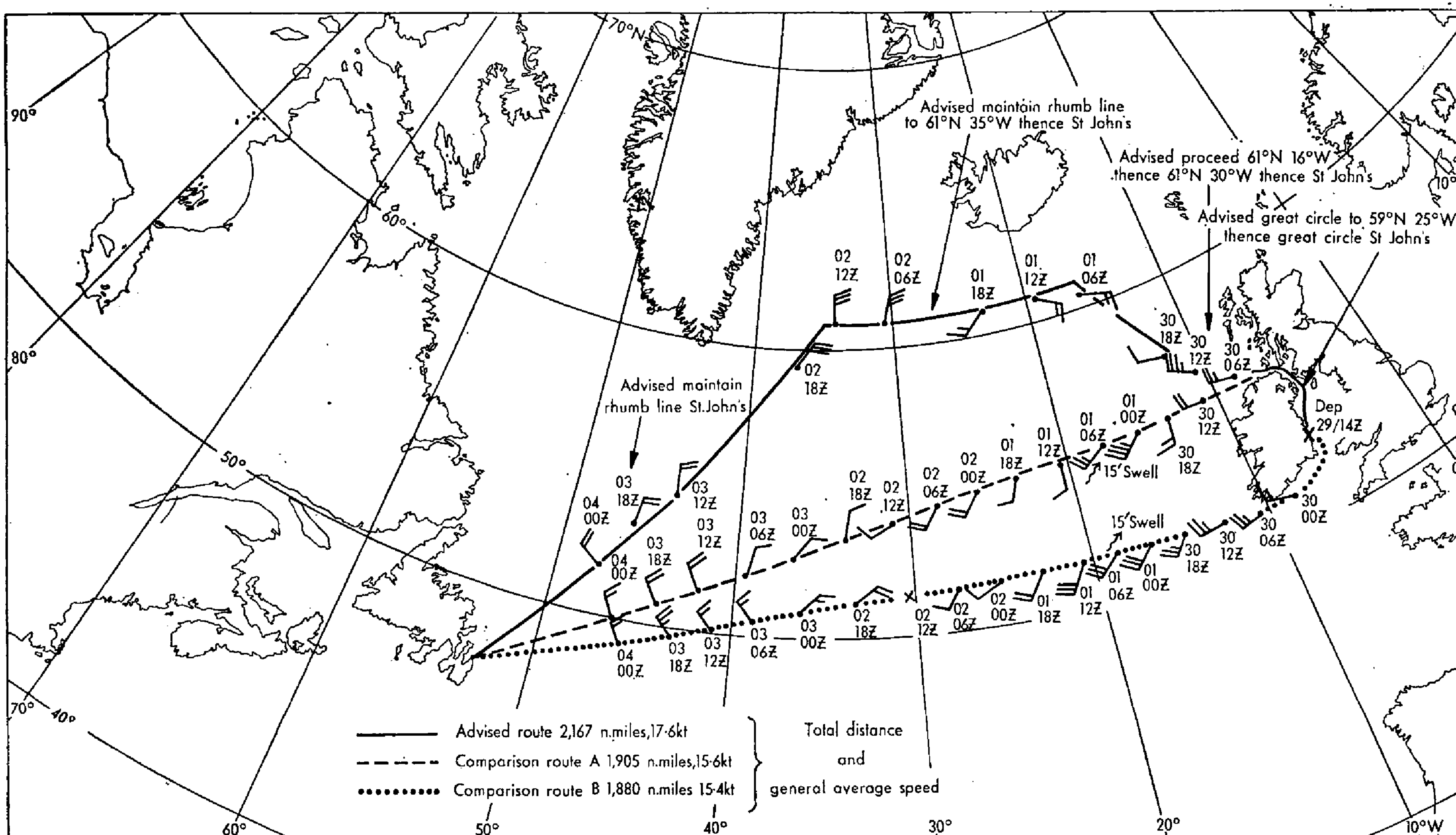


Fig. 1. Specimen of weather-routeing hindcast chart, Dublin to St. John's, Newfoundland, 29th September to 4th October 1968. (The comparison routes A and B are the great circle routes via Istrahull and Fastnet respectively.)

Table 2. Summarized results for all routed ships, September 1968 to May 1969 inclusive

	Westbound—61 crossings			Eastbound—43 crossings		
	Total Geog. Distance	Total Weather Distance	Total Time Saved	Total Geog. Distance	Total Weather Distance	Total Time Saved
Advised routes	203,663	+11,896 or 5·8%	181 hours =3 hours per crossing	132,337	+3,618 or 2·7%	17½ hours =0·4 hours per crossing
Comparison routes	200,933	+17,098 or 8·5%		103,943	+5,276 or 4·5%	

£50 that the shipowner has to pay for his ship to be weather routed on any particular passage.

That the total geographic distance covered by all advised routes exceeds that of the comparison routes seems pretty clear evidence that the shortest route across an ocean is not necessarily the quickest or the smoothest. This does not mean that all the advised routes during the period in question were the longer. The figures show that on 21% of the westbound passages the advised route was the shorter, while on 24% the distance was the same as on the 'comparison' routes; on eastbound passages these figures were 14% and 40% respectively. During the period there were three occasions when the geographical distance on the advised route exceeded that of the 'comparison' route by more than 300 miles.

The weather distance figures give a rough and ready indication of the advantage gained by weather routeing in the avoidance of the worst of the weather, which really means the avoidance of areas of high waves—the greater the weather distance the worse the weather—and it can be seen that in all cases the advised routes suffered least. This implies that weather routeing did, in general, achieve its purpose.

The economic advantages that weather routeing can offer in providing smoother passages for a ship, apart from a saving of time, are appreciable. The modern trend of increasing the size and speed of ships does not save them from pounding or slamming or occasional structural damage on deck in heavy weather. A report from *Lloyd's List* of marine casualties, picked at random, reads "Arising heavy weather . . . numbers 2, 3, 4 and 7 hatches, side stringer angle with main deck plating fractured . . . numbers 2, 3, 6, 7 and 8 hatch corner structures variously fractured . . .". Quite an expensive repair job. The Marine Superintendent of one company, whose ships have been regularly routed during the year, reports that the first of these ships to be dry docked reversed a previous trend by showing no bottom damage; this seems to imply a probable saving of several thousand pounds.

There is always a risk, in heavy weather, of direct or indirect damage to cargo in the ship's hold and the significance of heavy weather damage to deck cargo assumes a new importance now that so many containers are carried on deck—often in three tiers. A report from a New York underwriter a few months ago showed that there have been an appreciable number of claims for damage and loss of containers on deck due to the motion of the ship in very heavy weather.

In some cases the routeing advice may result in the ship having a smoother passage than on a more direct route, but arriving somewhat later owing to the greater steaming distance. Occasionally, when there is a wide band of adverse winds across the ocean, it is almost impossible to select a route to avoid all high waves.

Letters from the Masters of ships which have been routed are, perhaps, evidence of the beneficial results:

"In general my opinion of this service remains as in my previous report; I have the highest regard for it and would like to see its use being continued in the future."

"Many thanks for another highly successful routeing. Although we were way up north the weather was remarkably good, while to the south the picture was very different."

"There is no doubt that the over-all picture made up from forecasts and warning of adverse conditions, together with the routeing advice offered, constitute a valuable aid to vessels trading in the North Atlantic."

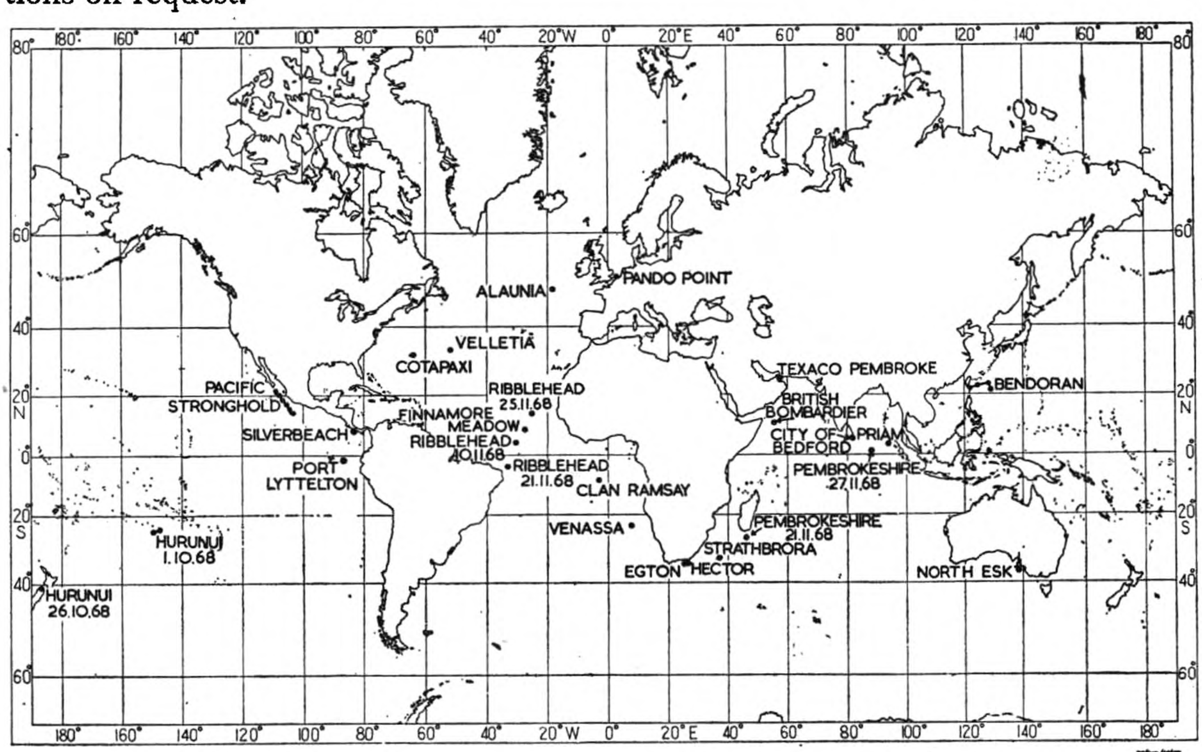
"Although no time was saved on this particular voyage the advice and details obtained through this very excellent service must surely provide the shipmaster with the best means of making a speedy and safe voyage."

C. E. N. F.

October, November, December

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

Observing officers are reminded that preserved samples of discoloured water, luminescent water, etc. considerably enhance the value of such an observation. Port Meteorological Officers in the U.K. will supply bottles, preservative and instructions on request.



Position of ships whose reports appear in "*The Marine Observers' Log*"

HURRICANE 'REBECCA'

Eastern Pacific Ocean

s.s. *Pacific Stronghold.* Captain H. J. Pirie. New Westminster, B.C. to Panama. Observers, the Master and all officers.

The following comments have been extracted from the ship's meteorological logbook:

7th October 1968

GMT

1500: Position of ship 22° 00'N, 109° 10'W. Course 125° at 15½ kt. Course altered to 180° in order to avoid track of tropical storm Rebecca.

1800: Position of ship 21° 16'N, 109° 06'W. Resumed course 130°. Reported position of storm centre by San Francisco Weather Bureau, 16° 12'N, 101° 30'W, with an estimated movement NW at 5 kt. No indication of storm on the barograph trace.

8th

0815: Position of ship 18° 48'N, 106° 04'W. Course 130° at 15½ kt. Large mass of cloud observed ahead. The sky partly covered by C_H5 cloud formed in long, lenticular bands radiating outwards from the cloud bank. A very faint halo observed round the moon. Wind N, force 3. Bar. steady.

1300: Position of ship 18° 12'N, 105° 19'W. Wind veered sharply to ENE, force 8. Torrential rain with thunder and lightning. Radar showed heavy rain pattern lying WNW/ESE at right angles to the wind.

1315: Wind decreased and backed rapidly to NW, force 3. From information received in weather forecasts the storm centre was bearing NE at a distance of 145 miles.

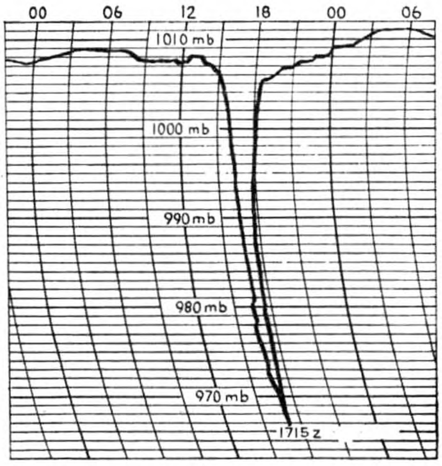
1400: Position of ship 17° 54'N, 104° 53'W. Course 130° at 15½ kt. Wind veered to NE, force 7. Short, steep ENE'ly swell. Pressure 1005 mb. Cloud C_L7 forming rapidly.

1500: Position of ship 17° 42'N, 104° 42'W. Wind backed slowly to NE'N and increased to force 10. Swell confused, mainly ENE'ly. Heavy seas. Pressure 997 mb, falling rapidly.

1600: Wind backed to NW'N, force 11. Torrential rain, causing visibility to fall to less than 220 yd. Swell very steep and confused. Heavy seas. Pressure 976 mb.

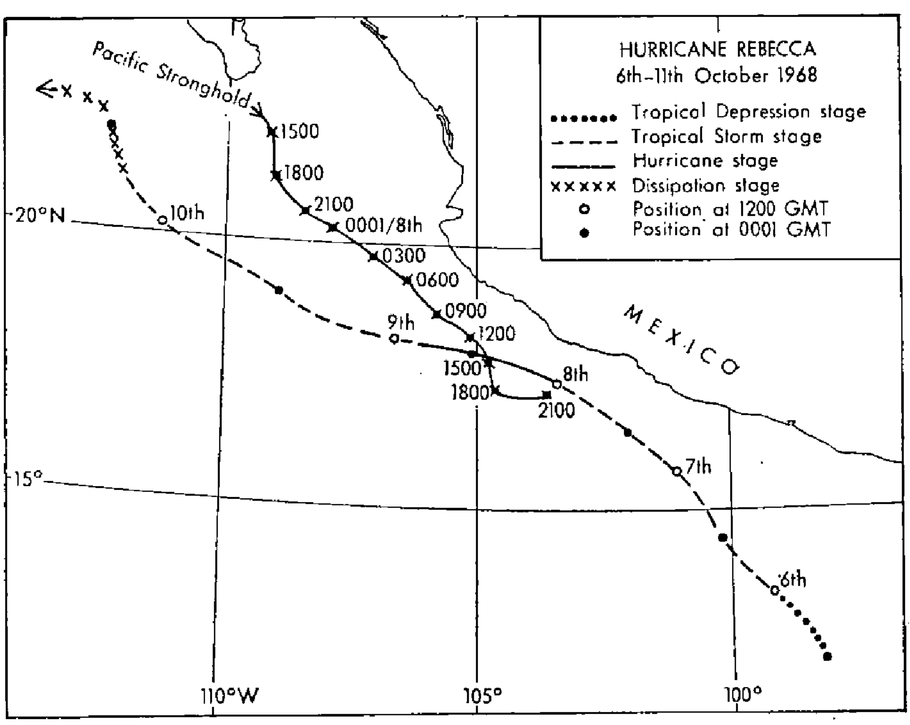
1700: Wind NW, force 12. Speed estimated to be 90–100 kt, based on the knowledge that the radar scanner is certified to revolve in winds up to 80 kt and it failed to revolve. Pressure 968 mb. Wind started to back rapidly.

1715: Sky lightened, wind eased slightly and visibility improved to more than 550 yd. The sun was seen through a temporary break in the clouds which appeared to be swirling in an anticlockwise direction. Seas highly confused and precipitous. Pressure 965 mb.



1720: Wind increased again to force 12, backing rapidly. Torrential rain from heavily overcast sky and driving spray reduced visibility to less than 55 yd. Bar. rose very rapidly.
1735: Wind steady s'ly, force 12. Pressure 998 mb.
1800: Position of ship 17° 18'N, 104° 36'W. Wind continued to back, still force 12. Visibility nil.
1830: Wind steadied to SE's, force 10. Visibility improved as the rain eased slightly.
1845: Wind steady SE'ly, force 8. Visibility over 2,200 yd. Bar. rising steadily.
1900: Wind eased to SE, force 5. Precipitation eased to fine drizzle.

The forecasts of the storm's position, we believe, were taken from satellite observations. It was not anticipated we should pass so close to the eye of the storm. From the alteration of course to starboard we expected to pass well clear to the south. Apart from the cloud formation at 0815 on the 8th, we had no real indication that we would pass so close and it was only at 1400, when the wind veered sharply to the NE and increased, that we realized we would pass very near the centre. At 1922 the Radio Officer transmitted a plain language message to San Francisco Weather Bureau giving the estimated position of the storm, wind speed and bar. reading at its lowest position. This was also transmitted to OBS CQ. We were pleased to observe that in the next weather bulletin from San Francisco the storm was re-classified to Hurricane and that the details we had transmitted earlier were included.



Note 1. Dr. G. P. Cressman, Director of the United States Weather Bureau comments:

"The reports from the *Pacific Stronghold* were the principal basis for the estimated central position and maximum winds of Hurricane Rebecca at 1800 GMT on 8th October, as reported in the 2100 GMT San Francisco advisory with mention of the ship's name. As surmised by Captain Pirie, the estimated positions for the centre at both 0600 and 1200 GMT map times were extrapolations from a 2156 GMT satellite fix of the preceding day. The reports from the *Pacific Stronghold* were also used in the preparation of the annual tropical cyclone report for the eastern North Pacific published in the *Mariners Weather Log*, and are being used in continuing studies of this hurricane.

"Our services to mariners are greatly dependent upon the conscientious reporting of weather, particularly with regard to hazardous conditions.

"We are grateful to Captain Pirie and his officers for these vital observations."

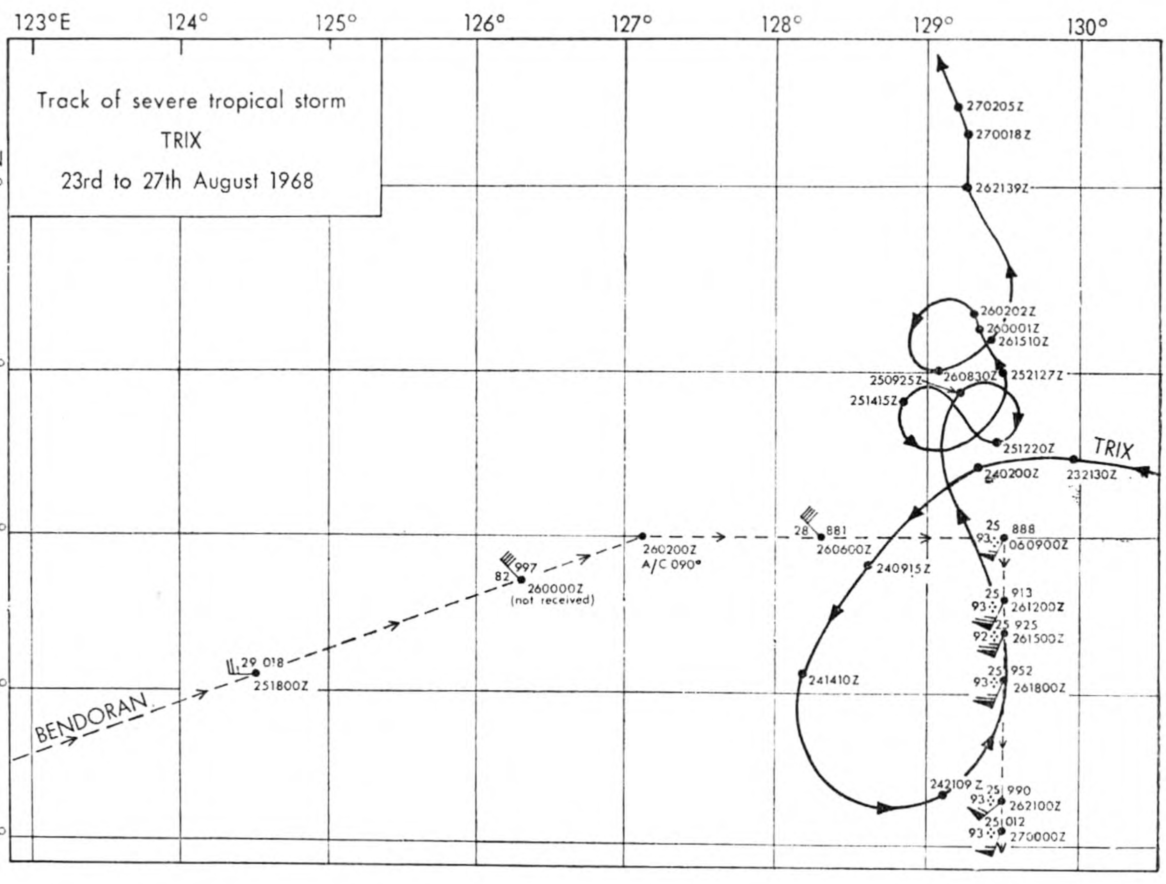
Note 2. In addition to the annual report mentioned by Dr. Cressman, the *Mariners Weather Log* of March 1969 also published a short item headed "*Pacific Stronghold* pinpoints Hurricane Rebecca". After paying tribute to the useful observations from the ship, the Editor goes on to say: "It is gratifying to realize that even today, with the increased satellite coverage available to meteorologists, merchant-ship observations have not lost their significance. That which is observed from above a storm will assist, but can never replace, that which is encountered from within a storm."

TROPICAL STORM 'TRIX'

Western Pacific Ocean

s.s. *Bendoran*. Captain R. Griffiths, Hong Kong to Yokohama. Observers, Mr. J. Fleming, 1st Officer, Mr. N. M. Wight, 2nd Officer, Mr. D. Duncan and Mr. A. Begg, Cadets.

A report for 25th–27th August 1968 from the *Bendoran* on tropical storm Trix was published in the July 1969 number of *The Marine Observer* and was forwarded to the Royal Observatory, Hong Kong. Before commenting on the report, the Marine Liaison Officer waited for the return of the *Bendoran* to Hong Kong in order to consult the Master and, unfortunately, the following chart and notes were received too late for publication in July.



Note. Mr. W. P. Goodfellow, Marine Liaison Officer at the Royal Observatory, Hong Kong comments:

"As a result of my visit to the *Bendoran* on 24th May, Captain Griffiths has authorized me to ask you to amend the entry for 0001 GMT on the 26th to read:

'Position of ship: 23° 42′N, 126° 18′E. Course 070° at 17·5 kt. . . . At 0200 vessel altered course to 090° on hearing reports that tropical storm Trix was apparently stationary approx. 80–90 miles to the north-east.'

"These corrections were made by Captain Griffiths and his 2nd Officer after reading the extract from the meteorological log and consulting the chart which was used last August. Captain Griffiths was most emphatic that he did not alter course until 0200 and at that time Trix was to the north-east of him, not north.

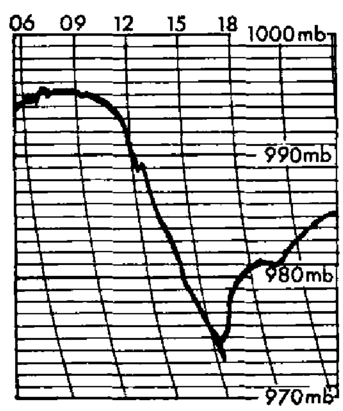
"I did not ask him how far the ship was from the D.R. position when he got sights on 27th August but, in discussion, he told me that although he was using revolutions for 12 kt to maintain steerage way after 0900 on the 26th the ship was making very little, if any, headway. The wind was such that it took the paint off the funnel and off the boats on the starboard side, so it seems probable that the positions in his 1200, 1500, 1800 and 2100 reports credit him with too much progress to the south. This would help to account for the prolonged duration of the hurricane-force winds in a storm which was not thought to have reached typhoon intensity, but which certainly had a sting in its tail."

DEPRESSION

North Atlantic Ocean

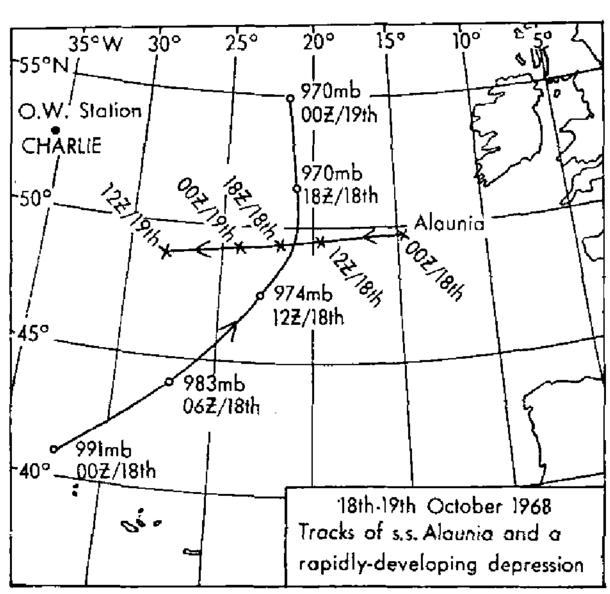
s.s. *Alaunia*. Captain J. R. Lidgey, D.S.C., R.D., R.N.R. Le Havre to New York. Observer, Mr. A. K. Davies, 2nd Officer.

18th October 1968. Between 1235 and 1535 GMT the barometer fell 15·5 mb (sometimes at the rate of 1 mb in 5 min) to 973·5 mb and then rose just as rapidly to level off at 981 mb. The vessel was in an area forecast as a complex low pressure system and this affected the whole of the area covered by the Atlantic Weather



Bulletin. However, there was no pressure centre in the vicinity of the vessel given as low as 973 mb, the main centre being given near ocean weather station 'Charlie', some considerable distance away. Ship's course 262°, speed 16½ kt. At 1200: Air temp. 56°F, wet bulb 54·5°, sea 56°. Wind S'W, force 7. Continuous moderate rain.

Position of ship: 49° 42'N, 19° 48'W.



18th-19th October 1968
Tracks of s.s. *Alaunia* and a rapidly-developing depression

Note. The fall of pressure of 15 mb in 3 hours is not exceptional since the *Alaunia* was moving towards a fast-moving and rapidly-deepening depression. However, the localized rate of fall of 1 mb in 5 min is a rare occurrence in these latitudes.

The depression developed during the morning of 18th October. At the time that the Atlantic Weather Bulletin was prepared (based on the 0001 GMT chart) the depression was merely a weak feature near the Azores and there was little evidence to suggest that it would deepen by 21 mb in the following 18 hours and during that time would have moved NE then NNE at about 40 kt. It is a pity that the observations made aboard the *Alaunia* during this period were not transmitted.

UNUSUAL PRECIPITATION

North Atlantic Ocean

m.v. *Finnamore Meadow*. Captain J. A. McCulloch. Immingham to Vitória, Brazil. Observers, the Master and all officers.

25th December 1968. The ship now being in the latitude 5°N, tropical weather had been enjoyed by the good crew for many days. During this day, fearful happenings occurred which the chronicler will make no attempt to explain. Half-way through the middle watch some violent force uplifted a table on the boat deck and sent it and the things upon it crashing to the deck. The ship was not rolling nor did the officer of the watch observe or hear any violent wind squalls.

During the forenoon numerous snow flurries fell in a small area on the starboard side of the boat deck. The area was confined to a space the size of two tables. It should be recorded that this snow, having settled, did not melt despite a temp. of 81·9°F. Further, this phenomenon is not the result of a report by one half-tipsy seaman but rather of the Captain and all the officers who were gathered there. It was seen that this snow had lain on a vertical surface in near-human lettering. Even the apparatus kept on the boat deck for the removal of fumes from the boilers was not spared. This snow required a strong hose of water to remove it. No officer reported any sign of wind until much later when considerable hot air was flowing.

A further occurrence, not directly connected but possibly emanating from the same 'spirit', was the movement of Sirius in a direction away from Orion, only to return when looked at slyly.

The officers of the ship are continuing with the voyage as they have a fear of water. They hope that the spirits involved are good, and, by frequent meteorological returns, could improve their lot.

N.B. The following day an empty aerosol can of Instant Snow was found discarded in the scuppers which leads us to believe that the above happenings were the work of a prankster and that little value should be placed on this report.

Position of ship at 1200 GMT: 7° 36'N, 27° 48'W.

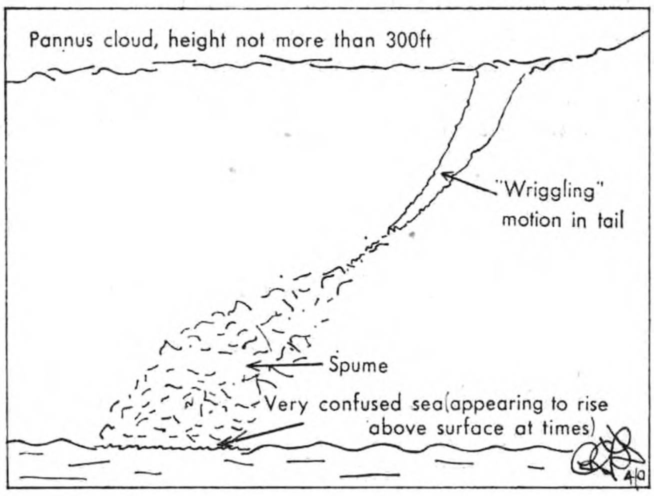
WATERSPOUTS

North Sea

s.s. *Pando Point*. Captain B. S. C. Mordaunt. Durban to Hamburg. Observer, Mr. C. G. M. Dale, 4th Officer.

26th December 1968. At 1015 GMT there appeared to be a cloud of smoke on the horizon but as it drew closer it was seen to be a small waterspout. It was picked up on the radar and observed to be travelling SSE at 31 kt. A second waterspout followed not more than 2 miles behind the first and was thought to be in the process of formation. This was confirmed by the turbulence becoming more and more pronounced until a distinct 'tail' was observed falling from the cloud. When the spouts were about 4 miles astern, but still visible, the vessel passed into a heavy hailstorm with hailstones approx. ¼ inch in diameter. Air temp. 40°F, wet bulb 37°. Wind NNW, force 7. Weather overcast with frequent hailstorms and snow flurries.

Position of ship: 51° 59'N, 02° 30'E.



Note. The fact that hailstones were reported indicates that Cb clouds, with which the reported pannus was associated, were present in the cold NNW'ly airstream. These clouds form when the atmosphere is very unstable and strong convection results and these are the conditions under which waterspouts develop.

EXCEPTIONAL VISIBILITY

Gulf of Oman

s.s. *Texaco Pembroke.* Captain J. W. Cook. Ra's Tannūrah to Europort. Observers, Mr. G. Hay, Chief Officer and Mr. M. W. Farrow, 3rd Officer.

28th November 1968. At 0500 GMT, when the vessel was 33 miles south of Ra's-e Jāsk visual bearings were obtained of Zangīak and Gūh Kūh mountains, the furthest of which was 75 miles to the NE. At the same time the Jabal al Akhdar range (highest peak, Jabal Sham, 10,190 ft) was visible some 120 miles to the south. Visibility remained good throughout the day and at 1320 Jabal Bardah, 1,349 ft, just south of Muscat, was visible at over 50 miles. At 0600: Air temp. 78·6°F, wet bulb 72·8°, sea 80·9°. Wind W'S, force 2.

Position of ship: 25° 06'N, 57° 39'E.

Note. In November the atmosphere is usually very clear in the Gulf of Oman. Nevertheless it is likely that abnormal refraction contributed to the exceptional visibilities reported.

STRONG CURRENT SET

South Pacific Ocean

m.v. *Hurunui.* Captain S. G. Robinson, M.B.E. Balboa to Auckland. Observers, the Master and Mr. M. J. Sutherland, 3rd Officer.

1st October 1968. Between 2100 and 2230 GMT, whilst the vessel was passing to the south of Île Tubuaï, it was found that the vessel was setting appreciably in a N'ly direction and it was necessary to apply 6° to counteract the set. The vessel was steering 259° on automatic pilot at the time and maintained correct course both before and after this occurrence. Positions were frequently ascertained by visual bearings and radar distances. It was estimated that the current was setting between 300° and 320° at a rate of 3–4 kt. Air temp. 74·7°F, sea 75·3°. Wind ESE, force 5. Heavy SE'ly swell.

Position of ship: 23° 26'S, 149° 04'W to 23° 31'S, 149° 26'W.

ADVERSE CURRENT

South Atlantic Ocean

m.v. *Ribblehead*. Captain J. Parsloe. Vitória, Brazil to Cardiff. Observers, the Master and Mr. C. R. Ingham, 2nd Officer.

21st November 1968. At 0200 GMT, while steering 011° at 11½ kt to pass 10 miles to westward of Fernando de Noronha, a light, apparently flashing white every 5 sec, was observed ahead. As this light did not conform to any listed in the Fernando de Noronha Archipelago and the radar screen was blank on all ranges up to and including 40 miles, the Master was called to the bridge. At first it was thought the light might be a patent warning light sometimes carried by single-handed yachts but this proved unlikely as the light maintained the bearing but did not appear to come any closer. At 0300 the radar picked up Fernando right ahead at 30 miles' range and it became obvious that the vessel had suffered an E'ly set since noon. It was necessary to alter course to 000° and subsequently to 357° to maintain distance off. At 0330 the flashing light had resolved into an alternating white and green light and turned out to be the air light flashing on the peak of Noronha. This air light had shown clearly at 43½ miles, its dipping-light distance for an observer 40 ft high (the light is 746 ft high). The light was still visible at 0800, just before dawn, 25 miles astern. It is worthy of note that even in a clear atmosphere and using binoculars the green element of the light was not distinguishable at more than 25 miles, both flashes appearing to be white, although one was weaker than the other, until we were within that range. At 0600: Air temp. 77·7°F, wet bulb 76·6°, sea 80·1°. Wind SE'E, force 3. Visibility over 27 n. miles.

Position of ship at 0200: 4° 28'S, 32° 44'W.

Note. The *South America Pilot*, Vol. 1, states that easterly sets of up to 1 kt have occurred in November with a frequency of 5% of all observations. From the information given in the report from the *Ribblehead* the easterly set was about 3 kt. This is an exceptionally strong current for this area and, together with the report from the *Hurunui*, serves to indicate the extreme caution which must be observed in the vicinity of oceanic islands.

DISTURBED WATER

Eastern Pacific Ocean

m.v. *Port Lyttelton*. Captain D. Hart. Napier to Panama. Observer, Mr. J. E. B. Simpson, 3rd Officer.

27th December 1968. At 1837 GMT, on course 038°, speed 15 kt, a line of disturbed water was observed running NW/SE as far as one could see on each side of the ship. The line seemed to neatly divide the sea surface in half. The sea temp. was noted to rise from 73°F to 76° after crossing this line. The wind was SE'ly, force 2–3, with waves less than 1 ft and there was a SE'S swell with waves 4–5 ft, period 6–8 sec.

Position of ship: 0° 42'S, 85° 54'W.

BIRDS

North Atlantic Ocean

s.s. *Cotopaxi*. Captain L. W. Cooper, O.B.E. Liverpool to Bermuda. Observer, Mr. P. R. Brown, Chief Officer.

24th October 1968. At 2000 GMT a large bird of prey, which had been circling the ship for some time, settled on the radar aerial. Its body was about 22 inches long and it had a large wing-spread in proportion to the body. The underpart of the body and most of the top part, where visible, were unbroken white. The wings were speckled dark-brown underneath but the top was not observed. It had a dark or black beak, sharply curved and hooked. The head was white with a broad, dark-brown eye stripe. The legs were clad with white feathers and had sharp-toed feet.

Position of ship: 32° 30′N, 63° 50′W.

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

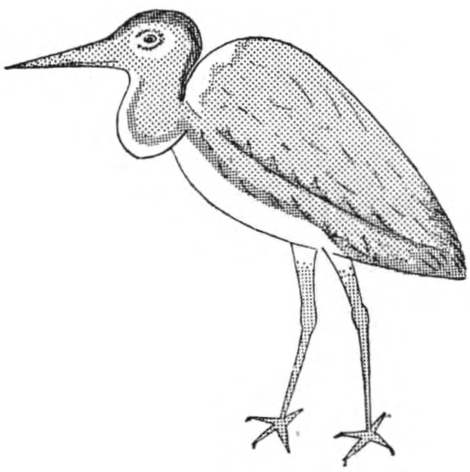
"From Mr. Brown's description I feel sure that this was an osprey for the details provided, bearing in mind that its upper wings were not visible (they are also brown above), conform exactly with that bird.

"We have had one previous report of an osprey on board far out at sea, somewhat south of this report. As ospreys breed on the east coast of North America, from the Gulf of Mexico right up to Hudson Bay, it is certainly quite unusual for them to occur out at sea. They are, of course, entirely fish-eating falcons."

North Atlantic Ocean

m.v. *Ribblehead.* Captain J. Parsloe. Vitória, Brazil to Cardiff. Observer, Mr. W. Barnes, 3rd Officer.

24th–26th November 1968. During the evening of the 24th, while the vessel was approx. 180 miles SW of Cape Verde Islands and 500 miles west of the nearest point on the African mainland, a bird alighted on the deck. It stood 26 inches high and when it extended its neck a further 12 inches could be added. Wing span was approx. 5 ft. It had a light-grey back with dark grey at the tail and on the underside of the wings. The crown of the head and back of the neck were also dark grey, or black, and the breast and front neck were white. The bird remained on board until late afternoon on the 26th. On only one occasion was it seen to catch a fish which it brought back to the ship and, on landing, promptly spat out. Food and fresh water were placed alongside it to entice it to eat but it appeared uninterested.



On the afternoon of the 25th two more birds arrived and alighted alongside the first one. They stayed only a short time before taking off in a NNE'ly direction. They were the same shape but differed in size and colour from the first bird. They were about half the size and, apart from their beaks and legs which were light orange, they were completely white. At 1200 GMT on 25th: Air temp. 79·5°F, sea 79·5°. Wind NE, force 3.

Position of ship at 1200 on 25th: 14° 48′N, 26° 12′W.

Note. Captain G. S. Tuck comments:

"I was most interested to receive this very detailed account and first-class identification sketch. The large bird was undoubtedly the common Heron (*Ardea cinerea*)—the grey heron one sees in England by the riverside. This heron may well have come either from the Cape Verde Islands or the 'bulge' of North Africa where they are resident.

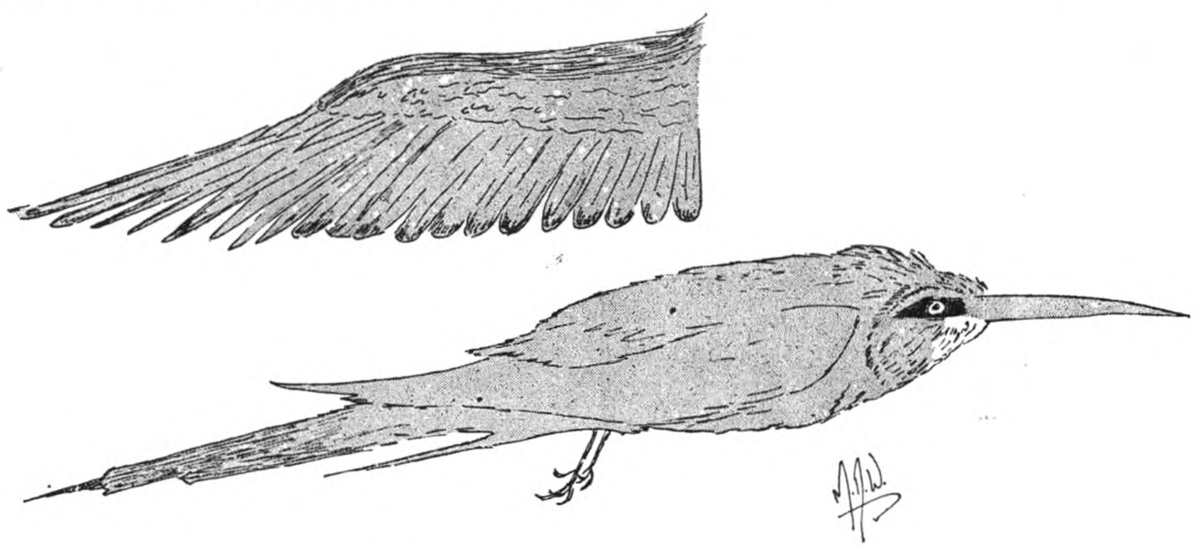
"The other two birds were, I feel certain, Cattle Egrets (*Ardeola ibis*). These white egrets would look about half the size. They are quoted as being 20 inches long but they have short necks which make them appear smaller. In breeding, apart from their yellow bills and brownish-yellow legs, they carry long buff-coloured tufts on crown, back and throat but these ornaments are shed on moult after breeding and they are then (25th November) completely white. Cattle Egrets are resident in North Africa and probably in the Cape Verde Islands. They habitually feed on cultivated fields keeping close to cattle and constantly running after them, picking insects disturbed by the cattle.

"Both species are inland birds of southern Europe (Spain) and North Africa. The herons are also widely distributed throughout Europe and Asia. One cannot guess why these two species occurred so far out at sea unless strong northerly or north-easterly wings had prevailed. The occurrence of both species on board together is most unusual. It is, however, interesting that in quite recent years the Cattle Egret has somehow reached Guyana and has spread north beyond Florida. Nobody knows how it got established there from its sole residence in North Africa and Spain. Once, however, in the RNBWS records, a Cattle Egret came on board a ship 400 miles west of Spain."

Arabian Sea

s.s. *British Bombardier*. Captain A. Derrick. Durban to Kharg Island. Observers, Mr. E. J. Musson, 2nd Officer, Mr. S. J. Bolam and Mr. M. N. Whiteley, Cadets.

8th November 1968. The accompanying sketch is of a bird found on deck by the two cadets when the vessel was about 140 miles SE of Socotra. Mr. Whiteley sketched the bird and Mr. Bolam wrote the description.



The bird was predominantly a very bright green, approximately 10 inches long with a wing span of 16 inches. Its bill accounted for 1½ inches of its length. The bill was slender, sharp and slightly curved. The blood-red eyes were set in a black bar along the side of the head. A hackle of white down surrounded the base of the bill. The head was turquoise-green on top and the throat was rust-brown. The body was green but progressively more brown towards the tail. The breast was distinctly emerald-green and the under sides of the wings were rust-brown. The top sides of the wings, however, were again bright green but had five bottle-green feathers in the middle of each and these were very distinct. The tail was very even, being fan-shaped except for two long feathers which projected from the middle for about 2 inches in a long, slender point. The feet had four long, delicate claws, three pointed forwards and one backwards. Roughly the bird could have been compared to both a Kingfisher and a Green Woodpecker. The bird was caught as it was repeatedly flying into a bulkhead in the dark. It was released the same night and had left the ship by morning.

Position of ship: 10° 28′N, 55° 26′E.

Note. Captain G. S. Tuck comments:

"I was very impressed to receive this observation and excellent coloured sketch. The two cadets who made the report may be interested to know that this was a blue-cheeked bee eater.

There are eight species of bee eater, either common to South Africa or which may winter in South Africa and migrate northwards in the spring. The RNBWS has previous records of these species coming on board ships off the east coast of South Africa.

"I would like to congratulate Cadet Whiteley for the accuracy of his sketch, for the different species are very similar, but the sketch has shown the points of difference and this one was undoubtedly the blue-cheeked bee eater."

ALBATROSSES

South Atlantic Ocean

m.v. *Clan Ramsay*. Captain D. L'Estrange, R.D. Cape Town to Avonmouth. Observers, the Master and Mr. M. R. Garton, 3rd Officer.

18th–23rd October 1968. The vessel sailed from Cape Town on the 18th and the following day it was noticed that two albatrosses were accompanying the ship. One was very much darker in appearance than the other. On the morning of the 23rd the birds had left us. Up to this time the ship had been on a course of 323° at 17 kt and the birds had followed the ship for approximately 1,750 n. miles.

Position of ship at 1200 GMT on 23rd: 9° 04′S, 2° 45′W.

Indian Ocean

m.v. *Pembrokeshire*. Captain R. B. Tiplady. Hamburg to Port Swettenham. Observer, Mr. A. Palmer, Chief Officer.

21st November 1968. When looking around the decks this early morning I found, to my astonishment, an adult Wandering Albatross (*Diomedea exulans*) sitting on the fo'c'sle head. This bird was probably one of five which had been following the ship during the previous day, perhaps the curious individual who had so frequently done some pretty close work. In surprise and eagerness to launch him I regrettably forgot his vital statistics. Having examined the bird and found that injuries were only superficial, he was, without further ado, launched back into his natural element. Not a moment too soon: the Chinese cook appeared on the scene just ten seconds too late, his mind intent on chicken chow mein! At 0001 GMT: Air temp. 67·4°F. Wind SSE, force 5.

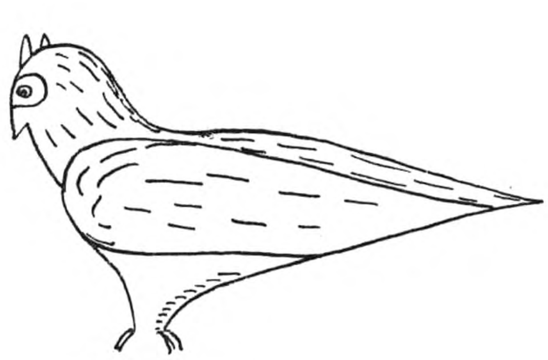
Position of ship: 26° 49′S, 45° 39′E.

OWL

North Atlantic Ocean

s.s. *Velletia*. Captain F. D. Smith. Malmø to Curaçao. Observers, Mr. H. J. Tibbs, 2nd Officer, Mr. P. A. Cocker, 3rd Officer and Mr. J. C. Yates, Snr. Radio Officer.

23rd October 1968. At 1800 GMT an owl arrived on board from an E'ly direction. It experienced some difficulty in landing and made several attempts before eventually settling on the fo'c'sle forward of the windlass. It remained there for over an hour



but, unfortunately, no one saw it depart. The most startling thing about it was its eyes which were a startling yellow colour. This made its gaze seem quite piercing. The head was brown and the wings dark grey and off-white. The underparts of its body were orange/brown. The owl was approx. 18 inches in length and had a wing span of approx. 48 inches. Air temp. 73·2°F. Wind NW, force 4.

Position of ship: 32° 12′N, 51° 17′W.

TURTLE

South Atlantic Ocean

s.s. *Venassa*. Captain M. P. Lee. Kharg Island to Belfast. Observers, the Master and Mr. B. W. Bailey, 3rd Officer.

3rd November 1968. At 1030 GMT, when over 300 miles from the nearest land on a course of 322° at 15½ kt, we passed a turtle swimming in a S'ly direction. Its length was approx. 36–40 inches and it was a green/brown colour. Although a watch was kept for a while no others were sighted.

Position of ship: 22° 43′S, 08° 35′E.

Note. Dr. L. D. Brongersma, Director of the Natural History Museum, Leiden, comments: "The record is extremely interesting, not only because the turtle was observed so far from land, but also because the nearest coast (the Walvis Bay-Swakopmund area of S.W. Africa) is one where turtles do not breed. The Green Turtle (*Chelonia mydas*), the Loggerhead (*Caretta caretta*), and the Leathery Turtle (*Dermochelys coriacea*) have been taken in the Walvis Bay area, but they are considered very rare visitors indeed. The turtle mentioned by Mr. Bailey must have come from a much greater distance than that which separates the position of the ship from the nearest land. A further point of interest is that the turtle was swimming in a southerly direction and, hence, more or less against the current. The observation was made in the southern summer and it may be that a good supply of food in this part of the sea attracted the turtle.

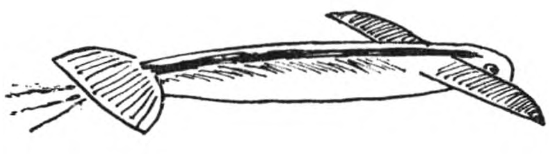
"Most probably the turtle was a Loggerhead; the green/brown colour may have been caused by a film of green algae having developed on the brown carapace. However, the possibility cannot be wholly excluded that a Green Turtle was seen."

FISH

South African waters

s.s. *Hector*. Captain J. Chapman. Fremantle to Cape Town. Observers, Mr. R. H. L. Henry, 2nd Officer and Mr. M. A. Cully, 3rd Officer.

1st December 1968. During the morning, while steaming some 25–30 miles off Port Elizabeth, what were at first thought to be flying fish were observed. It was noticed that, unlike flying fish, they propelled themselves by ejecting water from or beneath the after fin or sac and were capable of flying for long distances. The length of the fish was about 6 inches and they appeared in large shoals, usually of 30 or more. The colouring was similar to flying fish with a dark-brown stripe down the back although at first they appeared to be semi-translucent. The front fins were high up near the eyes while the rear fin was fan-tailed and may have been a sac.



They travelled much faster than flying fish and ejected water at intervals to keep them flying. They were not noticeably affected by the wind and landed tail first. At 1200 GMT: Air temp. 66·2°F, sea 64·1°. Wind SW, force 8.

Position of ship at 1200: 34° 12′S, 25° 54′E.

Note. The above report was sent to the Natural History Museum, together with a copy of the drawing.

DRAGONFLY

Indian Ocean

m.v. *Pembrokeshire.* Captain R. B. Tiplady. Hamburg to Port Swettenham. Observer, Mr. A. Palmer, Chief Officer.

27th November 1968. On this hot, sultry, tropical morning with light winds and considerable rain and more than 500 miles from the nearest land we found a dead dragonfly. Over-all wing span 118 mm, over-all length 88 mm. The wings were transparent except for a small, circular, greenish-yellow patch 5 mm diameter on each rear wing, a third of the wing length from the body. The head was dark-green with a lighter part at the front. The main body was a medium shade of green with bright-blue rump, pink underneath and the tail black with a small, circular, blue patch on each side of each segment but brown underneath. Legs mainly black, brown at the top.

Position of ship: 1° 13′N, 88° 32′E.

Note. Mr. D. E. Kimmins of the Department of Entomology, Natural History Museum comments:

"The dragonfly was probably *Anax guttatus* Burmeister. This species is a strong flier and has a wide distribution in the countries to the north and east of the Indian Ocean."

ABNORMAL REFRACTION

Great Australian Bight

m.v. *North Esk.* Captain R. P. Buckley. Hobart to Ardrossan, South Australia. Observer, Mr. A. F. Thom, 3rd Officer.

15th October 1968. At 1240 GMT (2240 EST) the vessel was in a position with Margaret Brock Reef light bearing 063° at 15·3 miles' distance when Cape Willoughby lighthouse (253 ft, range 22 miles) on the eastern end of Kangaroo Island was sighted at a distance of 93 miles. The vessel's height of eye was 30 ft. The light was clearly visible from 1240 to 1340 except for a short period from 1255 to 1305 when the light faded to a just-visible loom. The light was seen again some time later at a range of approx. 48 miles. The weather conditions at the time were excellent with a small amount of C_L1 cloud present. Wind NE, force 3. Sea smooth with low SW'ly swell.

Previous to sighting Cape Willoughby light, Margaret Brock Reef light itself had been raised at a greater distance than normal.

Position of ship: 37° 04′S, 139° 19′E.

Note. The *North Esk* is an Australian observing ship. When forwarding the above report, Mr. A. K. Hannay, the Regional Director of the Australian Bureau of Meteorology, commented:

"The synoptic chart for 1100 GMT showed a large anticyclone centred about 32°S, 155°E (off the N.S.W. coast about halfway between Pt. Macquarie and Lord Howe Island). The circulation from this high covered most of the eastern continent with a ridge toward Bass Strait. This ridge extended toward the Great Australian Bight although intercepted by a cold front drawn from 35°S, 134°E to 45°S, 137°E. Subsequent analyses proved this to be a very weak front.

"As a result of this pressure pattern the air circulation over the *North Esk*'s position would have been a generally anticyclonic NE'ly stream.

"The radiosonde released from Adelaide Airport at 1100 on the 15th showed a warm air mass with marked stability in the lower levels (up to about 3,000 feet). The temperature about 1,500 ft was 73·4°F.

"The explanation for the abnormal refraction appears to be in the inversion of the temperature lapse rate induced by the flow of warm air over the cooler ocean. The presence of a small amount of Cu cloud is somewhat contradictory under these circumstances."

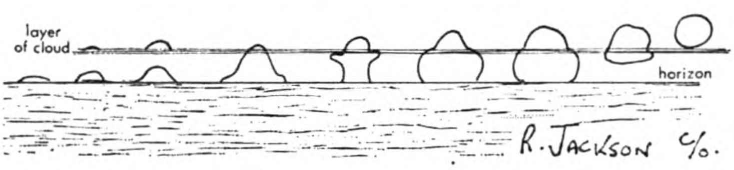
REFRACTED SUNRISE

South African waters

m.v. *Egton*. Captain W. Watson. La Pallice to Durban. Observer, Mr. R. Jackson, Chief Officer.

1st October 1968. An unusual sunrise was observed with two images visible, one on the horizon and one 2–3° above. A layer of stratus-type cloud was visible just above the horizon. Air temp. 59°F, wet bulb 58·2°, sea 60°. Wind ENE, force 2.

Position of ship: 34° 12′S, 25° 36′E.



Note. This display of abnormal refraction occurs when a temperature inversion exists above the sea surface, in this case probably at the height of the stratus-type cloud. The lower image is viewed direct whilst the upper image is viewed after refraction at the level of the inversion.

RAINBOW

Indian Ocean

m.v. *Strathbrora*. Captain J. A. Clifford. Cape Town to Hong Kong. Observers, Mr. C. J. C. Johnston, 3rd Officer and Mr. D. N. Keane, Cadet.

4th October 1968. At 1200 GMT the vessel was steaming through the southern Indian Ocean at 22 kt. The weather was mainly fine with occasional light rain showers. One of these showers was observed fine on the starboard bow at a distance of about 5 miles. A bright-red glow, roughly hemispherical in shape, was seen to rise from the surface of the sea into the rain shower. As the ship approached the shower, further colours of the rainbow were seen to rise from the sea surface to take the form of bands of colour inside the initial red bow. All the bands appeared to be of the same width. At a distance of about 1½ miles the forming rainbow lifted clear of the water and one could see under the arch. The length of the base of the bow was estimated at about 2 miles and altitude of between 12° and 15°. The sun had an altitude of 43°. Air temp. 60·5°F, wet bulb 54·5°. Wind S'W, force 5.

Position of ship: 33° 06′S, 38° 26′E.

Note. Rainbows are observed from the surface only when the sun's elevation is equal to or less than 42°. As the sun's elevation decreases through 42° the rainbow will 'lift' from the surface (red, being the outer colour, will appear first). For the top of the rainbow to be observed at 15° the sun's elevation must have decreased to 27°. In this latitude in October the time interval involved would be around 1¼ hours (the ship's own speed making a difference of only a few minutes). The shower was moving in the same direction as the ship at a slightly-reduced speed. From this report the shower must have existed for at least 1¼ hours, an unusually long time for a tropical rain shower.

CIRCULAR RAINBOW

Bay of Bengal

s.s. *City of Bedford.* Captain A. G. Hine. Aden to Chalna. Observers, the Master and Mr. W. D. Dick, Jnr. 2nd Officer.

22nd November 1968. At 0415 GMT a rain shower from a Cb cloud passed over the vessel from the NE. Just after the rain ceased a circular ring about 60 ft in diameter was sighted beside the ship. This ring had all the colours of a rainbow; in fact it appeared like a circular rainbow in the water. At 0600: Air temp. 84·5°F, wet bulb 77·9°, sea 82·5°. Wind NE, force 3.

Position of ship: 6° 30′N, 81° 54′E.

Note. From an elevated position, in this case the wing of the bridge about 50 ft above sea level, rainbows can be observed with the sun's elevation greater than 42°, providing that the rain producing the rainbow is very close to the ship. Under the right conditions this rainbow will take the form of a complete ring.

COLOURED SUN

New Zealand waters

m.v. *Hurunui.* Captain S. G. Robinson, M.B.E. Anchored off Nelson, N.Z. Observer, Mr. M. J. Sutherland, 3rd Officer.

26th October 1968. Between 2000 and 2300 GMT the sun was observed to have an orange-red haze around it which became a more pronounced red-brown hazy ring later in the morning. The Meteorological Office later said that it may well have been caused by the bush fires in New South Wales.

Position of ship: 41° 18′S, 173° 16′E.

LUNAR CORONA

North Atlantic Ocean

m.v. *Ribblehead.* Captain J. Parsloe. Funchal to Vitória, Brazil. Observer, Mr. C. R. Ingham, 2nd Officer.

10th November 1968. At 0320 GMT three green and orange rings were sighted around the moon. The inner rings were well defined but the outer rings were paler and more diffuse. There were clouds of C_L5 and C_M3 present, the estimated height of the low cloud being about 1–2,000 ft. At 0600: Air temp. 77·9°F, wet bulb 76·1°, sea 82·2°. Wind E's, force 4.

Position of ship at 0600: 3° 12′N, 30° 30′W.

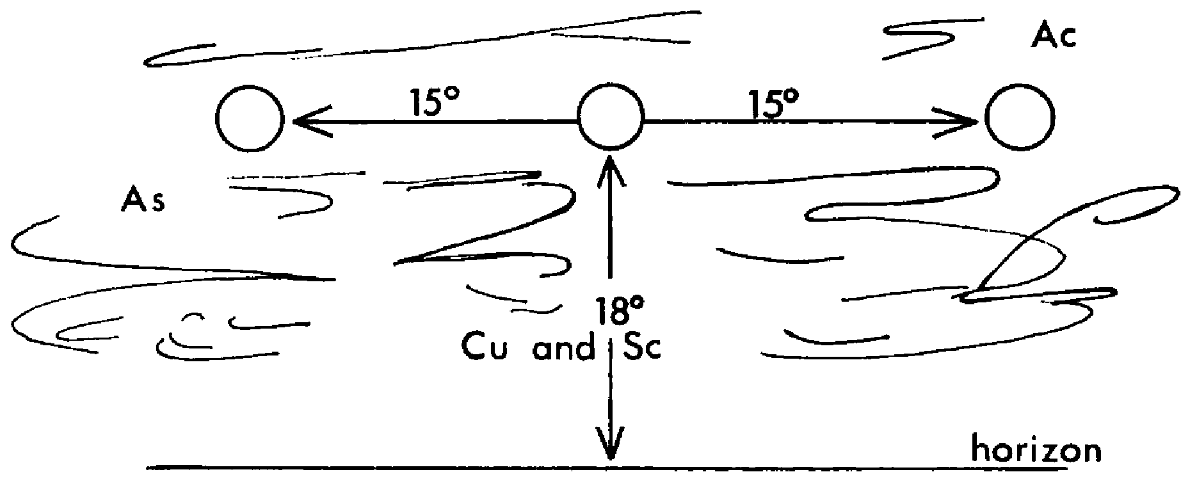
Note. Coronae are produced by diffraction of light rays by water droplets. The clouds with which these phenomena are associated are most commonly Sc (C_L5) and Ac (C_M3), both of which were observed at the time of the above report. A description of coronae appears in the *Marine Observer's Handbook.*

MOCK MOONS

Indian Ocean

m.v. *Priam.* Captain I. R. Atkinson. Rotterdam to Singapore. Observers, the Master and Mr. M. P. Stone, Chief Officer.

5th December 1968. At 1330 GMT it was observed that at an equal distance on each side of the moon there was a very bright patch, similar to the moon itself, behind the cloud. This lasted for 30–40 min before disappearing and leaving the true moon



showing behind the cloud. The angle of the images was obtained by using the azimuth mirror. The cloud was Ac and As above Cu and Sc. At 1200: Air temp. 81·3°F, wet bulb 76·3°, sea 83·3°.

Position of ship: 4° 42′N, 93° 14′E.

Note. A very good description of this phenomenon appears in the *Marine Observer's Handbook*. This phenomenon, which is by no means rare, is due to the refraction of moonlight by ice crystals in Cs cloud. What is unusual about this report is the angular distance between each mock moon and the luminary, reported as 15°. Mock moons normally occur on or outside the halo of 22° radius.

POSTSCRIPT

Eastern Pacific Ocean

m.v. *Silverbeach*. Captain M. R. Duke. Cardiff to Los Angeles. Observer, Mr. H. Lawson, 2nd Officer.

A report from the *Silverbeach* on numerous snake-like creatures seen on 19th July 1968 when in position 08° 00′N, 83° 30′W was published in the July 1969 number of *The Marine Observer*. The following was received too late for publication in July.

Note. Miss A. G. C. Grandison, Curator of Herpetology, Natural History Museum, comments:

"These creatures were almost certainly the common black and yellow sea snake *Pelamis palaturus* which is the only sea snake that crosses the Pacific and reaches the west coast of the Americas. The colour of this species is extremely variable but in the Gulf of Panama it is usually a dark brownish-black on the upper half of the body with brilliant yellow on the undersides, the two colours meeting in a sharp line. Frequently the markings on the tail may be in the form of dorsal, or dorsal and ventral bars, or bars and stripes. In some individuals the black dorsal stripe may be visible only anteriorly, in which case the general impression of the snake when swimming and when viewed from a distance could well be of a yellowish-brown with banded tail. The species is the most widely distributed of the sea snakes and it occurs from the African coast to Panama. There have been observations of them swimming by the thousand on the water's surface and the species is said to abound in the Gulf of Panama."

AURORA

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

"The varied names and positions of ships in which auroral observations were recorded during the period October–December 1968 bear witness to the excellent 'sea-coverage' continually supervised on our behalf by the Marine Branch of the Meteorological Office. We are grateful to all and would here mention our thanks to observers in m.t. *Orsino* for many detailed accounts of auroral displays recorded during their tour of duty as guard ship to the trawlers.

"The highest geomagnetic activity during these months occurred at the end of October/ beginning of November. This is reflected in the appended summary of reports received. On the nights 30th October–2nd November all the classic forms were visible in the zenith to observers in ships in the St. Lawrence, in mid-Atlantic and to many on land in western Europe. Cloud interfered with estimation of the southerly extent of the aurora over western Europe. The most southerly report in the northern hemisphere came from s.s. *Bristol City* off Norfolk, Va., on 2nd November, while a report from a Dutch ship off South Australia confirmed simultaneous activity in the southern hemisphere on 31st October. Reddish colouration was reported from both hemispheres.

"The remainder of the three months was geomagnetically fairly quiet, which was perhaps fortunate for those spending the Christmas period in the awe-inspiring remoteness of lunar orbit. A final sighting for the year by an observer in the trawler *Northern Reward*, who saw aurora to the south, reminds us that auroral observers work in some pretty remote spots too.

"All auroral reports are forwarded to the Balfour Stewart Auroral Laboratory at the University of Edinburgh."

DATE (1968)	SHIP	GEOGRAPHIC POSITION	Λ	Φ	I	TIME (GMT)	FORMS
3rd Aug.	*Manchester Trader*	53°20′N 50°48′W	030	64	+74	0148–0157	HA, RA, N
23rd	*Manchester Trader*	48°43′N 68°29′W	360	60	+75	0200–0230	HA, RA, N
						0352–0412	HB, N
2nd Oct.	*Cape Franklin*	70°00′N 30°20′E	130	66	+78	0030–0115	All forms
12th	*Finnamore Meadow*	68°30′N 13°05′E	110	67	+76	0001–0030	R, N
13th	*Tamworth*	53°10′N 39°00′W	040	62	+72	0055–0125	R, N
17th	*Ross Orion*	70°50′N 36°40′E	130	65	+78	2005–2025	HB, RB
28th	*Finnamore Meadow*	55°00′N 40°10′W	040	65	+73	2335–0007	RA, RB
31st	*Weather Surveyor*	59°00′N 19°07′W	070	65	+72	0003–0031	(S)RA
	Finnamore Meadow	52°00′N 54°30′W	020	63	+75	0100–0800	All forms
	Alert	52°10′N 31°25′W	050	60	+70	2000–2030	RA, RR, N
	Weather Surveyor	59°18′N 18°41′W	070	65	+72	2045–2135	RB
1st Nov.	*Weather Surveyor*	59°17′N 18°47′W	070	65	+72	0135, 0240	RB, P
	Weather Surveyor	59°18′N 18°45′W	070	65	+72	2050	HA
						2215, 2340	RA
	Alert	50°08′N 40°25′W	040	60	+71	2135–2220	RB, RR, P
	Weather Monitor	52°30′N 19°50′W	060	59	+69	2245	RR
	Manchester Commerce	46°00′N 72°30′W	360	59	+77	2300	RA, RR
2nd	*Bristol City*	37°00′N 76°00′W	360	49	+70	0020–0035	N
	Alert	50°08′N 40°25′W	040	60	+71	0258–0338	RB, RR, P
	Weather Surveyor	59°15′N 18°43′W	070	65	+72	0545, 0645	HB, RB, RR
	Redcar	52°36′N 50°16′W	030	63	+74	2236–?	HB, RR
7th	*Finnamore Meadow*	53°20′N 41°35′W	040	63	+72	0230–0540	HA, RA, RR
17th	*Weather Adviser*	52°46′N 20°03′W	060	59	+69	2150–0300	N
18th	*Weather Reporter*	58°55′N 19°10′W	070	65	+72	0700	P
	Weather Reporter	59°12′N 19°26′W	070	65	+72	2215	HA
22nd	*Weather Reporter*	59°11′N 18°31′W	070	65	+72	2050, 2150	HA, N
27th	*Weather Reporter*	59°00′N 19°02′W	070	65	+72	0345, 0550	N
10th Dec.	*Orsino*	67°05′N 21°55′W	070	73	+77	2053–2125	HA, HB, RR, N
18th	*Orsino*	66°50′N 24°25′W	070	73	+77	1835–2225	All forms
19th	*Weather Monitor*	59°00′N 18°36′W	070	65	+72	2100, 2200	N
20th	*Weather Monitor*	59°01′N 18°36′W	070	65	+72	2042	N
22nd	*Orsino*	66°32′N 23°44′W	070	73	+77	0205–0249	HB
23rd	*Weather Monitor*	59°10′N 18°20′W	070	65	+72	2100, 2200	N
24th	*Orsino*	66°38′N 23°55′W	070	73	+77	2130–2315	HB, RA, RB
25th	*Weather Monitor*	58°25′N 17°00′W	070	65	+72	0300–0700	N
	Orsino	66°40′N 24°00′W	070	73	+77	2230–2250	RA, P
29th	*Weather Adviser*	58°49′N 19°10′W	070	65	+72	2140	(S)RA
31st	*Northern Reward*	70°26′N 22°10′E	120	67	+78	2143–2210	HA, RA

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

656.6(268)

The Northern Sea Route

(FROM THE BARENTS SEA TO THE BERING SEA)

By V. M. Šapaev
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The northern sea route occupies a special place among the ocean routes of the world, since general and local Arctic coastal shipping is the most convenient form of transport and, moreover, the northern sea route is the shortest transport route from Europe to the Far East (see Fig. 1). Hence the first attempts at using the northern sea route go back to the sixteenth century when Russian seamen in the *Koči* sailed to the western coast of the Yamal peninsula and, if conditions permitted, past it to enter the Gulf of Ob' from the north. At the beginning of the seventeenth century (about 1619) they rounded the most northerly point of Asia, and in 1648 S. I. Dežnev became the first European to sail from the Arctic to the Pacific and discover the strait between Asia and America.

For nearly 70 years from the middle of the sixteenth century English captains (Cabot, Pet, Jackman) and Dutch captains (Barents, Nay, Tetgales) tried to reach China, or at least Siberia, by the north-east passage. But they were not able to go beyond Novaya Zemlya, being hindered by ice and the severe weather of the Arctic seas.

After this period there were various haphazard attempts at studying the northern sea route, undertaken for different reasons. One such scientific undertaking in the eighteenth century was the Great Northern Expedition (1733–44), the programme of which, laid down by Peter I, involved the investigation of the sea route from the White Sea to the Bering Sea. Among the party were V. Bering, the brothers D. and K. Laptev, B. Prončiščev, F. Malygin, F. Minin, D. Ovcin, D. Sterlegov, S. Čelyuskin and other subsequently famous explorers of the polar seas. The expedition collected much valuable meteorological and hydrological material, and its hydrographical data and descriptions of the coasts of seas on the edge of the Arctic were almost the only ones available to sailors for about 200 years.

In 1763 the great M. V. Lomonosov wrote about the possibility of ships sailing the northern sea route, established that the polar seas (especially the ice) needed to be studied from many angles and proposed a high-latitude variant of the northern sea route. Influenced by Lomonosov and forward-looking naval officers, the Russian Government organized a number of polar expeditions. One of these, led by Admiral V. Ya. Čičagov in 1765–66, headed eastwards by the northern sea route but was unsuccessful.

In the first half of the nineteenth century the Kara Sea was explored by several Russian expeditions (those of F. Litke, P. Pakhtusov and K. Ber) which came to the conclusion that the Kara Sea was inaccessible to ships. In the second half of the nineteenth century further attempts were made to sail by way of the Kara Sea (two Russian expeditions led by P. Kruzenštern, in 1860 and 1862, were likewise failures).

These and other unsuccessful attempts to sail eastwards by the northern sea route can be explained by the sailors' ignorance of the times when the Kara Sea was open to ships and of sailing conditions in general; the explorers' lack of caution also had a negative effect.

At the end of the 1860s Norwegian industrialists began to look for ways into the Kara Sea to catch fish and sea mammals. They made a number of successful voyages, proving that it was possible not only to visit the Kara Sea every year but to visit it over quite a long period.

At the same time the Russian gold-mine owner M. K. Sidorov proposed the idea of sea communications with Siberia. At his request, the English captain J. Wiggins sailed into the Kara Sea on the steamship *Diana*, reaching the northern entry to the Gulf of Ob' by August 1874. This was the first steamship to sail in the Kara Sea. Later, supported by the Russian merchant and industrialist A. M. Sibiryakov, Sidorov managed to interest A. E. Nordenskiöld in the idea of sailing by the northern sea route, and an expedition on the steamship *Vega* was equipped under Nordenskiöld's leadership. During the navigational seasons of 1878 and 1879 and the winter of 1878–79 (which it spent in the Chukchi Sea region) the *Vega* became the first ship to conquer the northern sea route from the Barents Sea to the Bering Sea. In the summer of 1878 the *Vega* was accompanied from Europe to the mouth of the Lena by the Russian steamship *Lena*, which sailed up the river as far as Yakutsk, carrying cargo from the west by sea. But Nordenskiöld considered that it was not possible to use the northern sea route for regular voyages by merchant vessels. During the First International Polar Year (1st August 1882–1st August 1883) two polar stations were set up in Russia (in Novaya Zemlya and at the mouth of the Lena) and they helped to accumulate hydrometeorological observations over a long period, which made a definite contribution to the development of the northern sea route.

The subsequent realization of Sidorov's idea, given official recognition by the Russian Government in the 1890s, led to a considerable expansion of shipping in the Kara Sea, both for carrying cargo to Siberia and for purely scientific purposes. From 1874 to 1905 there were 174 attempts to sail across the Kara Sea (155 steamships and 19 sailing vessels) in addition to those by Norwegian fishing vessels; 142 attempts were successful (127 by steam and 15 by sail), 21 ships were held back by ice and 11 vessels were wrecked or broken up on shoals. Among the successful voyages by merchant expeditions were the visits to the mouths of the Ob' and Yenisey by convoys of Russian and English ships in 1887 (1 Russian and 11 English ships led by Admiral S. O. Makarov); in 1898 (6 Russian and English steamships, under the command of Lieutenant Dobrotvorskij and with the participation of Captain Wiggins, which carried rails to the town of Yeniseysk for the Siberian railway); and in 1905 (the transfer of the largest flotilla which ever sailed along the Yenisey, consisting of 15 ships headed by the steamship *Pakhtusov*, mostly intended for navigation along the Yenisey). In 1898 the Arctic Hydrographical Expedition began work, making possible the collection of much material on hydrography, meteorology and state of ice in different parts of the Kara Sea and the straits.

Voyages of numerous ships in the Kara Sea showed that all the ships were more or less unsuitable for sailing in ice-covered polar seas. Hence Admiral Makarov proposed the building of an ice-breaker to explore Arctic seas and to ensure regular voyages of merchant vessels to the mouths of the Ob' and Yenisey. The *Yermak*, the original ice-breaker, was built in 1899.

The Russo-Japanese war of 1904–5 stimulated attempts to develop the northern sea route: expeditions were made (those of V. Rusanov, G. Syedov and G. Brusilov in 1910–12), a postal department was set up in 1912 to establish four coastal radio-meteorological stations, and four voyages were made from Vladivostok by the members of the above-mentioned hydrographical expedition on the ice-breaking steamships *Taymyr* and *Vaygač*, under the command of I. S. Sergeev and then B. A. Vilkitski. These voyages along the northern sea route reached, in turn, Mys Severnyy (Northern Cape), Medvez'i Ostrova (Bear Islands), the mouth of the Lena, and Severnaya Zemlya which they discovered. In 1914–15 the *Taymyr* and *Vaygač*, commanded by B. A. Vilkitski, became the first ships to sail the northern sea route from east to west (Vladivostok to Arkhangel'sk), spending the winter in the region of the Taymyr peninsula.

To search for the expeditions of Rusanov, Brusilov and others, which had disappeared without trace, a special expedition with a seaplane was organized. In August 1914 Ya. I. Nagurskij made the first eight flights over the drifting ice of the Barents Sea from Novaya Zemlya.

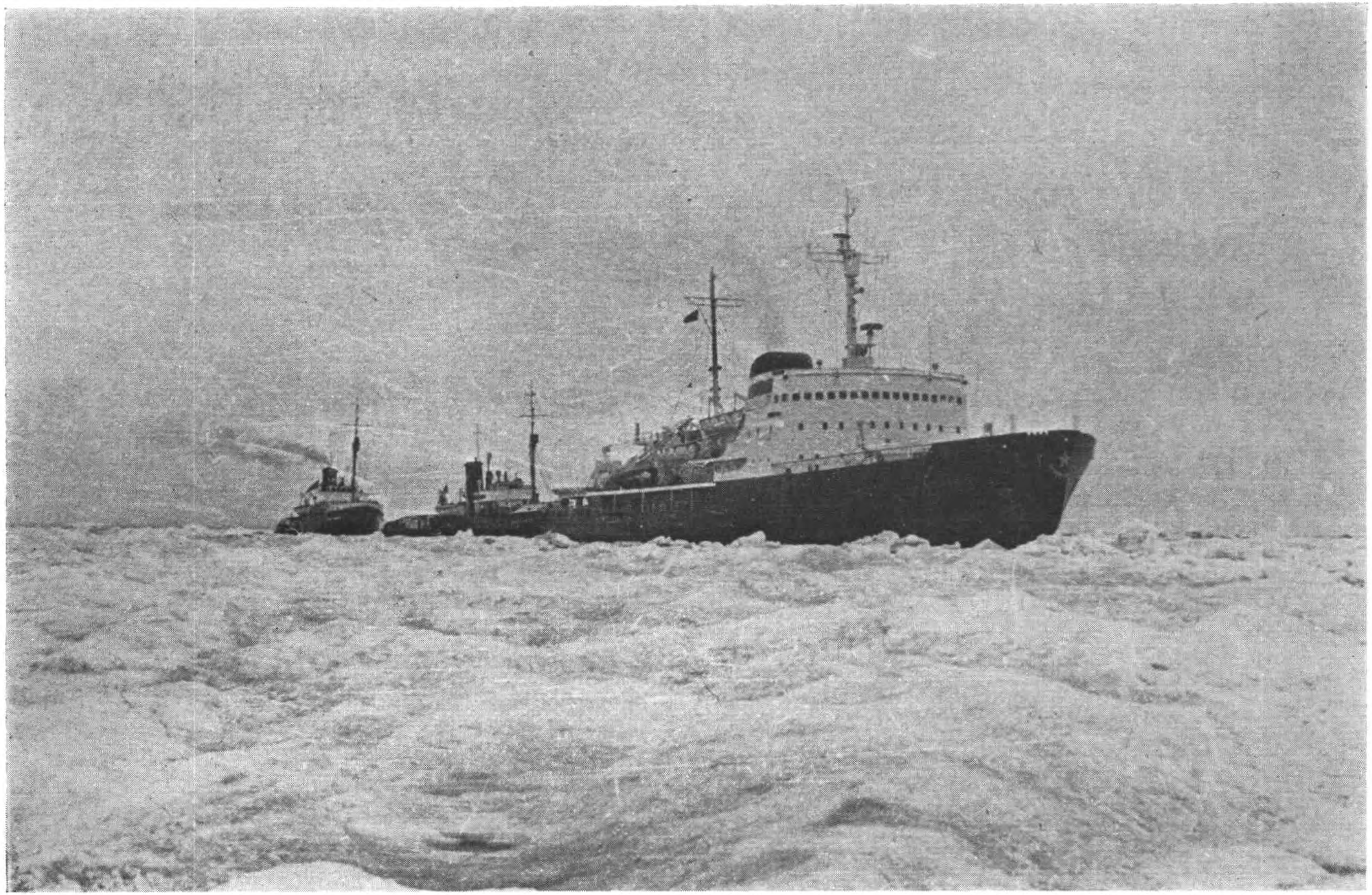

Photo from the Arctic and Antarctic Scientific Research Institute, Leningrad

The ice-breaker *Moskva* escorting a convoy of ships through the ice along the northern sea route (*see* page 183).

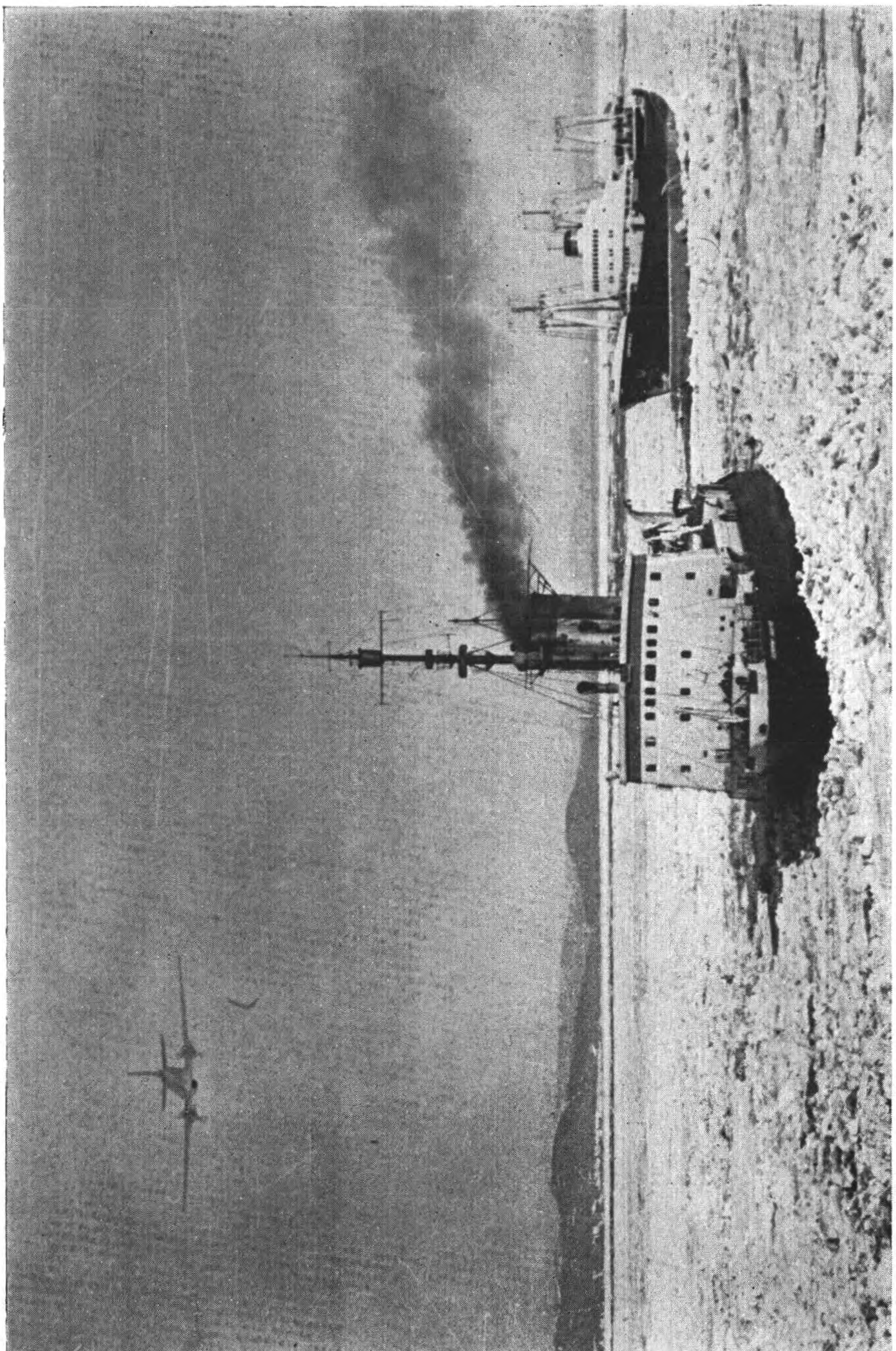

Photo from the Arctic and Antarctic Scientific Research Institute, Leningrad

The ice-breaker *Admiral Lazarev* and an ice-reconnaissance aircraft escorting a ship through ice near the coast (*see* page 183).

Thus the numerous attempts to develop this sea route, mainly the section up to the mouths of the Ob' and Yenisey, made in the course of several centuries (including the voyage of the Norwegian explorer R. Amundsen, who sailed the northern sea route from west to east aboard the small vessel *Maud* in 1918–20, spending two winters on the route) did not achieve their aim, since the voyages of cargo and expedition ships remained sporadic. They did not discover the laws of ice formation and drifting or of the weather and climate of the Arctic seas. These attempts showed that it was impossible to sail along the northern coast of Europe and Asia without scientific stations, communication points, roadsteads and ice-breakers.

The systematic opening up of the northern sea route began after the October Socialist Revolution in Russia; this measure immediately acquired political significance. The first resolutions of the Soviet Government (1918–20), signed by V. I. Lenin, provided for the organization of an Arctic hydrographical expedition with the task of studying sailing conditions from the Barents Sea to Cape Dežnev, the creation of scientific organizations which equipped numerous expeditions for the systematic study of the Arctic seas, the establishment of Kara Sea trading expeditions in the mouths of the Ob' and Yenisey, and (in principle) the reconstruction and building of Arctic ports.

Thus the problem of the northern sea route was to be solved simultaneously in two ways—by the study of the ice cover, the main obstacle to shipping, and the practical development of shipping, first on the western and eastern sections and then along the whole of the northern sea route.

Soviet scientists, hydrographers and merchant seamen began this work in 1918 but because of the intervention, during which the British captured 5 ice-breakers, a serious loss to the Soviet ice-breaker fleet (one of them, the *Svyatogor*, now the *Krasin*, was ransomed and another was returned), and of the civil war, the work had to be stopped; it was resumed in 1921.

To study the physical and geographical features of the northern sea route, the Soviet Union built a large number of hydrometeorological stations and observatories along the northern coast of Europe and Asia. In 1956, before the beginning of the International Geophysical Year, there were over 100 hydrometeorological stations in the region of the northern sea route, including 23 making upper-air observations and 13 making actinometrical observations. By means of a large number of radio centres this network of hydrometeorological stations provides ships' captains with daily information about the state of ice and the weather along the route. As they accumulate, the observations of the network of polar stations form one of the bases for the study of the hydrology, weather and climate of the Arctic seas.

Another source of information, of enormous significance in the assessment of ice cover and weather in the Arctic seas, is the many observations made by ships on different missions: observations of currents, sea disturbance, ice and various meteorological elements, including incoming solar radiation. In 1920–31 this method of collecting hydrometeorological data was dependent upon the development of shipping in the western and parts of the eastern sections of the northern sea route, when mainly annual expeditions were made by merchant vessels. For instance, convoys of ships on Kara Sea expeditions were escorted by the ice-breakers *Malygin* and *Krasin*, which gave Soviet seamen experience of sailing in ice, voyages were made for scientific purposes by the ice-breaking steamers *Syedov*, *Sibiryakov* and *Lomonosov* and the ice-breakers *Malygin* and *Krasin*, and by special exploration ships, the *Perseus* and *Zarnica.* Merchant vessels made occasional voyages from Vladivostok to the mouth of the Kolyma. At that time ships' captains had only limited information about ice conditions and usually kept to the coastal variant of a route. Voyages sometimes ended with a winter spent in the ice.

The further development and use of the northern sea route was based on the continuation of and results from extensive investigations into the state of ice, weather and climate of the Arctic, closely interrelated with the capabilities of the fleet, on which the success of Arctic navigation depended. The beginning of this

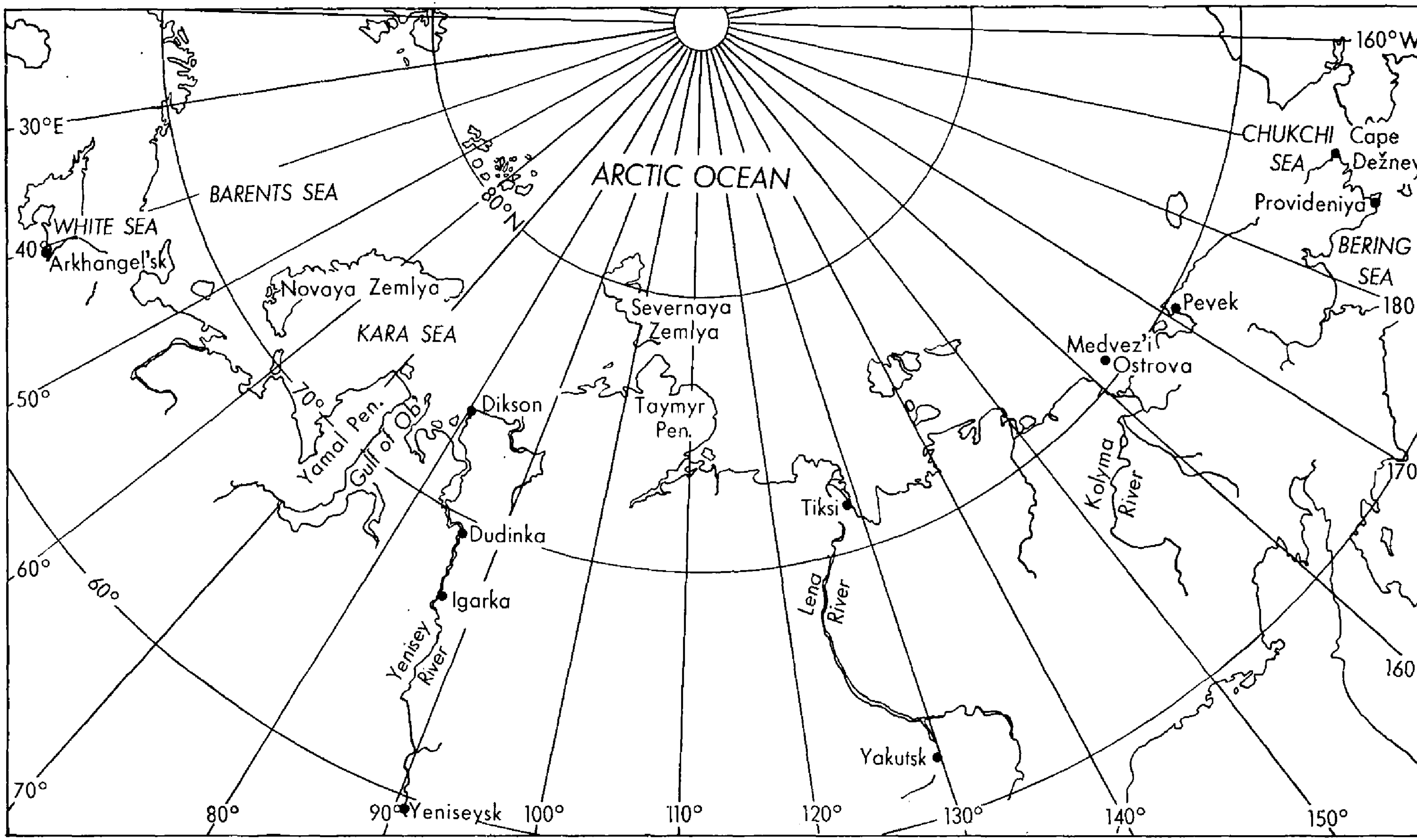

Fig. 1. Map of the Northern Sea Route.

period coincided with the Second International Polar Year (1st August 1932–1st August 1933) when, together with other measures, fifteen special sea expeditions were organized, their activities extending over all the Arctic seas and being subsequently continued. One expedition of great scientific importance was the forced drift of the ice-breaking steamship *G. Syedov* (1938–40), which was turned into a research base and almost repeated the drift path of the Norwegian expedition under F. Nansen on the *Fram* (1893–96) in the central polar basin. Others were the multi-purpose high-latitude expeditions made on the ice-breaker *Severnyy Polyus* (North Pole) and the ice-cutter *F. Litke* in 1946 and 1948 respectively.

After World War II observations were organized according to new systems, using the experience of the first drifting station Severnyy Polyus-1 (commanded by I. D. Papanin in 1937). In 1950 and from 1953 onwards there have been scientific stations on the drifting ice of the central polar basin (at present the station Severnyy Polyus-18 is drifting). Another method of observation, used since 1948, is airborne high-latitude expeditions, in which small groups of people are landed on the ice in pre-determined places in the central polar basin. The 'flying observatory' started work at the same time; it is an aircraft specially equipped for making various observations in the atmosphere. Since 1956 automatic radiometeorological stations, designed by Yu. K. Alekseev, are placed systematically on the ice of the central polar basin in the pre-navigational period.

The observational data from the above sources have served as a basis for many investigations, some of them on a very large scale, made by a large group of scientists concentrated in the Arctic and Antarctic Institute. The work of V. Yu. Vize, E. A. Leont'eva, Z. M. Prik, T. V. Pokrovskaya, M. P. Kozlov, B. A. Dzerdzeevskij, G. Ya. Vangengeym, N. T. Černigovskij, M. S. Maršunova, N. I. Špakovskij and many others has identified climate-forming processes and described the climate of the seas on the edge of the Arctic and the central polar basin (in three dimensions, including the troposphere and stratosphere). Various processes have been found in the atmospheric circulation over the Arctic, the intensification of which, since 1920, has led to a warming of the climate of the Arctic. At the end of the 1940s G. Ya. Vangengeym developed a method of long-range weather forecasting for the Arctic (in the navigational period) based on a study of synoptic processes.

The work of V. Yu. Vize, V. V. Šuleykin, N. N. Zubov, N. E. Evgenov, M. M. Somov, D. B. Karelin, P. A. Gordienko, N. A. Volkov, A. A. Kirillov, T. P. Morozova, M. S. Hramcova, Yu. A. Gorbunov, N. I. Tyabin and others has established the main features of the ice régime and ice drifting in the Arctic seas and the central polar basin and shown how ice régime parameters depend on the atmospheric circulation, the state of the sea (including ocean currents), the radiation budget and solar activity. In the year-to-year and seasonal variation of the ice cover the main part is played by the variation of the atmospheric circulation in the preceding period, and the state of the ice in a given Arctic sea area is determined by hydrometeorological processes, both in the region and outside it. This is the basis of the regular long-range ice forecasts which were first made by V. Yu. Vize for the Barents Sea in 1923 and have been made for the whole northern sea route since 1932. Long-range forecasts of changes in weather and ice distribution, made 3–5 months before the beginning of the navigational season, are used widely in planning the disposition of ice-breakers, the movement of ships and the work of ports on the northern sea route.

The development of scientific investigations and successful voyages along the western and eastern sections of the northern sea route have provided a practical basis for the solution of the problem of opening up the northern sea route to shipping along its whole extent, although the three preceding expeditions, those of Nordenskiöld, Vilkitski and Amundsen, gave no direct answer to the question of the possibility of normal, regular navigation along the whole northern sea route. The search for an answer began with the relevant resolution of the Soviet Government, the fulfilment of which was marked in 1932 by the notable voyage of the ice-breaking steamship *Sibiryakov* (from Arkhangel'sk to the Bering Strait in a 65-day voyage). In view of this success, at the end of 1932 a resolution of the Soviet Government created a special department (The Main Administration of the Northern Sea Route, headed for a time by Academician O. Yu. Šmidt) which was to establish the northern sea route decisively and ensure safe navigation along it.

To fulfil the Government's decree the steamship *Čelyuskin* repeated the voyage of the *Sibiryakov* in 1933, and in 1934 the ice-cutter *F. Litke* made a scientific voyage, sailing the northern sea route from east to west in one navigational season without damage for the first time.

Voyages by merchant vessels started at the same time. A convoy of ships headed by the ice-breaker *Krasin* reached the mouth of the Lena from the west in 1933. In 1935 two merchant vessels sailed the northern sea route from west to east in one navigational season and two merchant vessels made the same voyage in the opposite direction. This was the beginning of the transformation of the northern sea route into one of the normal transport routes of the Soviet Union. There was satisfactory progress in the navigational season of 1936 when 160 vessels sailed along the northern sea route and there were 14 through passages. In 1937, however, there was no such success: ice conditions were difficult and winter began early, so that some of the ships and ice-breakers had to spend the winter in the ice. These navigational seasons showed, on the one hand, that it was possible to use the northern sea route for shipping in practice, and that in the given case a positive part was played by the general decrease in ice cover in the seas on the edge of the Arctic, due to the above-mentioned warming of the climate of the Arctic, while, on the other hand, it became obvious that the safe and reliable use of the northern sea route required the addition of powerful new ice-breakers and ice-breaking merchant vessels to the fleet.

As the Arctic fleet grew, experience was accumulated and the knowledge of seamen who had mastered the difficult art of sailing in ice progressed. Among these men were the ice-breaker captains M. Nikolaev, V. Voronin, M. Belousov, A. Melihov, M. Sorokin, P. Ponomarev, F. Lyaško, N. Inyuškin, A. Vetrov, E. Ivanov, A. Pinedžaninov, Yu. Kučiev, B. Sokolov and many others, some now retired and some still on duty on the bridges of ice-breakers.

Arctic navigation required the expansion of the navigational and geographical study of the northern sea route and the adjacent sea areas which had begun in the 1920s; lighthouses were built along the coasts, ways of protecting coasts were established, sailing directions and sea charts were produced and the pilot service was started and developed. The two ice-breaking hydrographical vessels, the *Pakhtusov* and the *G. Syedov*, with the aid of which research and hydrographical work in the Arctic seas is now being developed, began work in 1967 and 1968. Great credit for this is due to the hydrographers N. Matusevič, K. Neupokoev, A. Lavrov, A. Žilinskij, V. Peresypkin, V. Čevykalov and others.

At the same time sea ports were built and extended, and the mechanization of loading and unloading is being developed. The main ports on the northern sea route at present are Dikson, Igarka, Dudinka, Tiksi, Pevek and Provideniya. There are roadsteads in the mouths of some Siberian rivers; local fuel bases for sea transport have been built.

Polar aviation, dating from the early 1920s, has played a great part in opening up the northern sea route. In 1924 the Soviet pilot B. Čuhnovskij followed Ya. Nagurskij in making an ice reconnaissance by aircraft. In 1926 the pilot M. Babuškin made the first landing and take-off from ice. Polar aviation later provided a regular air service for the northern sea route, making round-the-year and pre-navigational ice reconnaissances over the Arctic, including the regions round the North Pole. Aerial ice reconnaissance is even more important in the navigational period, particularly when convoys or separate ships are being escorted through the ice. Where very unfavourable ice conditions occur along the path of a vessel, the vessel is escorted directly by an aircraft or helicopter. In addition to purely operational work, polar aviation, using coastal and ice aerodromes, is essential in the organization of drifting stations and high-latitude expeditions. The polar pilots M. Vodop'janov, A. Alekseev, I. Mazuruk, B. Isipov and many others have made their names in the conquest of the air over the Arctic.

Thus ice-breakers, in co-operation with aircraft, were the basic link which, with the support of radio communications, the network of polar stations and data from scientific research, made it possible for the northern sea route to be opened. Moreover, ice-breakers and aircraft are in themselves important tools in the organization and carrying out of many scientific expeditions.

The research methods and results listed above, the technological progress of the Arctic fleet and polar aviation and improved ice-navigation tactics have led to much better use of the northern sea route. During the period 1958–65 the length of the navigational period was increased by 30% (by 20–25 days in the section of the route as far as Igarka). The mean speed of ships escorted by ice-breakers was increased by 40%, and the time taken to escort one ship in ice conditions was reduced by almost 50%. The total volume of cargo carried along the northern sea route increased by more than 80% during those years.

Thus only 36 years have been needed since the first through passage of the *Sibiryakov* for navigation along the northern sea route to become annual and regular. Now hundreds of Soviet merchant vessels sail there every year, carrying cargoes to large Arctic ports. Convoys (often large convoys) of river and deep-sea ships are escorted to the rivers of Siberia and to the Far East along this route, and through passages from west to east are organized for fishing vessels.

Normal navigation along the northern sea route will develop in the future. In view of this, standard observations at stations of the polar hydrographical network will be made as automatic as possible, and independent and semi-independent stations will be added to this network, which will make it possible to extend the programme of weather, sea and ice observations. Observations on drifting ice in Arctic seas and in marginal parts of the central polar basin will be made by automatic stations. In the circumpolar region the Severnyy Polyus stations will continue their work, surrounded by a network of automatic stations. The work of the automatic stations will be controlled by zonal observatories, which will also become centres for the study of the ice, weather and climate régimes of the regions in which they are situated and, at the same time, bases for the carrying out of various scientific investigations. The processing and analysis of the sharply-rising volume of hydrometeorological information will be done by territorial data centres, to be organized where scientific and technical groups and naval staff work (Dikson, Tiksi, Pevek). Artificial earth satellites launched into polar orbits will make it possible to obtain simultaneous data on the distribution of ice over vast areas of the Arctic and its marginal seas. High-altitude turbo-jet aircraft, equipped with appropriate apparatus, will supply local information about ice conditions irrespective of cloud, and also about ice thickness and sea-surface temperature. Radio-electronic instruments will be used in visual aerial ice reconnaissance to obtain more objective data. Extensive and many-sided observational data will make it possible to discover new relationships between the weather, climate and ice régimes of the Arctic seas and, on this basis, to develop improved methods for making meteorological and ice forecasts for various periods in advance. Many of these data will, with the aid of phototelegraphy and television communications, greatly improve information for ships' captains about actual and expected weather and ice conditions on the northern sea route. Forecasts and methods of taking account numerically of the state of ice in polar seas reported by escorting ships, together with calculations of the ice which can be penetrated by ice-breakers, will provide a firm scientific basis for the planning of sea operations, the calculation of optimal convoy compositions and speeds and the further extension of the period of Arctic navigation. In this connection great importance will be attached to the creation of extensive artificial channels in fast-ice, without waiting for the ice to break naturally. There are also plans for the production of a new ship, an ice-cutter for breaking up fast-ice. The combination of ice-cutter and ice-breaker reveals new possibilities of winter navigation in Arctic seas.

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551.556.8:551.466.3(261.1)

Measured Wave Heights and Wind Speeds at Weather Station 'India' in the North Atlantic

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There is considerable practical interest among naval architects and others in knowing what wave heights typically accompany given wind speeds. This is distinct from the interest of oceanographers in forecasting the waves generated by a given wind.

In 1966 the Seakeeping Committee of the 11th International Towing Tank Conference (ITTC) recommended a relation between significant wave height and wind speed as part of the definition of an interim standard wave spectrum.[1] In 1967 the Environmental Conditions Committee of the 3rd International Ship Structures Congress emphasized the variability of the wind/wave relation and suggested that this should be more clearly established.[2] Discussion of this point stimulated the present writer, who is chairman of the latter Committee, to prepare the diagram shown in Fig. 1 and compare it with other data.

Discussion

Fig. 1 is a contingency diagram constructed from data derived from measurements by wave recorder aboard weather ships at Station 'India' and Fig. 2 shows corresponding exceedance curves. Regarding the wind measurements, the anemometers aboard these ships are mounted at a height of 20 metres whereas the international standard height is 10 metres. From Bunting[3] it seems likely that the wind speeds at the standard height would be about 10% less than those shown in the diagram. The wave height data shown have been presented and discussed by Draper and Squire.[4] The values of H_s were determined from the first and second highest crests and troughs on each record, as explained therein.

It will be seen from Fig. 1 that the line recommended by the 1966 ITTC, based on weather ship wave measurements analysed by Moskowitz *et al.*,[5] lies quite close to the mean line through a scatter of the present measurements. Another line in the same diagram, derived from a formula proposed by Scott in 1968,[6] which is also

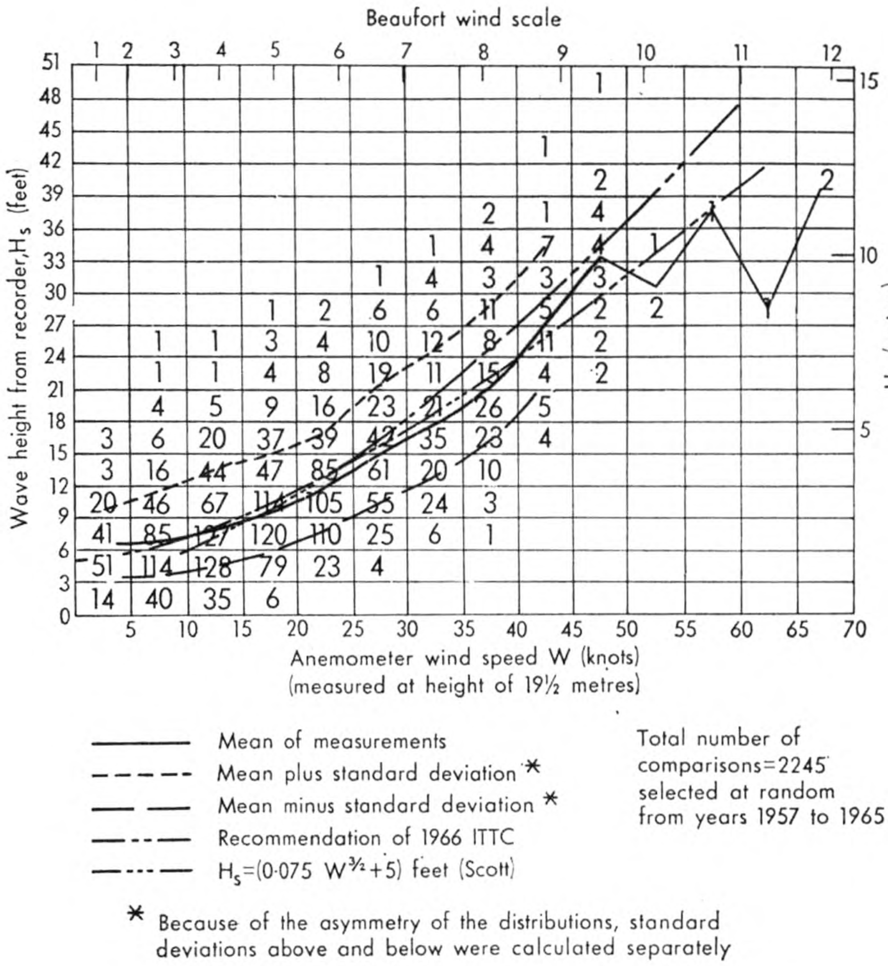

Fig. 1. Measured wave heights and wind speeds at Station 'India' (59°N, 19°W).

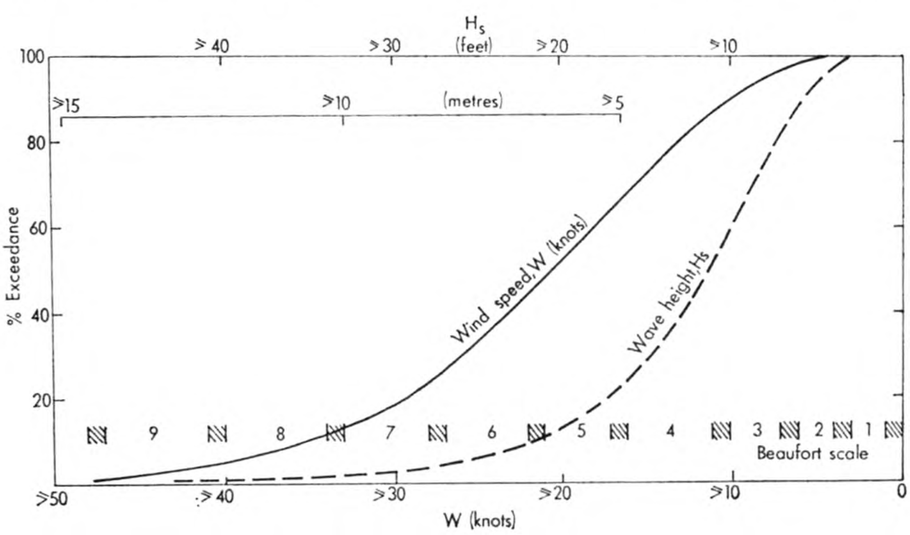

Fig. 2. Wave height and wind speed exceedance at Station 'India'.

based on the work of Moskowitz *et al.*, lies even closer. The Moskowitz results were derived from records from several North Atlantic weather ships over the years 1955–60 by spectral analysis.

A feature of the two empirical laws delineated by those two lines in Fig. 1 is that they indicate the existence of quite substantial waves even when there is effectively no wind. This is to be expected because there will normally be swell waves present which are, by definition, generated elsewhere and thus independent of the local wind force. At high wind speeds it will be found that these laws fall below the lines used by oceanographers[7] to predict the heights of fully arisen waves generated by given wind speeds. This is also to be expected because, in typical conditions, the waves are not fully arisen.

It is of interest to consider the comparison of these results with other data as shown in Fig. 3. It will be seen that the measured heights at Station 'India' are

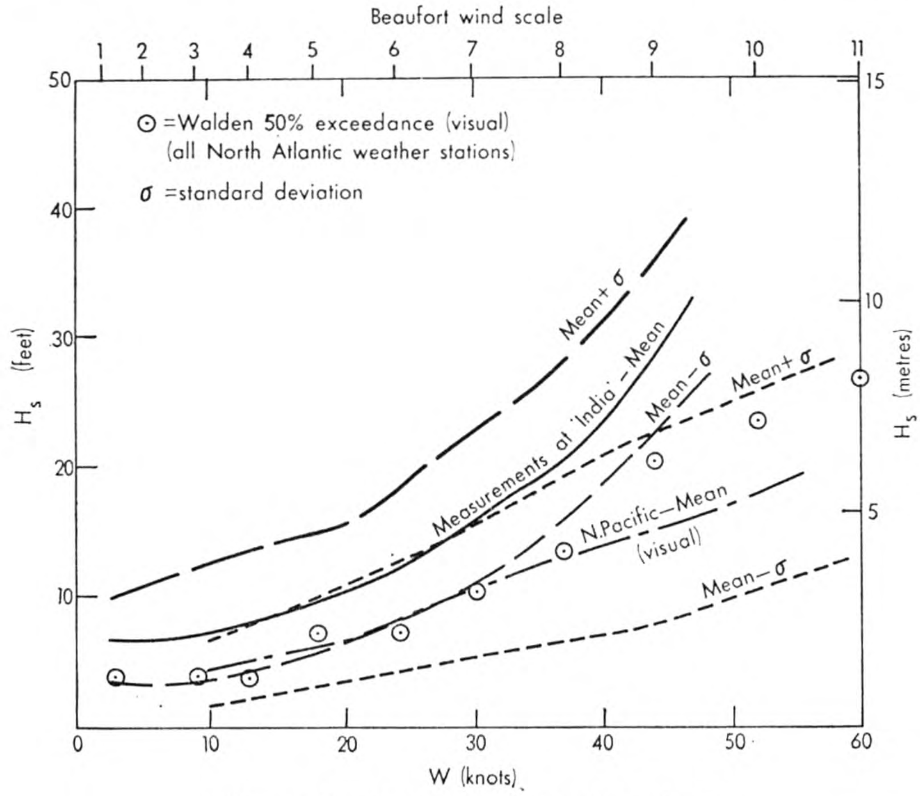

Fig. 3. Comparison with other data.

considerably greater than the corresponding visual estimates, both in the case of Walden's data[8] from weather ships at all the North Atlantic weather stations and of the North Pacific merchant ship data from Japanese work.[9] Except at high wind speeds, however, Walden's 50% exceedance results for the North Atlantic lie remarkably close to the mean line for the North Pacific.

There are two possible explanations which are probably both contributory factors. The first is that it is known that observers aboard ship, when making visual observations, generally report heights which are less than the significant wave heights derived from measurements.[10, 11] The second is that Station 'India', being in the north-eastern corner of the Atlantic, is exposed to long fetches of the prevailing wind and to a heavy incidence of swell. The visual data, however, are in both cases distributed over wide areas of ocean so that these effects may be moderated. Walden's data are taken from all the North Atlantic weather stations; the Japanese data are distributed over a band spanning the full width of the Pacific between 30°N and 50°N and also including an area west of 140°E which extends down to 10°N. The fact that the North Pacific data taken from voluntary observing ships show a smaller incidence of high waves than Walden's data from weather ships is in agreement with results presented in an earlier paper.[12] In there I suggested that this may be partly because, on average, voluntary observing ships are larger than weather ships and partly because the latter are constrained to remain on station, whereas the former are free to 'dodge' the rougher conditions.

Conclusions

1. Measurements of wave height and wind speed at weather station 'India' confirm that there is a large scatter in their correlation.

2. The mean line through the scatter agrees well with the empirical laws of Scott and of the 11th ITTC.

3. Comparison with visual data from the North Atlantic and North Pacific suggest that conditions at Station 'India' may not be typical and it appears that wave heights for a given wind speed there tend to be higher than average, possibly for climatological reasons. The fact that the North Atlantic visual data came from weather ships whereas the North Pacific results are from merchant ships may also help to explain the differences.

Acknowledgements

The author is indebted to Mr. L. Draper of the National Institute of Oceanography and Mr. G. M. Rattray of the Meteorological Office for supplying the measured data.

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THE CARE AND FEEDING OF BIRDS WHICH SEEK SHELTER ON SHIPS AT SEA

(Based on notes issued by the Royal Naval Birdwatching Society)

Birds which arrive on board ships at sea and allow themselves to be collected in the hand are usually seen to be in an exhausted state, often wet and bedraggled, and all primarily in need of rest, warmth and shelter.

In ocean weather ships on station at sea, where the ship spends most of the time lying stopped, a considerable number and variety of small land-birds seek shelter at intervals. Experience aboard these ships has shown that the most convenient arrangement, ideally, is to construct a commodious cage some 36 inches long, 20 inches high and 14 inches in depth, the floor, ends and back of plywood, the roof of hardboard, the front of vertical wire rods, i.e. barred half an inch apart. A vertical-barred front is preferable to wire netting as birds fluttering against bars do not injure their faces so easily. If an entrance flap is fitted in the roof it can be large enough to collect birds from all quarters of the cage. A muslin front cover should be arranged which will let in light and yet give air and a feeling of seclusion and keep the birds quiet.

Aboard a merchant ship on passage the number of birds coming aboard will almost certainly be less but in any case, as an *ad hoc* arrangement, any open-topped cardboard box perforated plentifully with air holes and covered with muslin will do.

The cage should be placed in a secure, warm place and judgement must be used as to the types of birds which can be placed together. At this stage a little water should be provided in a receptacle which will not easily tip up. When birds are seen to have 'perked up' the moment has come to provide food. At no time should oceanic sea-birds be placed in a bath of water.

Feeding birds

It is rarely possible to provide the natural diet which most species would feed upon in normal freedom. The following suggestions aim to cover a possible 'best' where feed can be stocked in advance as in ocean weather ships. Except where her passage touches a bird-migration route, a merchant ship will undoubtedly find that there is less opportunity for feeding birds than in the stationary ocean weather ships. But the good bird-watcher needs to be prepared for any eventuality and these notes should be useful in determining the correct food to give; this is an important point.

General. A good guide in the case of the smaller insectivorous and seed-eating land-birds is to remember that they may not recognize inert food and their attention may be stimulated by mixing some wriggling meal-worms or maggots (used by fishermen and called 'gentles') amongst the feed—see notes on meal-worms.

Seed-eating land-birds. For the smaller birds millet on the stalk is always an attraction. Also canary seed, white millet and hemp seed which can be obtained as a mixture sold by dealers as 'Aviary Mixture', 'Finch Mixture', 'Swoop', etc. Large seed-eating birds such as Jays, less likely to come on board, can be tempted with grain. Pigeons will take to uncooked rice.

Insectivorous birds. Meal-worms are valuable. Suitable proprietory foods are 'Activite', 'Stimulite', 'Prosecto' or 'Sluis'. Soaked, chopped currants and dried or fresh fruit chopped small. 'Starter Crumbs', used for rearing poultry chicks, finely-chopped hard-boiled egg or finely-grated cheese are valuable alternatives.

Ducks, Geese, Herons, Egrets. Soaked bread, cereals, chopped green vegetable for ducks and geese; finely-minced raw meat without fat or tissue and hard-boiled egg for herons, egrets.

Waders, Hawks, Owls, large Thrushes. Finely-minced raw meat without fat or tissue; for hawks and owls, small squares of raw meat.

Sea-birds. Chopped, fresh raw fish, finely-minced raw meat. Sea-birds frequently need feeding forcibly at the outset.

In the absence of special foods. For small land-birds, soft breadcrumbs and finely-chopped hard-boiled egg or finely-grated cheese. For large seed-eating land-birds, soft-boiled rice or porridge oats can be tried.

Feed should be put in the cages or boxes, making sure there is sufficient light and not too much at once. *Water must always be available.* Where birds are too big to cage, their radius of action should be restricted so that food is always in view.

Meal-worms

Meal-worms require warmth to keep them alive and should be kept in a tin, with holes pierced in the lid, at a temperature of, say, 60°F. They should also be provided with some food, i.e. porridge oats, and occasionally fresh pieces of apple skin; skin will make them fatter. The skin should be removed before it goes mouldy. (Maggots can also be kept alive for some time but they must be kept in a cool temperature to prevent them pupating.)

Meal-worms can be bred under the following conditions: Put about three inches of barley meal, mixed with maize meal, in a shallow, wooden box covered securely with gauze or muslin for ventilation. Put sheets of crumpled newspaper amongst the meal in layers. Put half-inch slices of carrot on top of bran and add fresh slices occasionally. A quarter of a pound of meal-worms is sufficient to start a colony which takes a little time to develop. Keep in a warm place; 85°F is the optimum temperature. Extreme cold will kill the colony. Meal-worms should not be used as feed until adult beetles have developed and are breeding.

PRESENTATION OF BAROGRAPHS

As announced in the October 1968 number of *The Marine Observer*, inscribed barographs were to be awarded to Captain J. R. M. Ramsay (New Zealand Shipping Co. Ltd.), Captain W. H. Stoodley (Bristol City Line), Captain H. Gravell (Hain-Nourse Ltd.) and Captain A. Cookson (Manchester Liners Ltd.).

The year was the twenty-first in which these special awards have been made but only once has it been possible to bring all four recipients together for the one ceremony, and this year we were once again disappointed, Captain Ramsay having retired to live in New Zealand.

In the absence of the Director-General of the Meteorological Office, the presentations to Captains Cookson, Gravell and Stoodley were made by Mr. P. J. Meade, Director of Services at Bracknell on 9th January 1969. As is customary on these occasions, a small luncheon party was arranged and, in addition to the three Captains, we were also pleased to welcome Mrs. Gravell and Mrs. Stoodley. Captain P. E. Maiden, Marine Superintendent and Mr. F. H. C. Efford from the Management also attended to represent Hain-Nourse.

In making the presentations, Mr. Meade paid tribute to the vast amount of help which the Voluntary Observing Fleet had given the Meteorological Office over the years; this help was spread over many shipping companies and he noted that in the twenty-one years of giving the special awards 20 shipping companies had been represented. Two of today's recipients, Captains Gravell and Stoodley, came from companies which were new in this field and Hain-Nourse had 13 of their fleet of 19 ships observing for us whilst the Bristol City Line had all their ships on the Voluntary Observing List. Captain Cookson was the fifth shipmaster in the Manchester Liners to receive a barograph award and, here again, we had a company whose entire fleet of 19 ships was helping us.

The luncheon was attended by the Marine Superintendent and senior officers of the Meteorological Office branches associated with ships' observations and afterwards the visitors were shown some of the work of the Office. A photograph taken at the presentation appears opposite page 200.

L. B. P.

Presentation of barograph in Hong Kong

Captain A. C. Tai, lately of the Shun Cheong S.N. Co. Ltd., was the recipient of a barograph at a presentation made at the Royal Observatory, Hong Kong on 7th March 1969 (*see* photograph opposite page 200). The presentation was made by Mr. G. J. Bell, Director of the Royal Observatory, who thanked Captain Tai for his outstanding services to marine meteorology and to the Royal Observatory during the past eighteen years.

Captain Tai has served as voluntary observer and as master in Hong Kong based ships, where his active interest in marine meteorology and assistance in the training of young Chinese officers as observers has been most valuable.

The presentation was attended by the senior scientific officer in charge of the

Meteorological Services Division, Mr. P. Sham Pak and by Mr. W. P. Goodfellow, D.S.C., V.R.D., the marine liaison officer.

W. P. G.

NOTES ON ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM APRIL TO JUNE 1969

APRIL

Low pressure persisted from south Greenland across Scandinavia to north Russia with high pressure over north Greenland and the Canadian Arctic. The resultant winds were from a northerly point over most areas except south-east Canada. Temperatures, generally, were well below average though there was a tendency for a recovery towards normal at the end of the month. Excessive amounts of ice persisted in parts of the Greenland Sea, especially between Iceland and Spitsbergen, in the Barents Sea and the Baltic, whilst off south-east Canada ice conditions continued to be abnormally good.

Canadian Arctic Archipelago, Foxe Basin, Hudson Bay and Strait, Baffin Bay. These areas remained generally ice-covered though unusually wide leads opened up in the Amundsen Gulf and in the north of Baffin Bay whilst narrow shore leads opened up on the western sides of Foxe Basin and Hudson Bay.

Davis Strait and Labrador Sea. In the eastern part of the Davis Strait, Cape Farewell pack-ice spread north to 62½°N by mid-month and then retreated to 61°N (its normal position). Ice conditions on the west side of the Davis Strait and Labrador Sea were near normal.

Great Bank, South Newfoundland Sea, Gulf and River of St. Lawrence. Early in the month close pack-ice spread southward to 50½°N with a tongue of open pack-ice spreading east at this latitude to 50°W, about 120 miles east of normal. This tongue of open pack-ice melted towards the end of the month but, further west, close pack-ice continued to spread south to its normal position at 49°N. The South Newfoundland Sea remained ice-free. Apart from close pack-ice in and near the Belle Isle Strait, the St. Lawrence was almost ice-free. Ice conditions were normal in the Belle Isle Strait but elsewhere in the Gulf there was much less ice than normal.

Greenland Sea and Spitsbergen. Except in the extreme south-west, off south-east Greenland where the ice cover was near normal, there were excessive amounts of ice over the area. Moderate to strong north-easterly winds gradually reduced in strength and, as a result, air temperatures, in places 10 degC below normal, recovered to near normal by the end of the month. Sea temperatures were near average except off north Iceland where the sea was up to 4 degC colder than normal. There was more ice than normal in the Spitsbergen area; the ice edge early in the month was located 60 miles south of Bear Island but later retreated northwards to 30 miles north of the Island, still further south than normal. At 74°N the ice edge was located near 1°E but this edge later retreated westwards to its normal position at 5°W. The ice edge was 50 miles south-east of Jan Mayen at first and, though there was some retreat north-westwards, the edge was still south-east of Jan Mayen, a little beyond normal, at the end of the month. In the Iceland area there was again a large excess of ice. The edge gradually moved south and at the end of the month was within 10 miles of the north Iceland coast, some 100–120 miles south-east of average.

Barents Sea. Cold winds from a northerly point persisted and temperature remained below normal, in places by as much as 12 degC, at the beginning of the month. East of 30°E the ice edge was located near 72°N, 100–150 miles south of normal. West of 30°E the ice edge was at its normal position near 75°N. The south-east of the area remained ice-covered except for shore leads off the west coast of Novaya Zemlya.

White Sea and Baltic. Moderate west-north-westerly winds soon became light and variable and temperatures remained near normal. Unusually large breaks occurred in the White Sea pack-ice towards the end of the month. A great deal of melting occurred in the Baltic during the month though there was still more ice than normal. In the Gulf of Bothnia the break-up began early in the month and towards the end of the month there was a large area of open water in the south and south-east. (The Gulf of Bothnia is normally ice-free apart from some fast ice on coasts at this time). The southern part of the Baltic Sea was ice-free apart from a small area of open pack-ice near Stockholm. Some melting occurred in the western sides of the Gulfs of Finland and Riga though there were still abnormally large amounts of close pack-ice in these gulfs at the end of the month.

Table 1. Icebergs sighted by aircraft and merchant ships within latitudes 40°N–65°N and longitudes 40°W–65°W

(This does not include growlers or radar targets)

Limits of Latitude and Longitude		Degrees North and West: 66	64	62	60	58	56	54	52	50	48	46	44	42
Number of bergs reported south of limit	April	> 1025	> 892	> 781	> 736	> 736	> 736	> 593	374	80	3	2	2	2
	May	> 559	> 534	> 510	> 503	> 502	> 481	> 414	> 317	> 143	26	4	0	0
	June	> 1680	> 1679	> 1679	1578	1387	953	437	221	120	8	8	0	0
	Total	> 3264	> 3105	> 2970	> 2817	> 2625	> 2170	> 1444	> 912	> 343	37	14	2	2
Number of bergs reported east of limit	April	> 1025	> 1025	> 1025	> 1025	> 1025	> 926	> 677	> 281	> 97	> 7	0	0	0
	May	> 559	> 559	> 559	> 559	> 538	> 486	> 251	> 126	> 45	> 18	0	0	0
	June	> 1680	> 1676	> 1574	> 1229	> 894	> 592	> 210	> 34	> 19	3	0	0	0
	Total	> 3264	> 3260	> 3158	> 2813	> 2457	> 2004	> 1138	> 441	> 161	> 28	0	0	0
Extreme southern limit	April	41° 12′N, 52° 10′W on 1.4.69												
	May	45° 47′N, 47° 15′W on 19.5.69												
	June	44° 21′N, 48° 42′W on 3.6.69												
Extreme eastern limit	April	48° 56′N, 47° 05′W on 29.4.69												
	May	46° 00′N, 46° 30′W on 24.5.69												
	June	45° 08′N, 46° 52′W on 10.6.69												

> ('greater than') has been inserted where there is some doubt as to the actual number of icebergs at some of the sightings, but the true value is probably greater than the value given.

Extreme limits during the 3-month period are underlined.

Table 2. Baltic Ice Summary: April–June 1969

No ice was reported at the following stations during the period: Kalmar, Göteborg, Visby, Tönning, Husum, Emden, Lübeck, Gluckstadt, Bremerhaven, Kiel, Flensburg, Stettin, Gdansk, Aarhus, Copenhagen, Oslo, Kristiansandfjord. No ice was reported at any of the stations during June.

Station	April									May								
	Length of Season		Ice Days			Navigation Conditions			Accumulated Degree Days	Length of Season		Ice Days			Navigation Conditions			Accumulated Degree Days
	A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I
Leningrad ..	1	24	17	5	0	15	2	0	1063	2	8	6	0	0	6	0	0	807
Riga ..	1	21	16	6	1	2	6	0	619	0	0	0	0	0	0	0	0	296
Pyarnu ..	1	30	30	21	9	4	26	0	730	1	2	2	0	0	1	0	0	439
Viborg ..	1	30	30	26	4	0	1	29	—	1	4	4	0	1	3	1	0	—
Klaipeda ..	1	12	7	0	0	0	0	0	467	0	0	0	0	0	0	0	0	140
Ventspils ..	1	10	9	0	4	4	0	0	—	0	0	0	0	0	0	0	0	—
Tallin ..	1	30	30	2	28	5	25	0	—	1	4	3	0	1	0	1	0	—
Helsinki ..	1	25	25	17	0	15	10	0	809	0	0	0	0	0	0	0	0	545
Mariehamn	1	11	10	1	1	4	1	0	487	0	0	0	0	0	0	0	0	261
W. Norrskar	1	17	17	15	2	0	0	17	—	21	24	4	0	0	2	0	0	—
Turku ..	1	15	14	8	0	6	8	0	719	0	0	0	0	0	0	0	0	452
Mantyluoto	1	17	17	12	0	0	17	0	—	0	0	0	0	0	0	0	0	—
Vaasa ..	1	30	30	30	0	0	13	17	1019	1	7	7	7	0	7	0	0	819
Oulu ..	1	30	30	30	0	0	2	28	1473	1	14	14	11	0	0	14	0	1308
Roytaa ..	1	30	30	28	2	0	2	28	—	1	18	18	0	18	0	18	0	—
Lulea ..	1	30	30	30	0	0	0	30	1569	1	21	21	18	0	5	4	10	1431
Bredskar ..	1	30	30	30	0	3	25	0	—	1	3	3	3	0	0	0	0	—
Alnosund ..	1	30	22	11	0	8	0	0	741	1	12	4	0	0	0	0	0	563
Stockholm	1	20	20	13	2	16	0	0	307	0	0	0	0	0	0	0	0	7
Skellefteå ..	1	30	30	30	0	0	0	30	—	1	20	20	20	0	8	2	10	—

CODE:
A First day ice reported.
B Last day ice reported.
C No. of days that ice was reported.
D No. of days continuous land-fast ice.
E No. of days of pack-ice.
F No. of days dangerous to navigation, but assistance not required.
G No. of days assistance required.
H No. of days closed to navigation.
I Accumulated degree-days of air temperature (°C) where known.*

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

May

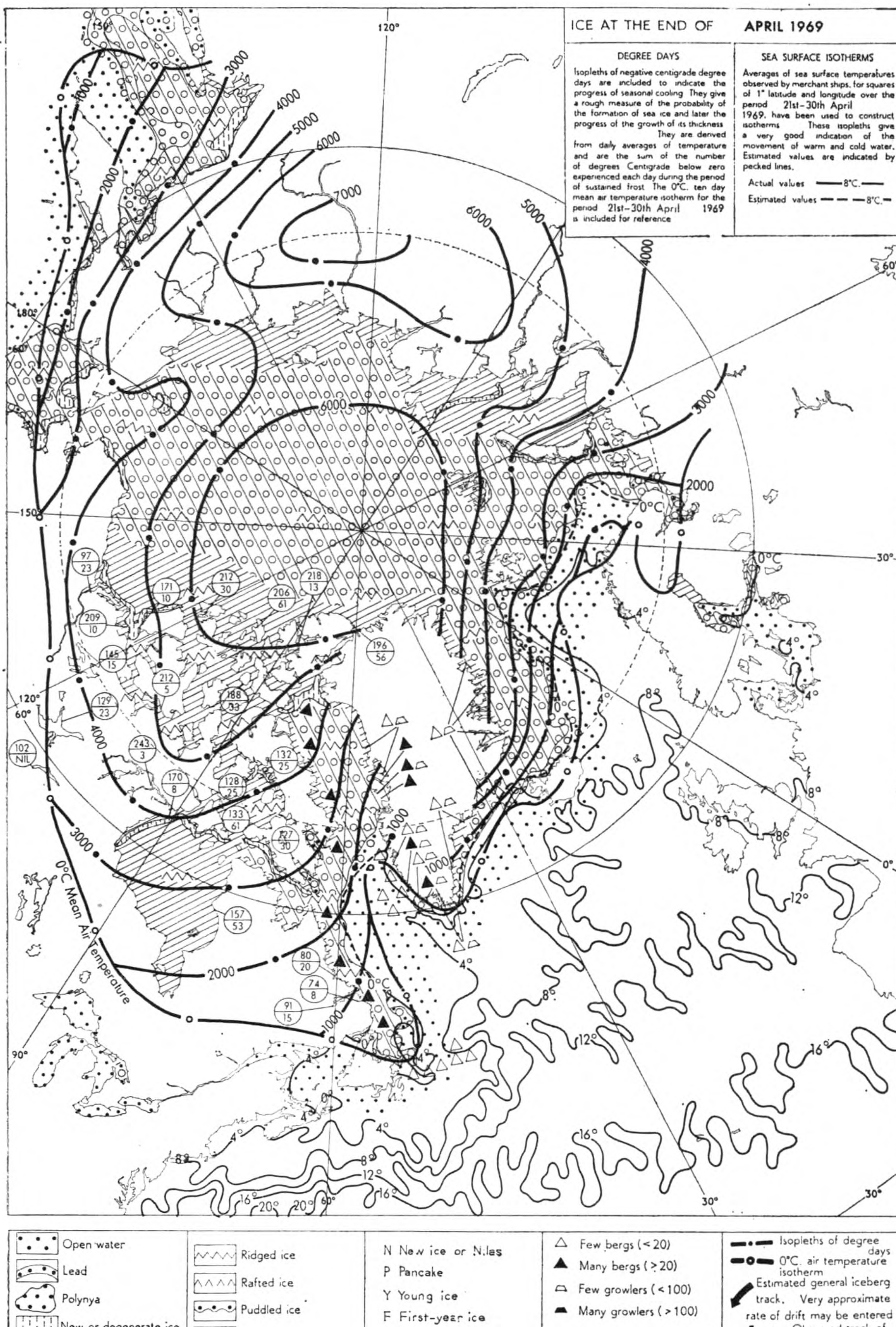
The low pressure belt of April moved south and allowed high pressure to dominate over most areas except eastern Canada. Easterly winds thus prevailed except where they were deflected to become south to south-east over Davis Strait and Baffin Bay and north to north-east over Hudson Bay around the east Canadian depression. Once more the Greenland and Barents Seas remained with excessive ice cover.

Canadian Arctic Archipelago, Foxe Basin, Hudson Bay and Strait, Baffin Bay. The leads and polynyas of April became larger during the month. The Amundsen Gulf polynya was unusually large (almost 100 miles across) though, by the end of the month, the northern half of this open-water area was covered by young ice. Open areas at the north of Baffin Bay and north-west Hudson Bay persisted and new leads opened up on both sides of Baffin Bay, otherwise the whole area was covered by fast ice or close pack-ice.

Davis Strait and Labrador Sea. The Cape Farewell pack-ice was driven north-west by south-easterly winds to 64½°N (the normal position is 62°N). Further north, open water existed as far as Disko Bay. On the western side of the Davis Strait and over the Labrador Sea there was a near-normal cover of ice.

Great Bank, South Newfoundland Sea, Gulf and River of St. Lawrence. Amounts of pack-ice off east Newfoundland decreased rapidly although a small area (more than average) remained at the end of the month. Otherwise, apart from icebergs, some of which were reported in the Belle Isle Strait, these areas were completely ice-free. By the end of the month icebergs over the Great Bank had spread south to 45½°N at 48°W.

Greenland Sea and Spitsbergen. To the north of Iceland winds were mainly light and variable and air temperatures rose to about 2 degC above normal. The ice edge, close to Iceland early in the month, retreated quickly but, nevertheless, ice cover remained excessive. The ice edge was 60–90 miles south-east of normal off south-east Greenland but this ice, under the influence of persistent north-easterly winds, was driven south to 58½°N (40 miles south of normal) before rounding Cape Farewell. Heavier than normal ice conditions persisted along the west coast of Spitsbergen.


ICE AT THE END OF APRIL 1969
DEGREE DAYS
Isopleths of negative centigrade degree days are included to indicate the progress of seasonal cooling. They give a rough measure of the probability of the formation of sea ice and later the progress of the growth of its thickness. They are derived from daily averages of temperature and are the sum of the number of degrees Centigrade below zero experienced each day during the period of sustained frost. The 0°C. ten day mean air temperature isotherm for the period 21st–30th April 1969 is included for reference
SEA SURFACE ISOTHERMS
Averages of sea surface temperatures observed by merchant ships, for squares of 1° latitude and longitude over the period 21st–30th April 1969, have been used to construct isotherms. These isopleths give a very good indication of the movement of warm and cold water. Estimated values are indicated by pecked lines.
Actual values 8°C.
Estimated values 8°C.
0°C Mean Air temperature
Open water
Lead
Polynya
New or degenerate ice
Very open pack-ice (1/10 - 3/10inc)
Open pack-ice (4/10 - 6/10inc)
Close or very close pack-ice (7/10 - 9+/10inc
Land-fast or continuous field ice (10/10) (no open water)
Ridged ice
Rafted ice
Puddled ice
Hummocked ice
(The symbols for hummocked and ridged ice etc. are superimposed on those giving concentration)
Extreme southern or eastern iceberg sighting
Ice depths in centimetres
Snow depths in centimetres
N New ice or Nilas
P Pancake
Y Young ice
F First-year ice
S Second-year ice
M Multi-year ice
Known boundary
Few bergs (<20)
Many bergs (>20)
Few growlers (<100)
Many growlers (>100)
Radar target (probable ice)
The 'number observed' may be put below the iceberg, growler, or radar target symbol
Radar boundary
Assumed boundary
Cracks
Isopleths of degree days
0°C. air temperature isotherm
Estimated general iceberg track. Very approximate rate of drift may be entered
Observed track of individual iceberg. Approximate daily drift is entered in nautical miles beside arrow shaft
Note - The plotted symbols indicate predominating conditions within the given boundary. Data represented by shading with no boundary are estimated

Barents Sea. Air temperatures remained around 3 degC below normal and, once more, there was an excess of ice in the east of this area where the ice edge, at about 42°E, was 70 miles west of normal. A wide lead, covered at times by new ice, persisted off the west coast of Novaya Zemlya.

White Sea. At the end of the month close pack-ice existed along the western side of this area; elsewhere there was very open pack-ice. Generally there was less ice than normal despite a negative air temperature anomaly of around 4 degC.

Baltic. Except for the extreme north, where an abnormally large area of close pack-ice existed at the head of the Gulf of Bothnia, the area was completely ice-free at the end of the month.

JUNE

Once again high pressure dominated over most of the area although this month there were two centres, one to the west of Banks Island and the other to the south-east of Spitsbergen. Low pressure persisted over eastern Canada and a second low became established to the south-west of Iceland. As a result of this pressure distribution, winds from a northerly point prevailed over central Canada and the eastern part of the Barents Sea. In those areas air temperatures were well below normal. The month of June was noteworthy for the extreme ice conditions (according to the latest data) in the Barents Sea and off south-west Greenland. After almost two years of excessive ice conditions over the Greenland Sea the ice edge there was back to its normal position.

Canadian Arctic Archipelago, Foxe Basin, Hudson Bay and Strait, Baffin Bay. Despite abnormally cold conditions over these areas, in places 4 degC below average, ice conditions were near or a little less than normal. The Amundsen Gulf polynya, the 'north open water' of Baffin Bay and the wide lead in north-west Hudson Bay remained larger than normal. First-year ice in Baffin Bay was now melting rapidly and open water extended to 75°N on the eastern side of the bay. Hudson Strait, exceptionally, had an excess of ice and this was largely due to winds driving the pack-ice into both entrances of the Strait.

Davis Strait and Labrador Sea. On the east side of the Davis Strait south to south-east winds persisted and the Cape Farewell pack-ice remained north of its normal position and, at 64°N, north of any recorded extreme limit. This extreme condition was largely due to north-easterly winds on the east side of southern Greenland and south-easterly winds on the west side persisting for several months. On the west side of the Davis Strait south-easterly winds pushed the ice-edge back towards Baffin Island, about 50 miles west of its normal position. Over the Labrador Sea the ice edge at 58°N was north of normal but at this latitude open pack-ice extended eastwards to 59°W, a little further east than normal. South of 58°N there was no pack-ice but a normal number of icebergs was reported. The south-eastern limits of icebergs was at 42°N, 44°W at the end of the month.

Greenland Sea and Spitsbergen. After almost two years of excessive ice conditions in the Greenland Sea the month of June saw a return to normal conditions in this area. North of the Denmark Strait light and variable winds prevailed and temperatures remained around 2 degC above normal. South of the Denmark Strait winds were north-easterly and, although ice conditions remained near normal off south-east Greenland, the ice edge off Cape Farewell, at 59°N, was a little south of normal. As in earlier months, more than the usual amounts of ice persisted around Spitsbergen.

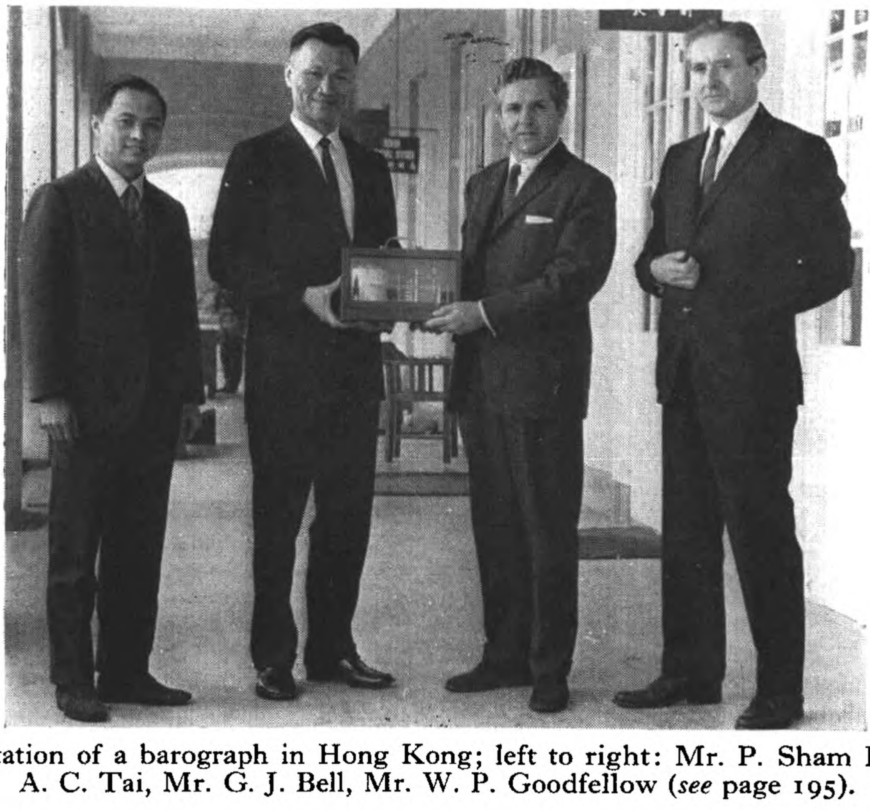
Barents Sea. Northerly winds persisted over the area and air temperatures were well below normal, in places in the east by as much as 7 degC. Sea temperatures in the east were around 3 degC below normal. Between Spitsbergen and 40°E the ice edge at 75½°N was 100–200 miles south of average. East of 40°E the ice edge was located at 72°N at 50°E; this is south of any known extreme limit.

White Sea and Baltic. In the White Sea, as normal, a little ice remained at the end of the month. The last of the ice in the Baltic, at the head of the Gulf of Bothnia, melted early in the month and the area became ice-free at the normal time.

R. M. S.

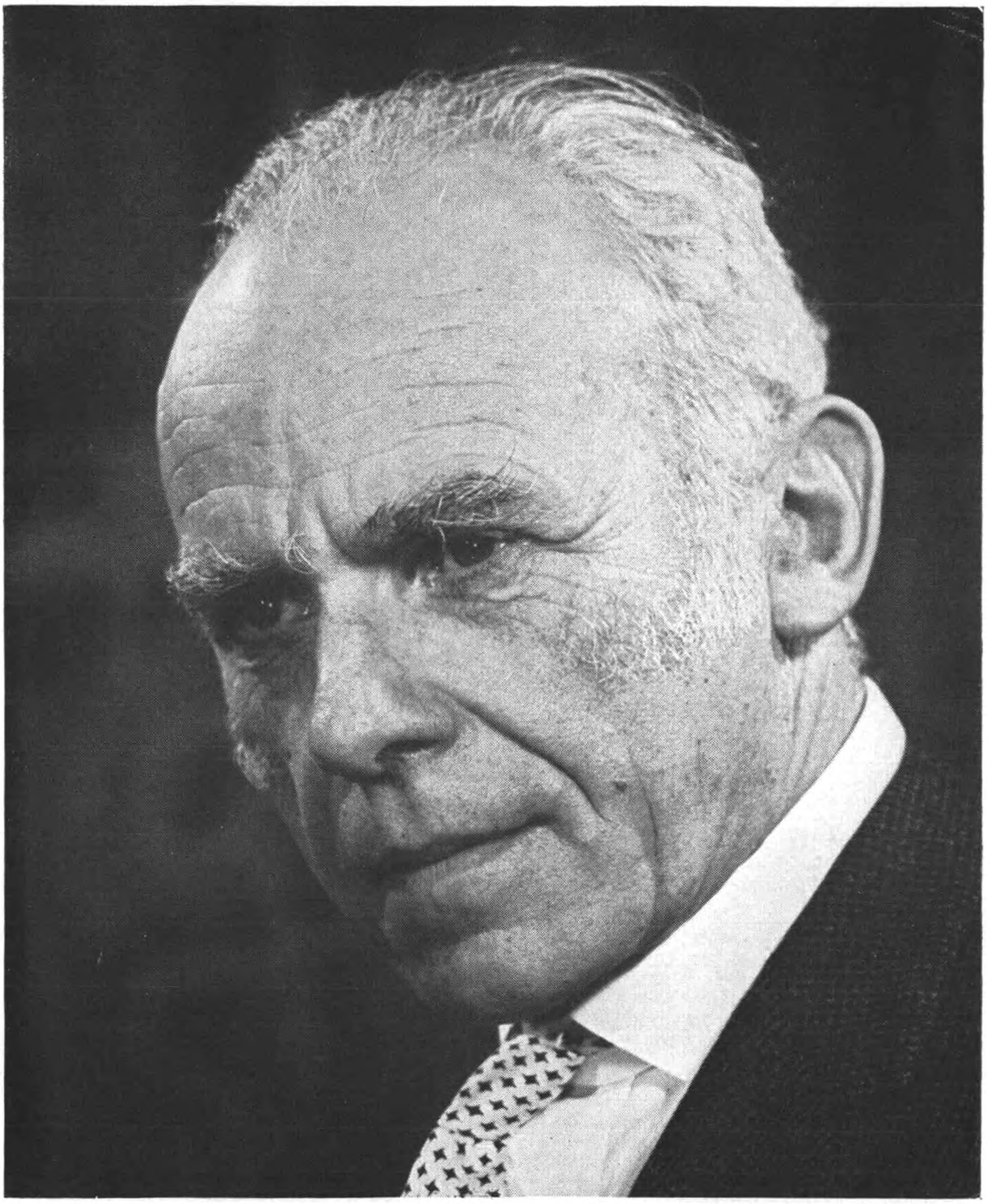
Note. The notes in this article are based on information plotted on ice charts similar to the map shown overleaf but on a much larger scale (39 in × 27 in). These charts are published at ten-day intervals and are available at the price of reproduction on application to the Director General, Meteorological Office (Met.O.1), Eastern Road, Bracknell, Berks. RG12 2UR. Alternatively, they may be seen at any Port Meteorological Office or Merchant Navy Agency. Up-to-date ice charts are broadcast daily by facsimile.

The presentation of barographs at Bracknell; left to right: Captain A. Cookson, Mr. P. J. Meade, Captain W. H. Stoodley, Captain H. Gravell (*see* page 195).



The presentation of a barograph in Hong Kong; left to right: Mr. P. Sham Pak, Captain A. C. Tai, Mr. G. J. Bell, Mr. W. P. Goodfellow (*see* page 195).

(*Opposite page* 201)



Commander C. E. N. Frankcom, O.B.E., R.D., R.N.R. (Rtd.), Marine Superintendent of the Meteorological Office 1939–69 (*see* page 208).

SPECIAL LONG-SERVICE AWARDS

Annual Excellent Awards for the best hundred meteorological logbooks received from ships during the year have been a feature of the Voluntary Observing Fleet for many years but in 1948 it was decided to institute four special awards for long and zealous voluntary observing at sea. This is the 22nd successive year in which these awards, inscribed barographs, have been made.

The minimum qualification for a special award is fixed at 15 years in which meteorological logbooks bearing the officer's name, either as an observing officer or as Master, have been received, including naturally the year previous to that in which the award is made. As soon as an officer's first meteorological logbook is received in the Marine Division, a personal card is started for him and thereafter a note is made on his card of his every subsequent meteorological logbook and the assessment awarded to it; we thus have a record of everything which an officer has ever done for us. Each year the record cards of all officers with 15 or more years' service are brought out and their overall record is worked out by our mathematical formula which takes into account the number of actual years observing together with the assessment which has been awarded to each individual meteorological logbook and this effectively places them in an order of merit. Fifteen years does not seem a very long period in which to observe but we have usually found that they are spread over many years, sometimes as many as 40, because any officer almost invariably spends some time in ships which are not observing ships or in a rank which does not participate in the work, or he comes ashore to study for a certificate, or his ship is perhaps laid up for some time. All these events will preclude his observing service from being continuous but, so long as his name appears in every meteorological logbook which he sends to us, he may be sure that each book is credited to him, no matter how long have been the gaps between them. But, in order to keep the cards efficiently, we require the full co-operation of the officer in giving us his full name and all the other particulars which are asked for on the inside back cover of the meteorological logbook; officers of the same name are sometimes very difficult to separate, especially if they have changed companies during their observing career.

This year there were 78 officers falling within the required zone of 15 years; the formula was applied to each one of their cards and as a result the Director-General of the Meteorological Office is pleased to award inscribed barographs to the following:

1. CAPTAIN J. D. BENNETT (New Zealand Shipping Co. Ltd.) whose first meteorological logbook came here from the *Tekoa* in 1935; he has 20 years of voluntary observing to his credit and has sent us 43 meteorological logbooks of which 35 have been classed 'Excellent'.
2. CAPTAIN H. J. D. SLADEN (New Zealand Shipping Co. Ltd.) who sent us his first meteorological logbook in 1947 when he was in the *Gloucester*. In 18 years he has sent us 29 meteorological logbooks of which all but one have been classed 'Excellent'.
3. CAPTAIN A. J. F. COLQUHOUN, M.B.E. (Anchor Line) who first observed for us in the *Olympia* in 1925. In 20 years, Captain Colquhoun has sent us 47 meteorological logbooks of which 29 have been classed 'Excellent'.
4. CAPTAIN J. HOGG (Cairn Line) who sent us his first meteorological logbook in 1949 when he was in the *Cairnesk*; subsequently he has sent us, in 19 years, 33 meteorological logbooks of which 23 have been classed 'Excellent'.

We congratulate these four shipmasters on this recognition of their valuable voluntary service for us over many years. They will be personally notified of the award and of the arrangements which will be made for its presentation.

An account of the presentation of the previous year's special award appears on page 195 of this issue.

L. B. P.

AUSTRALIAN EXCELLENCE AWARDS

(From the Director of Meteorology, Australian Bureau of Meteorology)

The following ships and ships' officers were selected to receive Excellence Awards for 1967:

SHIPS AWARDS

m.v. *Arawatta*, Eastern and Australian S.S. Co. Ltd.
m.v. *Bamora*, British India S.N. Co. Ltd.
m.v. *Delamere*, Western Australian State Shipping Service.

PERSONAL AWARDS

Mr. W. Gent	3rd Officer, m.v. *Kooringa*, Associated S.S. Pty. Ltd.
Captain Killman	m.v. *Lemnos*, Rederi A/B Helsingborg
Mr. G. Brown	Radio Operator, m.v. *Bass Trader*, Australian National Line
Captain F. Roberts	s.s. *Bugong*, Associated Bulk Ships Ltd.
Captain A. J. Murdock	s.s. *Arafura*, Eastern and Australian S.S. Co. Ltd.
Mr. A. Whitlock	Radio Operator, m.v. *Empress of Australia*
Captain G. B. Thompson	m.v. *Barpeta*, British India S.N. Co. Ltd.
Mr. J. W. Mills	2nd Officer, m.v. *Koolama*, Western Australian State Shipping Service
Mr. J. H. Williams	Radio Operator, m.v. *Koolama*

CANADIAN EXCELLENT AWARDS

(The following statement has been received from the Director of the Canadian Meteorological Branch)

The winners of the annual Canadian Excellent Awards for marine weather observing in 1968 have been announced and are listed on page 203.

Fifty-four awards in the form of suitably inscribed books, detailed below, have been presented to the Captains, Principal Observing Officers and Radio Officers of ocean-going voluntary observing vessels.

Twenty-four books were presented as 'Ship Awards' to vessels which have returned the best logbooks in regard to both quality and quantity in 1968. The book chosen for this award was *Expo '67—Montreal, Canada.* This award was for group achievement and is placed in the ship's library for all to enjoy.

For their individual efforts the best fifteen Principal Observing Officers received *The American Practical Navigator*, originally by Nathaniel Bowditch.

Fifteen Radio Officers received the book *The Elizabeth—Passage of a Queen*, by Leonard A. Stevens, for transmitting the greatest number of weather observations.

The Canadian Meteorological Branch congratulates the award-winning ships and officers and extend their thanks for the splendid work done by all the officers of the voluntary observing fleet.

INDIAN EXCELLENT AWARDS

(From the Deputy-General of Observatories (Forecasting), India)

During the year ending 31st March 1968 India's Meteorological Department had 47 Selected and 87 Supplementary ships in their Voluntary Observing Fleet. These ships rendered invaluable service to the Department, and to world meteorology in general, by recording and transmitting their meteorological observations. A notable feature of the year was the marked increase in the number of those observations, from 14,233 in 1966–67 to 19,500 in 1967–68. It is also encouraging to note that recently a number of Captains and shipowners have volunteered to have their ships enlisted in the fleet.

Recipients of Canadian Excellent Awards—1968

Name of Vessel	Captain(s)	Principal Observing Officers	Radio Officers	Owner/Agent
Acadia	J. W. C. Taylor	F. W. Sheppard	P. B. Rafuse	Government of Canada
Arcadia	E. Cowen	—	—	P. & O. Lines Management Ltd.
Belcargo	L. P. Johannessen	—	—	Seaboard Shipping Co. Ltd.
Belisland	K. Hoversholm	—	—	Kingsley Navigation Co. Ltd.
Bluenose	W. H. Crocker	D. Vail, H. Whitehead	—	Government of Canada
Canberra	E. G. H. Riddelsdell	B. G. Nash	R. J. Hawkins	P. & O. Lines Management Ltd.
d'Iberville	A. Lavoie, M. Gagne	—	E. R. Bonneau	Government of Canada
Derbyshire	R. Weir	—	—	Bibby Line Ltd.
Droxford	W. A. Ross	F. W. Watts	C. B. Smith	Risdon Beazley Ltd.
E. E. Prince	W. Matthews	G. Stone	—	Government of Canada
Emerillon	I. Balodis, C. A. Bradshaw	—	—	Shell Canada Ltd.
Gypsum Countess	R. Koppel, R. T. Luckey	F. W. Schnare	C. Orchard	Fundy Gypsum Co. Ltd.
Gypsum Empress	E. S. Creaser, R. C. Riley	P. A. Heathcote	D. J. Oliver	Fundy Gypsum Co. Ltd.
Gypsum Prince	R. A. Behnan, N. Crowe	C. R. Coste	—	Fundy Gypsum Co. Ltd.
Gypsum Queen	J. A. Blinn, O. K. Langdon	—	T. E. Potts	Fundy Gypsum Co. Ltd.
H 1060	G. H. Anderson	—	D. Keating	Kent Line Ltd.
Ixia	G. W. Mortimer	—	—	Stag Line Ltd.
John A. Macdonald	P. M. Fournier, G. Burdock	—	N. T. Kristensen	Government of Canada
John Cabot	G. S. Burdock, D. S. Tosh, G. Warren	—	—	Government of Canada
Kapuskasing	J. Vieau	G. K. Zinck	—	Government of Canada
Labrador	I. Green, G. Burdock, P. Tooke	—	P. Cooper	Government of Canada
Maxim	C. Y. Chow	—	—	Kingsley Navigation Co. Ltd.
Nego Anne	H. Oskarsson	G. Liland	—	Wallem & Co. A/S
Oriana	C. Edgecombe	C. R. P. Campbell	E. R. Le Gear	P. & O. Lines Management Ltd.
Princess of Acadia	J. A. Blinn	P. Petrovitch	W. E. Fontaine	Canadian Pacific Railway
Procyon	G. Roussos	—	—	B. W. Greer & Son Ltd.
Queen of Prince Rupert	J. D. Callan, W. Murray, G. Ruddick	—	R. J. Barrie	British Columbia Ferry Authority
Silvercape	A. A. Walker	R. A. Chappel	J. Leahy	Silver Line Ltd.
Silvercove	N. H. B. Bloye	—	—	Silver Line Ltd.
Simandou	R. W. Jones, J. T. Harper	—	W. Gallacher	Harrisons (Clyde) Ltd.
Sir Humphrey Gilbert	J. Rose, G. W. Brown	D. Daly	—	Government of Canada

The Department wishes to convey its thanks to all the officers and shipowners concerned who have assisted in this important work.

Awards are offered in the form of books to the Captains, Observing Officers and Radio Officers of the ships whose meteorological work has been adjudged 'excellent' and the following ships have been selected for such Excellent Awards for the year 1967–68:

NAME OF VESSEL	OWNER
Jaladhan ..	Scindia S.N. Co. Ltd.
Jag Kisan ..	Great Eastern Shipping Co. Ltd.
Jalaganga ..	Scindia S.N. Co. Ltd.
Jalapalaka ..	Scindia S.N. Co. Ltd.
Saudi	Mogul Lines Ltd.
Jalagouri ..	Scindia S.N. Co. Ltd.
Apj Akash ..	Apeejay Lines Ltd.
Mahavikram ..	South East Asia Shipping Co. Ltd.
State of Madras	Shipping Corporation of India Ltd.
Karanja	British India S.N. Co. Ltd.
Kampala ..	British India S.N. Co. Ltd.
State of Bombay	Shipping Corporation of India Ltd.
Rajula	British India S.N. Co. Ltd.

In addition to the ships mentioned above, the following have been awarded a Certificate of Merit for commendable work done during the same year:

Apj Sushma	*Jalavikram*	*State of Maharashtra*
Gandhi Jayanti	*Nicobar*	*State of Orissa*
Jaladharati	*State of Andhra*	*Vishva Jyoti*
Jalajawahar	*State of Bihar*	*Vishva Maya*
Jalavihar	*State of Haryana*	*Indian Exporter*

In token of appreciation of long and meritorious service the *Rajula* and the *State of Bombay*, which have figured most frequently on Excellent Award lists in the past, are each being presented with a Special Award—a meteorological instrument.

Book Reviews

The Maiden Voyage, by Geoffrey Marcus. 8¾ in × 5¾ in, pp. 320, *illus.* George Allen & Unwin Ltd., Park Lane, Hemel Hempstead, Herts., 1969. Price: 50*s.*

The title suggests a rather pleasant occasion, with everything spick and span aboard, official receptions in the public rooms, and the usual teething troubles to worry the Master and Officers of the ship—but this is the story of what is perhaps the most dramatic and tragic maiden voyage of all. A note on the cover of the book tells us that it is "a complete and documented account of the *Titanic* disaster". The references and notes at the end of the book, which take up 17 closely-printed pages, are evidence that the author did try very hard to get his facts right. In the preface he states that although the *Titanic* disaster "demands, above all things, a strictly factual and objective approach, no comprehensive, detailed, documented account of the affair has yet appeared. . . . It was with the object of clearing away some of the cloaking camouflage erected at the time by the vested interests concerned and getting at something like the real truth of the matter that this book was conceived".

Fact is often more exciting than fiction and it is perhaps a tribute to the author that, having declared his intention of seeking truth, the book provides some very dramatic reading. The author has a vivid style and events are described chronologically and, as the drama unfolds, one finds it difficult to put the book down.

The curtain opens at the boat-train on Waterloo Station at 9.30 a.m. on 10th April 1912. The joyous and emotional scenes as the *Titanic* sailed from Southampton, the activities on board during the voyage and the little character studies of Captain, crew and passengers are well told. The fatal chain of events of 14th/15th April is described in some detail, including extracts from ice reports received by radio. It was about 11.40 p.m. ship's time on the 14th that the *Titanic*, steaming at about 23 knots in an almost glassy sea, with air temperature about 33°F, hit the berg. At about 3 a.m. the *Titanic* sank on a calm, clear night within sight of the lights of another steamer lying stopped in the ice.

The author spares nobody in his attempts to find the truth. Apart from the calm courage and heroism of individuals, none of those concerned with the operation of the ship come out of it very well—including the White Star Line, owners of the ship, her Master and Officers and the Marine Department of the Board of Trade. It seems that the passengers, in general, seem to have been extraordinarily calm under the frightening circumstances in which they found themselves aboard that luxury ship, on such a calm cold night, with plenty of time to get away but not enough boats to take them.

After the disaster came the reckoning—the American inquiry and the British one, both of which are described in appreciable detail. Here again the author spares nobody in his search for truth.

No book about the *Titanic* would be complete without a reference to the *California*. The author discusses the controversy but has no doubt, having weighed up the evidence, that the *California* was the ship concerned.

The book is illustrated with some interesting photographs of the ship herself and some of the people concerned.

C. E. N. F.

The Navigation Explosion. A special issue of the *Journal of the Institute of Navigation*, January 1969. 9½ in × 6 in, pp. 150, *illus*., John Murray (Publishers) Ltd., London, 1969. Price: 30*s*.

In the foreword, H.R.H. The Prince Philip, Duke of Edinburgh, who is patron of the Institute of Navigation, tells us that this number of the *Journal* celebrates its 21st year of publication. He mentions that, thanks to the Institute's wise publication policy, the *Journal* is acknowledged as one of the world's leading periodical publications on navigation and attracts many contributions from abroad.

In an introductory note the Editor explains that this number provides opportunity to pause and consider changes in navigation that have taken place in these 21 years and to look a little into the future and that there has "in effect been a navigation explosion, an expansion of ideas, techniques and methods perhaps unparalleled since the sixteenth century". Hence the title.

This little paper-backed book forms two very useful functions. It gives in a condensed form an excellent outline of what has taken place in the navigation world during these 21 years and it brings home to the reader what a magnificent job the Institute has done towards improving the art of navigation and enhancing safety at sea and in the air. It is, after all, a voluntary organization entirely supported by its members.

The first item in this journal is the Presidential Address by Professor A. Stratton, given at the Annual General Meeting of the Institute (1968) on The Science and Technology of Navigation; as its title suggests this deals with sophisticated navigational devices such as doppler, long-range radio aids, navigational satellites, the inertial system and an application of the speed of light to navigational problems. Wing Commander Anderson provides a paper about navigational development in relation to the Institute, while Captain Wylie contributes a valuable historical sketch about the development of radar at sea. Dr. Calvert provides a controversial paper on Human factors and the Collision Problem in which he illustrates his proposals for specific manoeuvring rules which have the object of endeavouring to eliminate the human factor.

Commandant Oudet, who did much to inspire the scheme for the separation of traffic in Dover Strait, contributes an excellent article on The Ordering of Seaborne Traffic, and Mr. D. Sadler in a paper on Astronomy and Navigation reminds us that astronomical sights still find an honoured place in navigational practice—even in space navigation.The relationship between oceanography and navigation is described in an article by Dr. Deacon, Director of the National Institute of Oceanography. Captain Wepster, Marine Superintendent of the Holland-Amerika Line, a keen supporter of the Institute, contributes a very practical paper about the future of marine navigation in which he mentions, *inter alia*, the meteorological aspect of navigation, including weather routeing, and also the navigational problems rising from the arrival of the very large and fast cargo ship of deep draught. There is a paper on Navigation and Economics in the Air by J. D. Williams and a contribution by A. M. A. Majendie which is entitled Money, Men and Machines which, as its title suggests, poses the question as to how far should one go for economical and practical reasons in the development of any particular new navigational techniques. A fascinating article on Navigation in Animals is provided by G. V. T. Matthews of the Wildfowl Trust. Finally, Michael Richey, Editor of the *Journal*, gives a description of his passage in his boat *Jester* in the single-handed trans-Atlantic race of 1968.

This review amounts to little more than a summary of the contents of this journal but it will perhaps indicate that anybody interested in navigation would do well to acquire a copy.

C. E. N. F.

My Lively Lady, by Sir Alec Rose, $8\frac{3}{4}$ in × $5\frac{3}{4}$ in, pp. 204, *illus*. Nautical Publishing Company, Captain's Row, Lymington, Hants. Price: 35*s*.

This is Sir Alec's personal account of his magnificent feat of seamanship and endurance in circumnavigating the world alone by way of the Cape of Good Hope and Cape Horn, a voyage he had dreamed of since childhood.

Encouraged by his success in finishing fourth in the 1964 single-handed trans-Atlantic race of fourteen contestants, he then thought of attempting a more ambitious ocean voyage. He had proved his competence as a seaman and navigator and he had no doubt about the soundness of his 36-foot cutter *Lively Lady*, built in 1948.

When, some two years later, Sir Francis Chichester announced his plans for sailing to Australia along the clipper route, Sir Alec resolved to follow him, as this would also afford him an opportunity to see his son in Australia, and his daughter-in-law and their two young children he had never met.

His preparations for this long voyage were made with great care. With the valuable experience of two single-handed trans-Atlantic voyages (one east and one west) he was well aware of the importance of rig and sail plan, and also had a good idea of what he would require in the way of stores and equipment. He sought the expert advice of his friends John Illingworth, Angus Primrose and Sir David Mackworth and with their advice decided to add a light mizzenmast and rig the boat as a yawl. Sir Alec's financial resources were slender but he had no wish to be sponsored, preferring to be completely independent. A few close friends did finally persuade him to accept their modest help, with no strings attached, towards the cost of some additional sails.

His practical and devoted wife gave him every encouragement, and never for a moment doubted his ability to complete the world voyage alone. She relieved him of all worry about the management of their business in Portsmouth during the final stages of fitting out and throughout his long absence at sea.

Shortly after sailing from Portsmouth in the summer of 1966 things began to go wrong. First the engine, without which the batteries could not be recharged, refused to start, then the steering blade of the self-steering gear snapped. Sir Alec decided to put into Plymouth to get these troubles put right. Three days later he set off again in good heart, feeling all would now be well; but worse troubles were yet to come. Early the next morning, during the hours of darkness, *Lively Lady* was struck a glancing blow by a large, unidentified, power-driven vessel which splintered the bowsprit, bent the pulpit, broke off two guard-rail stanchions and damaged the steel mainmast. There was nothing for it but to return to Plymouth for repairs. When these were just about complete and the boat moored alongside in a drying-out berth at Mashford's Yard, at low tide one night, when Sir Alec was sleeping ashore, *Lively Lady* fell away from the wall and crashed heavily on her starboard side, cracking three or four of her timbers. The extensive repairs required to make good the damage meant postponing the voyage for several months. Although Sir Alec was very dispirited by this calamitous turn of events he was determined not to give up his plan.

The following May, with repairs completed, Sir Alec sailed *Lively Lady* back to Portsmouth, planning to set off again on his world voyage on 16th July. This time all went according to plan.

Sir Alec's account of his epic voyage to Melbourne via the Cape of Good Hope and home again via Cape Horn is written with warmth and simplicity. He gratefully acknowledges all the kindness and encouragement he received from his many admirers, the impressive welcome given to him in Australia and New Zealand, and on his triumphant return home on 4th July 1968 after an absence of nearly twelve months.

The book is well illustrated, many of the plates being in colour. Part II contains a very human account by Lady Rose of the pattern of her life during Sir Alec's long absence, and an account by her Radio Officer of *Wave Chief*'s meeting with *Lively Lady* off Cape Horn; also an interesting chapter on the inhospitable Cape Horn region by Michael Mason (a former Commodore of the Royal Ocean Racing Club), and another about voyages made by small craft in the Roaring Forties by Commander Erroll Bruce. The Appendix includes an illustrated description of *Lively Lady*'s wind-vane steering gear by Colonel Haslar, the designer, some advice on weathering storms by Sir Alec, and a list of the stores and provisions on board *Lively Lady* when he sailed from England.

A. D. W.

Personalities

RETIREMENT.—COMMODORE C. EDGECOMBE, C.B.E., R.D., R.N.R. has retired after 44 years at sea.

Clifford Edgecombe was born at Beckenham, Kent, in 1909, the great-great-grandson of Admiral Sir Charles Bletsoe who fought at Trafalgar with Nelson. He received his early education at Dulwich College and went on to pre-sea training in H.M.S. *Worcester* before joining the New Zealand Shipping Company as a Cadet. He passed for 2nd Mate in 1928, for Mate in 1929 and Master in 1933 after which he did his long R.N.R. training before joining the Orient Line in 1934 as 4th Officer.

As an officer of the permanent Royal Naval Reserve, he was called into the Royal Navy for World War II and was appointed to command the minesweeper H.M.S. *Oak*; he received three commendations during the war, for mine clearance operations in the North-Western Approaches in the early days, for Channel mine clearance preparatory to the allied re-entry into Europe in 1944 and during the re-entry of the allies into Burma and Malaya in 1945.

After the war he returned to the Orient Line and was appointed to his first command, the *Otranto* in 1955. In 1961 he was promoted to Commodore R.N.R.; in the New Year Honours of 1965 he was appointed C.B.E. and in 1967 he became Commodore of the joint P. & O.-Orient Lines.

Commodore Edgecombe holds a number of civic awards; he is an Honorary Citizen of the State of Florida, an Honorary Commodore of the Port of Los Angeles, an Honorary Pilot of the Panama Canal, having been presented with the Golden Key of the Locks by the Governor of the Panama Canal, and also holds the Order of Maritime Merit in San Francisco. Additionally he has also been presented with the Keys of Hollywood (Florida), Lauderdale, Los Angeles, Miami, Port Everglades and San Francisco. He has also received presentations from the Mayors of Honolulu, Suva, Sydney and Vancouver.

Our association with Commodore Edgecombe goes back to 1931 when he sent us a meteorological logbook from the *Rangitane*. Subsequently in ten years we received 20 meteorological logbooks from him, the last one being in 1959. He received Excellent Awards in 1932, 1933, 1937 and 1938. In 1960 Commodore Edgecombe went in command of the new *Oriana*; by mutual agreement she was taken into the Canadian Voluntary Observing Fleet because the U.K. List was, at that time, full whilst there was room on the Canadian List. Moreover, the ship was to spend much of her time in the Pacific Ocean. In every year since then Commodore Edgecombe received an Excellent Award from the Canadian Meteorological Service.

Amongst our record cards we have one also for Mr. Clifford Edgecombe, the Commodore's son, who observed for us in the P. & O.-Orient Lines in 1962–63 but has since come ashore.

We wish Commodore Edgecombe a long, healthy and happy retirement.

L. B. P.

RETIREMENT.—CAPTAIN W. A. KENNEDY, retired from the sea on 3rd May 1969 after completing his last voyage in command of the *Aragon*.

William Angus Kennedy was born on 31st May 1908 and first went to sea as an apprentice with Manchester Liners and served with Hall Line from November 1928 until December 1935. He afterwards joined the Royal Mail Lines as 4th Officer, serving in various Royal Mail ships until appointed to command the *Teviot* in February 1955. During World War II he was unfortunately in the *Highland Patriot* when she was torpedoed. He also commanded the ships *Pardo*, *Paraguay*, *Tuscany*, *Loch Loyal* and *Andes*.

His association with the Meteorological Office commenced in 1946 with his first meteorological logbook from the *Highland Brigade* and in 18 years of voluntary observing he has sent in 28 logbooks of which 12 were classed Excellent.

We wish him health and happiness in his retirement.

J. C. M.

RETIREMENT.—COMMANDER C. E. N. FRANKCOM, O.B.E., R.D., R.N.R. retired as Marine Superintendent of the Meteorological Office on 27th June after more than 30 years' service (*see* photograph opposite page 201).

Charles Edward Nowell Frankcom was born at North Wraxall, Wiltshire, in July 1903. After two years' training in H.M.S. *Conway* (1918–20), followed by eight months' naval training as an R.N.R. midshipman aboard the aircraft carrier H.M.S. *Argus*, he commenced his apprenticeship with Royal Mail Lines in 1921.

In 1924 he obtained his 2nd Mate's certificate and returned to Royal Mail Lines as a junior officer, serving in both cargo and passenger ships of this company. Having obtained his Extra Master's certificate in 1930 he was naturally anxious to obtain early command. To achieve this he resigned from Royal Mail Lines to join the Bristol City Line as Chief Officer, and the following year was promoted Master.

In 1936, after a further period of naval training in submarines, he joined the Board of Trade as a Nautical Surveyor and Examiner of Masters and Mates. His first appointment in that service was at Liverpool. The following year he was transferred to the Central Board of Examiners in London.

In January 1939 he was appointed Marine Superintendent of the Meteorological Office and Editor of *The Marine Observer* in succession to the late Captain Brooke Smith.

Shortly after the declaration of hostilities that year the Marine Branch moved to Stonehouse (Gloucestershire) when their main task was the preparation of climatic atlases from data recorded by ships' voluntary observers over a period of about 100 years. There was an urgent need for these atlases at that time for use in naval operations.

In November 1940 he volunteered for service at sea in the Royal Navy and was appointed Commodore of coastal convoys on the Southend-Methil-Loch Ewe-Oban route. For this service he was awarded the O.B.E. Early in 1943 he was transferred at his own request to combined operations and took part in the North Africa, Sicily, Reggio and Anzio landings. He was later appointed Naval Officer-in-Charge at Piombino (Italy) and opened up the ports at Patras, Gruz (Dubrovnik) and Split, and was employed on special duties in Corfu. During his absence his assistant, Commander J. Hennessy, M.B.E., R.D., R.N.R., was Acting Marine Superintendent.

After demobilization in September 1945, Cdr. Frankcom rejoined the Meteorological Office as Marine Superintendent where his first task was to reorganize the voluntary observing fleet which had ceased to function in September 1939. He was responsible for the planning and conversion of four 'Flower' class corvettes to ocean weather ships in 1947, and the planning and conversion of the four 'Castle' class frigates which replaced the 'Flower' class vessels as ocean weather ships between 1958 and 1961. The operation of these ships has been one of his duties since the service began in 1947.

He has been a member of the Commission for Maritime Meteorology of the World Meteorological Organization since 1939 and served as President of CMM from 1946 to 1956, since when he has been Chairman of an operational Working Group of the Commission and represented the World Meteorological Organization at various meetings of the Maritime Safety Committee of IMCO. He attended the inaugural meeting of IMCO at Geneva in 1948. He also represented WMO and was an adviser to the British delegation at the Safety of Life at Sea Conference in 1948 and 1960, and was a British delegate at the International Load Line Convention in 1966. He has been a member of the British delegation at all the international weather ship conferences and, since 1954, has been Chairman of the Advisory Committee of European Operating States on North Atlantic Ocean Stations. From 1963 till 1968 he was Chairman of a subcommittee of the British Standards Institution charged with the preparation of a booklet on climatic hazards in the transport and storage of goods (including cargoes in ships' holds). He is a Liveryman of the Honourable Company of Master Mariners, a Fellow of The Institute of Navigation, a member of the Challenger Society and the Society for Underwater Technology and a Freeman of the City of London.

In addition to his official duties he has always taken a very active part in the social activities of the Meteorological Office, his particular interest being amateur dramatics.

We wish him a long and happy retirement.

A. D. W.

VALEDICTION

This is the last number of *The Marine Observer* which I shall edit because, by the time it is published, I shall have retired from the post of Marine Superintendent of the Meteorological Office; at the time of writing my successor had yet to be appointed. My work as Editor of this journal for 23 years (publication was discontinued from 1940 until mid-1947 because of the war) has been both pleasant and interesting. I believe that *The Marine Observer* is a valuable link between the Meteorological Office and our voluntary observers and that its contents are of some value to the meteorological services of other countries.

I would like to pay tribute to the excellent work done by all those voluntary observers with whom I have been associated during the 30 years that I have been in the Meteorological Office. They have made an enormous contribution to international meteorology.

I send farewell greetings and best wishes to all our readers—afloat and ashore.

C. E. N. F.

Notice to Marine Observers

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

Headquarters.—Captain A. D. White, R.D., Lt.-Cdr. R.N.R., (Acting) Marine Superintendent, Meteorological Office (Met.O.1.), Eastern Road, Bracknell, Berks. RG12 2UR. (Telephone: 0344 20242, ext. 456.)

— Deputy Marine Superintendent. (Telephone: 0344 20242, ext. 543.)

Lieut.-Commander L. B. Philpott, D.S.C., R.D., R.N.R., Nautical Officer. (Telephone: 0344 20242, ext. 461.)

Mersey.—Lieut.-Commander E. R. Pullan, R.D., R.N.R., Port Meteorological Officer, Room 709, Royal Liver Building, Liverpool L3 1HN. (Telephone: 051–236 6565.)

Thames.—Mr. J. C. Matheson, Master Mariner, Port Meteorological Officer, Movement Control Building, South Side, Victoria Dock, London, E.16. (Telephone: 01-476 3931.)

Bristol Channel.—Captain F. G. C. Jones, Port Meteorological Officer, 2 Bute Crescent, Cardiff CF1 6AN. (Telephone: Cardiff 21423.)

Humber.—Mr. W. G. Cullen, Master Mariner, Port Meteorological Officer, c/o Principal Officer, Board of Trade, Trinity House Yard, Hull. (Telephone: Hull Central 36813.)

Clyde.—Captain R. Reid, Port Meteorological Officer, 118 Waterloo Street, Glasgow, C.2. (Telephone: 041-248 4379.)

Forth.—All enquiries to Captain Reid above.

Tyne.—Captain C. J. D. Sutherland, Merchant Navy Agent, c/o F. B. West & Co., Custom House Chambers, Quayside, Newcastle-upon-Tyne. (Telephone: Newcastle 23203.)

Southampton.—Mr. A. C. Howie, Master Mariner, Merchant Navy Agent, Southampton Weather Centre, 160 High Street below Bar, Southampton SO1 0BT. (Telephone: Southampton 20632.)

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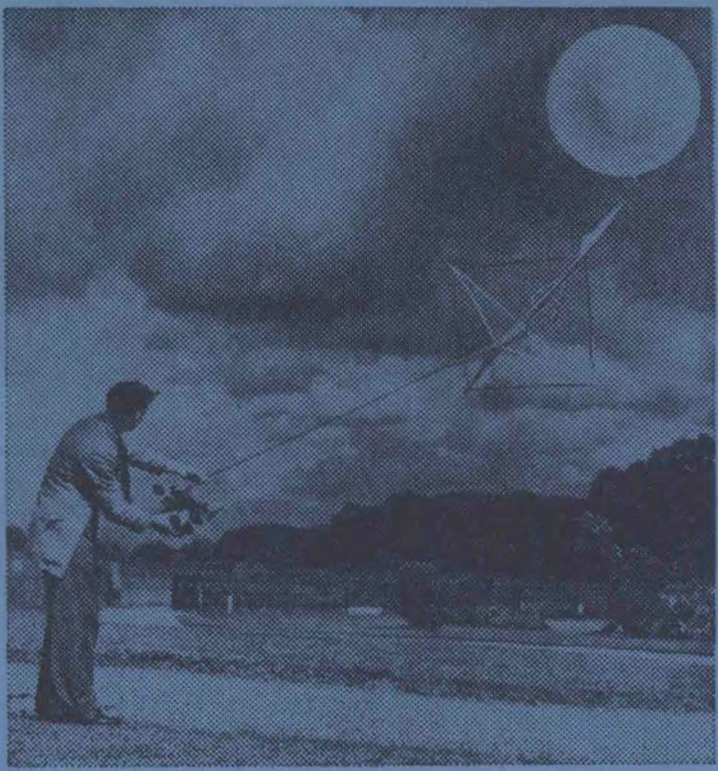

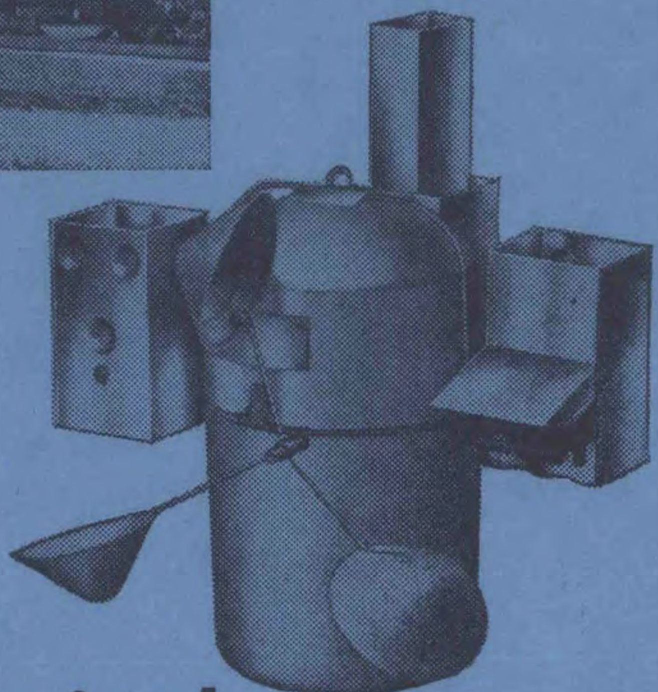

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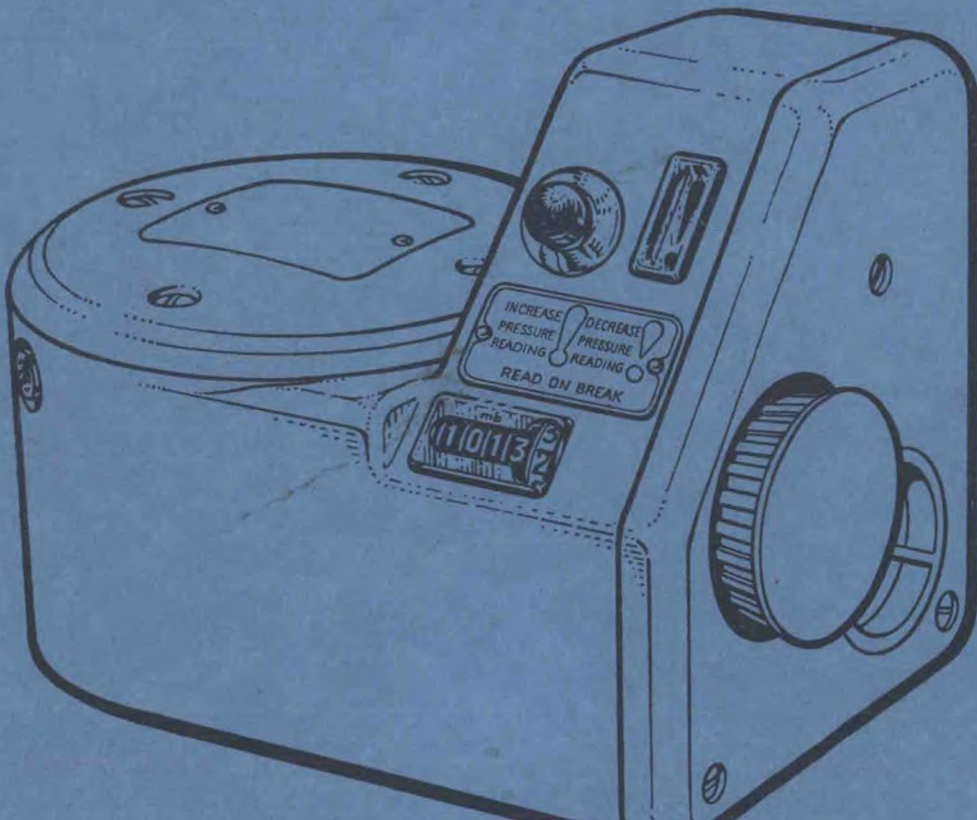

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