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The Marine Observer

A quarterly journal of Maritime Meteorology

Volume XXXIII No. 202

October 1963

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THE MARINE OBSERVER

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

VOL. XXXIII No. 202 OCTOBER 1963

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Editorial

In April 1963, at the Institute of Navigation, the Marine Superintendent of the Holland America Line and a Netherlands meteorologist opened a discussion on "Navigation and the Operation of Merchant Ships"; each of them contributed a paper describing experiments in 'weather routeing' carried out during recent months by ships of the Holland America Line on the advice of the Royal Netherlands Meteorological Institute.

Weather routeing of ships in its wider sense is nothing new; it merely means that the master of the ship takes advantage of all available meteorological information in order to achieve the most favourable passage for his ship. The master of a sailing ship was entirely dependent upon weather routeing for a favourable passage and prior to about 1850 he had to rely upon his own experience or upon information he could get from other experienced shipmasters. In the 1850's, Maury's *Sailing Directions* placed before the mariner, for the first time, atlases giving seasonal information, necessarily rather crude, about the winds and currents of the world and thereby sailing ships were able to do much more economical passages than they were able to do previously. Nowadays, thanks to the voluntary meteorological work done aboard merchant ships of all nations during more than 100 years, detailed and accurate climatic information about the wind and currents of the world is readily available to mariners, in atlases and in the text of Admiralty Pilots. A recent innovation has been the publication by the Hydrographer of routeing charts, portraying on a monthly map, for each ocean, essential climatic information supplied by the Meteorological Office and also the various loadline zones and most of the conventional steamer tracks.

The Admiralty publication *Ocean Passages for the World*, 1950 edition, gives detailed advice as to the best route to be followed by a steamship or a sailing ship, in all oceans, at various seasons of the year. The text of this book is supplemented by maps illustrating the various routes, a climatic chart of the world for January and July and a map showing the surface currents of the world. Thus, from the climatic or seasonal point of view, the shipmaster now has available to him accurate information about wind force and direction, weather and visibility and ocean currents to help him plan the most advantageous passage for his ship. If care of cargo is a major consideration, air and sea temperature and humidity may figure in his planning.

This seasonal information is probably of the greatest value in the Indian Ocean and China Sea because of the regular behaviour of the monsoons. In other oceans, also, an intelligent appreciation of the climatic and ocean current conditions can be beneficial to the economy and safety of the ship. However, with certain notable exceptions, the weather doesn't follow a climatic pattern, which, after all, is only the average story; to get the best out of weather routeing, the synoptic story also needs to be known. Nowadays, the mariner does not have to rely solely upon his own appreciation of the climatic story—thanks to radio, he has at his disposal, in all parts of the world, professional meteorologists who are prepared to give him the synoptic advice he needs; and in giving that advice, the meteorologist will, himself, undoubtedly take the climatic probability into account.

In tropical areas, 'weather routeing' to avoid a tropical storm has for very many years been the general practice of seamen. The "concise rules for avoiding tropical storms", which were first published in 1839 and have been brought up-to-date from time to time, include advice as to the warning signs of the approach of a tropical storm and this subject forms part of the examination for masters and mates. The frequent radio weather bulletins now issued by meteorological authorities in areas where tropical storms are prevalent include advice about the intensity and speed of the storm and make it much easier for the shipmaster to put these rules into effect and avoid the worst of the storm.

In temperate latitudes, the frequency and variability of extra-tropical depressions, the wide area they cover, and the speed of their movement, makes 'synoptic weather routeing' a much more difficult problem. A tropical storm is relatively small in area, and the associated winds are so violent that it is suicidal for a ship not to make every effort to avoid it. In a temperate zone depression, however, there is not usually much danger if a well found ocean-going ship does encounter the worst of the wind because the maximum winds do not normally exceed Beaufort force 9 or 10 anywhere in the storm field. If a wind of force 10 or above is experienced in such a storm, it is usually in a fairly restricted area and in most cases there is opportunity to warn shipping on the high seas, in accordance with international practice, by the issue of a storm warning by radio. The occasion when an ocean-going ship is likely to get into serious trouble with temperate zone depressions is when she is in coastal waters, where there is probably the complication of relatively shallow water, lack of sea room and perhaps a lee shore. In the open ocean, it is only when something unusual happens like a bulk cargo shifting or a propeller being lost that the ship gets into real trouble, and this is unlikely to occur unless she encounters winds of exceptional fury. If the master gets a radio weather bulletin giving warning of storm winds, he can usually take action to avoid such winds.

In the majority of cases, the only reason an ocean-going ship needs to avoid a temperate zone depression on the high seas is for economic reasons—to get a more favourable passage, to avoid damage to cargo, to minimise the risk of superficial damage on deck, or to avoid discomfort to passengers and crew. Ships cost so much to operate at present and competition is so intense that the importance of these economic considerations is fairly obvious.

It seems that it is largely for economic considerations that the Holland America Line has taken up this weather routeing project so enthusiastically in collaboration with the Netherlands Meteorological Service. The papers read at the Institute of Navigation showed that the masters of the ships which are selected for weather routeing are encouraged to consult the Meteorological Institute before sailing and seek advice as to the route to be followed. Each ship is provided with a facsimile receiver, at the company's expense, so that the master always has the latest weather information at his finger tips. It has generally been agreed that waves have a greater effect than wind upon the progress of the ship through the water and that swell has this effect as well as sea, although to a lesser extent. The general intention of the Netherlands technique, is to advise the master as to a route which avoids the worst of the waves but yet takes the ship towards her destination. In other words, they endeavour to pick out a 'least time track' bearing in mind the known behaviour of the ship in heavy weather. They include, in their advice to weather routed ships, information about existing and forecast waves (sea and swell). This information covering the whole North Atlantic is made available to the master of the ship by facsimile broadcast, and is additional to the actual and forecast maps showing surface meteorological data.

The meteorologist advises the master by radio each day, after studying all the available information, as to whether he considers it advantageous to make an alteration in course or speed; it is up to the master as to whether he accepts that advice or not.

The papers showed that the advantage of this 'weather routeing' technique as applied to these Netherlands ships is somewhat marginal; it is claimed that after two years, the west-bound transit time per voyage (Rotterdam to New York) was reduced by about three hours, the average speed of the ships being about 16 knots; the east-bound transit time was reduced by about 1½ hours per voyage. Although these gains seem rather small, yet when one considers the high operating costs per day of a ship nowadays, coupled with the very high cost of stevedoring in the United States ports, it seems that the west-bound figure, at least, is significant—and certainly the Holland America Line appear to think it worthwhile. There seems to be evidence that this weather routeing technique has reduced damage to their ships and cargo.

In 1959, the replies by British shipmasters to a questionnaire about the value of wave forecasts in the North Atlantic were inconclusive; only about 50% of the replies indicated that such forecasts would be of much practical value. The argument advanced by many of the masters was that if you know the wind force in mid-ocean, you have a pretty good idea of what the wave situation will be like. This seems to be true, depending on the length of time that the wind has been blowing and its fetch; it is only when there is the complication of swell waves that there is much doubt about this. The Meteorological Office has, in fact, developed a system for forecasting waves, with the aid of the electronic computer, which can be put into effect if and when required. But for most practical purposes, particularly as far as the safety of the ship is concerned, forecasts of the wind alone can do much in indicating the best routes for a ship to follow. Recent experiments into the weather routeing technique, using 'paper' ships, have been carried out in the Meteorological Office, using the wave data supplied by the Netherlands authorities. The results of these experiments have been rather inconclusive, but the Meteorological Office is continuing to study this question.

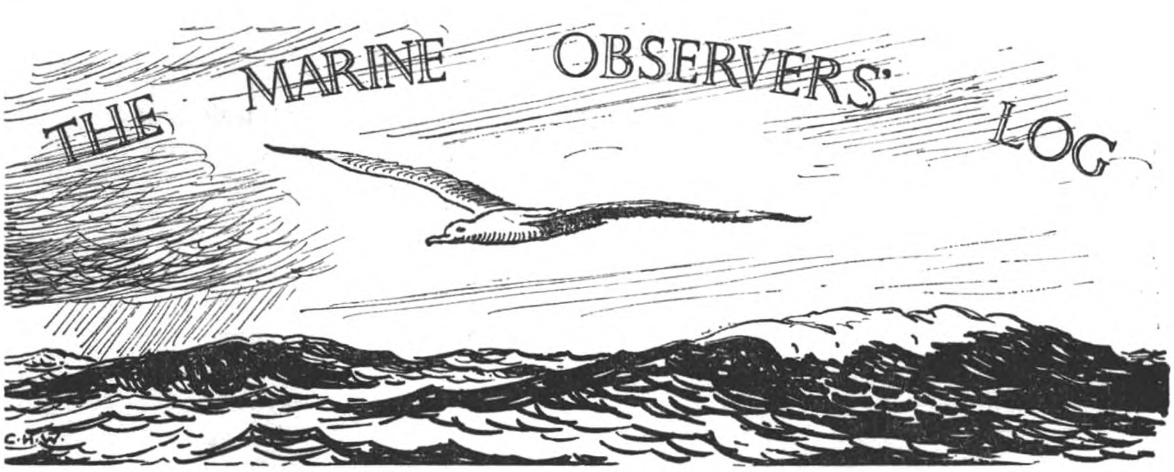
The modern shipmaster can, however, do his own weather routeing fairly effectively in most parts of the world, using maps, weather bulletins and the readily available information on climate and currents. In order to get the best results it is desirable that his ship be fitted with a facsimile receiver, so that he can have the benefit of the frequent actual and forecast maps that are broadcast about every six hours. This would avoid the tedium of a ship's officer having to plot by hand the coded analyses received by radio; in a single operator ship there is a limit as to the number of analyses that can be received in any case. Facsimile transmissions have the advantage of being available in most parts of the world and they can portray not only the present and future weather, but also the ice situation. The information shown on these facsimile maps is readily understood by any shipmaster. It is also desirable that the master should, from time to time, consult a forecaster of the meteorological service responsible for the issue of weather bulletins for the area in which the ship is navigating. For example, having in mind that the forecasts in radio weather bulletins for shipping normally cover a 24-hour period, the master might ask the meteorologist for a special 'extended' (2–3 day) forecast of wind force and direction along his intended route, or he might ask for an estimate as to the reliability of the forecast or seek clarification of some particular aspect of it. In special circumstances he might find it useful to have a daily consultation by radio with the meteorologist. It will, however, always be the master's responsibility for any action that he takes; the forecaster can only give advice, from the meteorological viewpoint. Also there may be times when a telephone conversation with a forecast office before sailing will be useful. The forecaster at a local meteorological office should usually be in a position to give the advice required. For example, when a ship is sailing from (say) the Tyne to a port north of the Delaware, such consultation might help the master in deciding whether to go via Pentland Firth or the Channel. There seems to be no reason why a medium range forecast of wind force and direction cannot be given for two to three days in advance with reasonable accuracy. (If, on occasions, the forecaster can't see so far ahead, he would say so!) In such a case, the advantage of a three-day forecast is obvious, because nobody would want to be routed through the Pentlands, merely because of favourable winds going up the North Sea, if he is going to get strong westerly gales immediately he 'poked his nose' round the corner. Even when a ship is committed to a particular route, subsequent alterations of course or speed can be made by the master, in consultation with the meteorologist, to avoid getting into very violent weather.

The papers read at the Institute of Navigation inferred that, on the route from Bishop Rock to Nantucket, the Great Circle route was on most occasions the most favourable. It seems that it is only in special circumstances that major diversions have been necessary.

If a deep depression is approaching the Channel, with its centre (say) 100 miles SW of Valentia, it might pay the master of a west-bound ship to head up towards Valentia at the beginning of the voyage, in order to get the benefit of winds with an easterly component. If he subsequently gets further depressions passing to the southward of him, so much the better and he doesn't lose much by keeping a bit north of the Great Circle. But in many cases, there isn't much he can do to avoid rough weather; reducing speed may sometimes prove helpful, nevertheless.

In the United States, it seems that a weather routeing technique somewhat similar to that used in the Netherlands is practised fairly extensively by the Hydrographic Department, for the benefit of Government ships, and by commercial meteorological consultations for ordinary merchant ships. Whatever system is used, the responsibility for the route that he takes must continue to be the master's, for he alone is responsible for the safety and economical operation of his ship. At best, the meteorologist can only advise; under normal circumstances, he cannot forecast the wind with any accuracy more than 48 to 72 hours ahead; in some cases this will be reduced to 24 hours. But the meteorologist will usually have some idea as to the accuracy he can expect in a given situation, and this is where the direct consultation between him and the shipmaster can be so useful.

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.

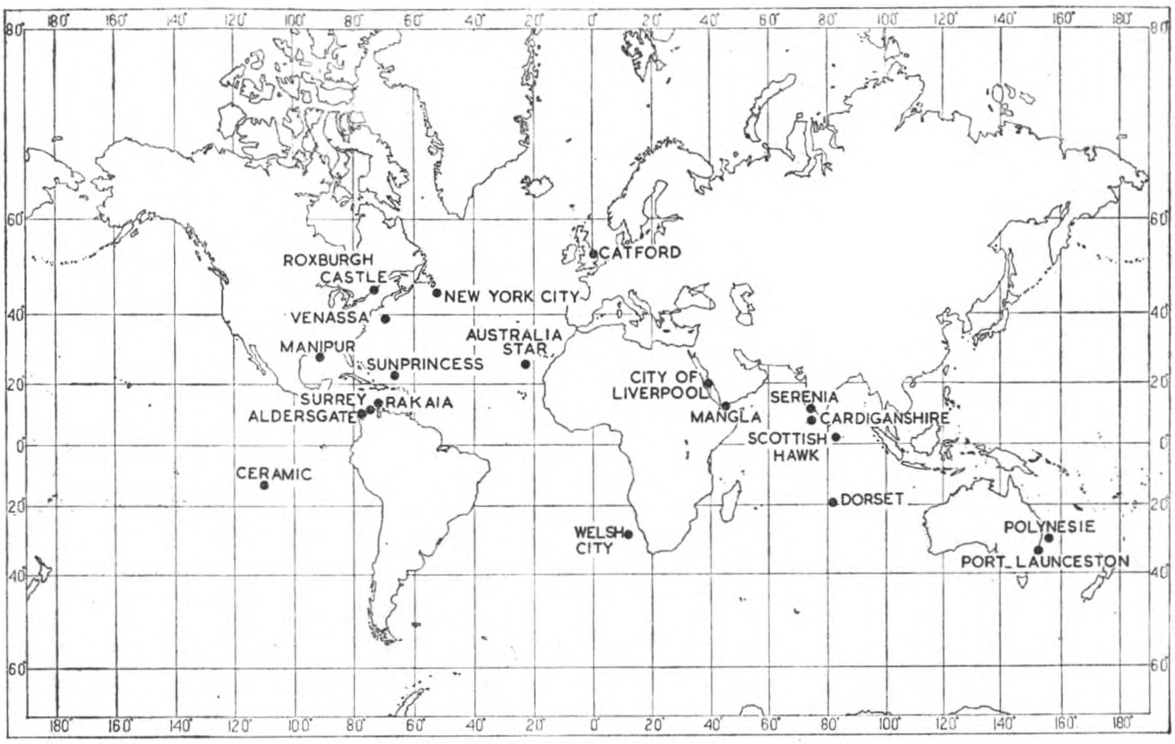
It sometimes happens that we are unable to offer an explanation for phenomena reported. In such cases we shall be very glad to hear from any reader who can put forward an authoritative or a possible explanation, which could be published in this journal. We should also be glad to hear from any reader who has witnessed a similar phenomenon in the past, but which has not previously been communicated to us.

HURRICANE 'ELLA'

North Atlantic Ocean

s.s. *New York City*. Captain F. W. Harris. Avonmouth to Boston, Mass.

22nd October 1962. The barograph trace, here reproduced, shows clearly the extremely rapid fall, and even more rapid rise, of pressure recorded at the ship during the passage of the very intense depression which was originally Hurricane 'Ella'. The lowest pressure (966 mb.) occurred at about 1000 GMT on the 22nd when the vessel passed through the centre of the depression. During the morning the

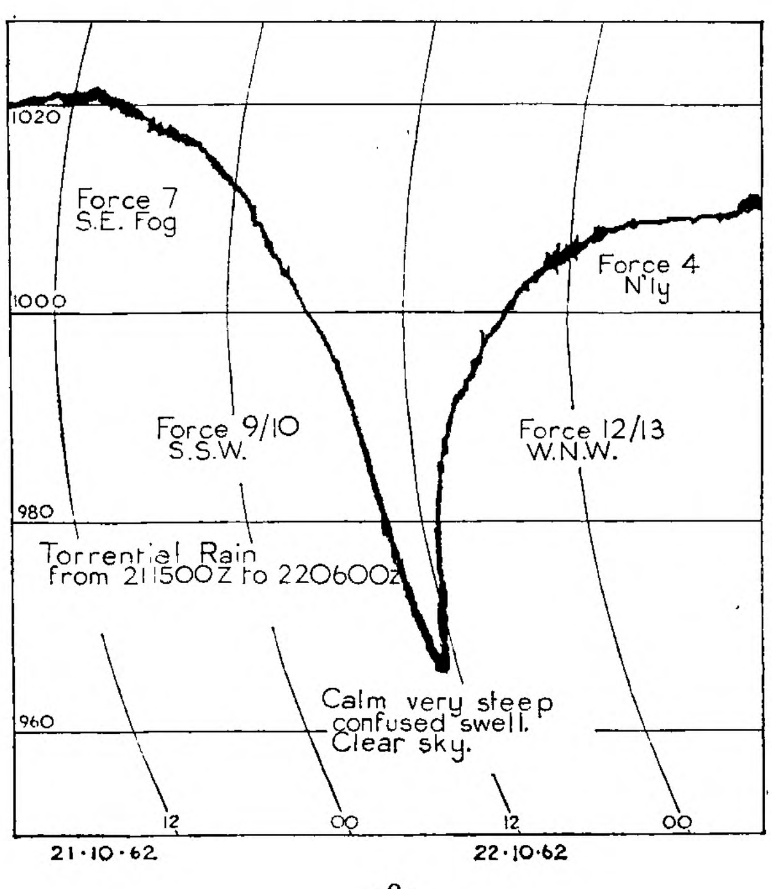


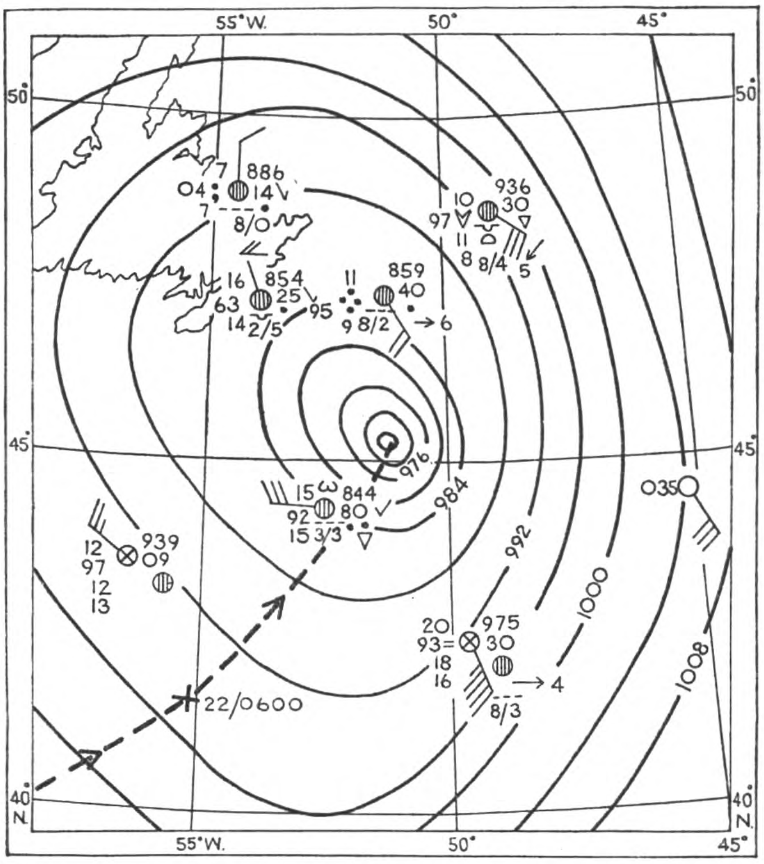
Positions of ships whose observations are recorded in "The Marine Observers' Log"

wind was SSW, force 9–10, but at the passage of the centre it suddenly veered and became WNW, force 12, or more, for a time. A section of the synoptic chart for noon on the 22nd October 1962 is also reproduced.

Position of ship at noon: 44° 18′N, 52° 42′W.

Note. Hurricane 'Ella' was first observed as a weak low pressure area on the 14th of October over the extreme south-eastern Bahamas. The wind at that time was about 25 kt. near the centre, which was located in the afternoon of the 14th at 23° 48′N, 73° 06′W. The lowest pres-





Synoptic chart for 1200 GMT on 22nd October 1962. The ship just SW of the centre is *New York City.*

sure then was 1008 mb. As the storm moved northwards on the 17th, winds increased to hurricane force; next day the system recurved, moving towards the north-east. From midday on the 19th until near noon on the 21st, winds near the centre were reported as reaching approx. 85 kt. The storm became extra-tropical late on the 21st near 41°N, 58°W, moving away north-eastward off the south-east coast of Newfoundland.

WATERSPOUTS

South Pacific Ocean

m.v. *Polynesie.* Observer, Mr. J. Mangin, Radio Officer.

9th June 1962, at 0405 GMT. The waterspouts seen in the photograph (opposite p. 208), which was taken by Mr. Mangin, occurred at a distance of about 15 miles from the ship, during showery weather. Air temp. 70°F. Wind WSW, force 4.

Position of ship: 30° 57′S, 155° 42′E.

Note 1. This observation, from a New Caledonian Selected Ship, was received too late for publication in the April 1963 issue of *The Marine Observer,* but we include it now as it is somewhat unusual to have a photograph of three active waterspouts occurring simultaneously.

Note 2. Mr. J. N. McRae, Commonwealth Bureau of Meteorology, Melbourne, comments:

"In the surface synoptic analysis on this day an anticyclone was centred at 32°S 167°E and another at 30°S 148°E. The waterspouts were observed very close to the col between these two anticyclones. The nearest radiosonde station is at Lord Howe Island, whose sounding at 00 GMT on 9th June 1962 is considered to be representative of conditions in the region of the waterspouts.

On this sounding a super adiabatic lapse rate existed from the surface to 900 mb. (approx. 3,000 ft.) with a practically saturated adiabatic lapse rate from 900 mb. to 400 mb. (approx. 23,000 ft.). The mixing ratio was 9·3 gm/kgm at the surface, 6·7 gm/kgm at 900 mb. and 1·3 gm/kgm at 700 mb. (approx. 10,000 ft.) with no recording above 700 mb. On this sounding, convective cloud might be expected to extend from 3,000 ft. to 25,000 or 30,000 ft.

It is also of interest that on the 300 mb. (approx. 30,000 ft.) analysis for 00 GMT on 9th June, a trough existed over eastern Australia with a jet core having speeds greater than 100 knots orientated WNW from 28°S 158°E. In such a situation upper divergence would be expected at 300 mb. above the position of a surface col.

The conditions at the surface and in the upper troposphere and the distribution of temperature and humidity in the vertical were all favourable for the development of cumulonimbus cloud and waterspouts."

Caribbean Sea

m.v. *Aldersgate*. Captain M. H. F. Smith. Panama to Genoa. Observer, Mr. N. J. Evans, 3rd Officer.

5th November 1962. At 1655 SMT a thin, slightly curved waterspout was seen at a distance of about 1 mile, stretching downwards from the base of a Cb. cloud (estimated height 600 ft.) to the sea. At the place where the spout met the sea, the water was agitated, the disturbed patch being about 15 ft. across, and rotating once in 4 sec., approx. Spray was carried up to a height estimated at 20 ft. Three other disturbed patches were seen later but they were all smaller; their speed of rotation however was still about 4 sec. At their nearest approach these embryo waterspouts were ½ mile from the ship. Air temp. 75·1°F, wet bulb 74·3°, sea 83·2°. Wind ENE, force 3.

Position of ship: 11° 04′N, 77° 47′W.

Note. If the direction of rotation had been given this would have added to the value of the report.

VESSEL STRUCK BY LIGHTNING

off Sydney, N.S.W.

m.v. *Port Launceston*. Captain V. G. Battle. Sydney to Burnie. Observers, the Master, Mr. J. Starkey, Chief Officer, Mr. R. H. Michell, 3rd Officer, Mr. M. G. Mills, Junior 3rd Officer, the Chief Engineer and others of the crew.

18th December 1962. At 2000 LMT the vessel having just cleared Sydney Heads encountered a thunderstorm of exceptional intensity. The sky was overcast and there was extremely heavy rain which continued for approx. an hour, reducing visibility to less than ¼ of a mile. The wind was S'ly force 5–6 and gusting to force 7 at times. Without doubt the vivid lightning was the most spectacular part of the storm—at very short intervals the sky and the ship would be illuminated by forked lightning of a reddish-white colour, followed almost immediately by deafening peals of thunder which persisted for about 5–10 sec. A flash was observed to strike No. 5 port samson post, this being witnessed by the Chief Engineer and four other engineers who were watching the storm from a sheltered spot near No. 4 hatch. The light was so blinding that they could not see properly for about 30 sec. Next morning when the samson post was examined it was found to be unmarked. Due to the heavy rain and other flashes of lightning, the fact that the vessel had been hit was not noticed by the people on the bridge, so the effect, if any, on the magnetic compass was not noticed. After an hour and a half the storm began to decrease and moved away in a NW'ly direction over the land. The air temp. was 66°F.

Position of ship: outside Sydney Heads.

Note 1. The synoptic chart for the 18th December, issued by the Australian Weather Service, shows that a depression was centred over the Bass Strait with a minor trough of low pressure extending northwards from it along the south-east coast of New South Wales. The thundery activity appears to have been associated with this trough.

Note 2. Prior to this observation we had, in forty years, published only 13 observations of a ship at sea being struck by lightning, by far the largest number of strikes being in the fore part of the vessel: one on the forecastle head, seven on the foremast, one on the bridge, one on the radar scanner, two amidships and only one on the mainmast. *Port Launceston's* strike is the furthest aft that we have heard of, No. 5 samson posts being on the poop only about 35 ft. from right aft. The ship has no mainmast as such but the top of these posts is considerably below that of No. 4 samson posts at the after end of the midship house.

SUDDEN FALL OF SEA TEMPERATURE

North Atlantic Ocean

s.s. *Venassa.* Captain R. C. Swainston. Puerto Miranda to Portland (Maine).

29th October 1962. Between 1400 and 1435 GMT a number of sea temperature readings were taken, using the insulated bucket. These showed that a gradual fall was taking place, but between 1425 and 1435, the sea temp. dropped suddenly from 79°F to 69°. The sea temp. continued to fall, being 63·2° at 1800 and 50·7° at midnight. During the afternoon the wind changed from SW, force 4, to N, force 4.

Position of ship at 1430: 38° 50′N, 69° 04′W.

Note. s.s. *Venassa* was in a region where there are very large variations in sea temperature, with comparatively small changes in latitude. The size of the fall was in no way unusual for this area.

LINE OF DEMARCATION

Caribbean Sea

m.v. *Rakaia.* Captain F. S. Angus. Panama to Curaçao. Observers, Mr. G. C. Stalker, 2nd Officer and Mr. G. A. M. Pollard, Apprentice.

5th November 1962. When the vessel was off the Peninsula de Guajira at 1900 GMT, a change in the colour of the sea water was noticed. The water to the south of a line lying in an E–W direction westwards from Pta. Gallinas was a light green shade and had a temperature of 78·5°F. On the north side of the line the sea was dark blue and the temperature of the water was 80°. The wind was ENE, force 5, and the sea was rough. Air temp. 82°.

Position of ship: 12° 32′N, 71° 50′W.

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

"Probably this is the difference between plankton-rich coastal water and warmer oceanic water containing fewer organisms. The lower temperatures inshore and the lie of the land in relation to the wind strongly suggest up-welling inshore and this normally favours increased growth of plankton. Americans who have worked along that coast tell me that winter is the normal time for the phytoplankton maximum in the inshore waters there."

m.v. *Surrey.* Captain R. B. C. Brown. Curaçao to Cristobal. Observer, Mr. G. Younger, 2nd Officer, Mr. J. Sheraton, 3rd Officer and Mr. Macdonald, Q.M.

7th December 1962. At 1600 GMT the vessel crossed a clearly defined line of demarcation, lying from horizon to horizon in a direction 090°–270°. On the north side of the line the sea was a deep blue colour, while on the south side it was a light shade of green. Sea water temperatures were taken on both sides of the line and no difference was found, the readings being 82·5°F. While crossing the boundary the vessel swung off course to starboard. The wind was ENE, force 5.

Position of ship: 11° 36′N, 74° 51′W.

Note. m.v. *Surrey* was in the area where the north-east going Caribbean counter-current, setting parallel with the coast of Colombia, meets the main west-north-west going current of the Caribbean: this would account for the vessel's swing off course. The change in colour across the line may be due to the presence of micro-organisms in the shallow water of the counter-current. In the Caribbean there is no significant horizontal temperature gradient and therefore little change would be expected across the line of demarcation.

SEA SMOKE

Gulf of Mexico

s.s. *Manipur.* Captain A. B. Davies. Galveston to Mobile. Observer, Mr. P. D. Peters, 3rd Officer.

13th December 1962. At dawn, the sea, which was comparatively calm, looked as if it was boiling, wisps of sea smoke, some 3–12 ft. in height, being seen all round. These did not seriously impair visibility, but at times only the tops of ships and oil rigs could be seen. The mist was seen from 0630 to noon LMT. In the previous 36 hours the air had been very cold. Air temp. 37°F, wet bulb 34°, sea 66°. Wind NNE or NE, force 3.

Position of ship at noon GMT: 28° 30'N, 92° 24'W.

Note. Sea smoke forms when very cold air flows over a sea surface which is markedly warmer. In the present case a well-developed anticyclone covering the southern states of North America had given rise to very low air temperatures, the value at Mobile at 0100 EST on the 13th December being only 14°F. The air stream, moving from NE, was being gradually warmed up as it passed over the Gulf of Mexico and the smoke fog resulted from the turbulent mixing of the air.

DISCOLOURED WATER

East of Laccadive Islands

s.s. *Serenia.* Captain J. C. Nettleship, O.B.E. Mena-al-Ahmadi to Singapore. Observers, the Master and Mr. P. Taylor, 3rd Officer.

10th October 1962. Large patches of what appeared to be off-white scum were noticed at 0615 GMT over an area of about 2 miles. Just previously three whales of about 20–25 ft. in length were seen cruising on the surface; these dived when about ¼ mile from the ship and were not seen again. Intermingled with the scum-like patches was water which appeared to have a reddish-brown tint. In the same area strong undercurrents caused the vessel to steer badly while on automatic control, for a period of two hours. Sea temp. 82°F and no change noticed. Wind, light airs. Sea very slight with long, very low swell.

Position of ship: 11° 42'N, 74° 51'E.

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

"Blooms of microscopic algae in great variety are known from this area, sometimes rare instances of organisms of two distinct classes flourishing together. It could be that diatoms, dinoflagellates or *Trichodesmium*, or the first two in combination were responsible, but one can only guess without a sample."

CURRENT RIP

Indian Ocean

m.v. *Cardiganshire.* Captain A. Lane. Aden to Penang. Observer, Mr. S. Barnes, 2nd Officer and Mr. F. C. Lindsay, 3rd Officer.

22nd December 1962. At 0745 GMT the vessel passed through a current rip which was orientated 060°–240°. It was conspicuous on account of foam and agitated choppy seas. About half an hour before reaching the rip, the automatic pilot was applying 5°–8° starboard helm to keep the vessel on course: when the bow entered the rip, the vessel sheered off 10° to port of her course (106°). The steering became normal when the rip was crossed. There was no wind, light airs and calms having been experienced all morning. Before entering the area the sea temp. was 84·9°F. It fell to 83·9° on the other side of the rip.

Position of ship 7° 30'N, 74° 24'E.

Note. This rip was experienced near the boundary between the west-bound Current set up by the North-East Trade Wind system and the equatorial counter current. However the changes of course associated with the rip observed by m.v. *Cardiganshire* suggest that a more local discontinuity of flow was involved—possibly some localised upwelling.

PHOSPHORESCENCE

North Atlantic Ocean

m.v. *Sunprincess.* Captain J. J. Hodgkinson. Halifax to San Juan, P.R. Observer, Mr. G. J. Holden, 3rd Officer.

28th November 1962. At 0200 GMT while using the Aldis signalling lamp, it was noticed that as the beam became directed onto the water scores of small, marine organisms were giving off an intense amber light. The magnitude of the light so reflected was comparable to that of an electric torch bulb and individual lights were visible for an estimated distance of one quarter of a mile from the ship. The lights were entirely separate from each other and the ship was not in an area of normal phosphorescence.

The organisms did not appear to be independently luminous for as soon as the Aldis was switched off they became lost in the darkness. When the Aldis was switched on again they darted about on the surface in what seemed to be great confusion. During the remainder of the watch the Aldis was used frequently and every time the amber lights reappeared. The distance covered during the observations was 40 miles. Air temp. 78°F, sea 81°. Wind calm. Sea smooth with low swell.

Position of ship: 22° 33′N, 66° 02′W.

Gulf of Aden

s.s. *Mangla*. Captain A. E. Evans. Suez to Aden. Observer, Mr. J. I. Clucas, 3rd Officer.

26th December 1962. At 1945 GMT the vessel suddenly ran into a vast area of brilliant phosphorescence. The bow wave and wave crests were so brightly illuminated that the troughs and sides of the waves were visible. For the most part the colour was the normal blue-green, but occasionally vivid flashes of emerald green were seen, particularly in the bow wave.

A number of luminous sausage-shaped objects were seen in patches about 10 ft. × 25 ft. in size; they were almost stationary and floating beneath the surface, as they were undisturbed by the waves. The display continued for about 25 min. Wind E′S, force 5.

Position of ship: 12° 30′N, 44° 23′E.

Indian Ocean

m.v. *Scottish Hawk*. Captain J. H. Thorn. Melbourne to Colombo. Observer, Mr. S. A. Hulse, 3rd Officer.

29th October 1962. At 1700 GMT, heavy driving rain with the wind gusting to force 8 at times came up from the west, and the sea became brilliant with white phosphorescence which lasted for about 10 min. At 1730 the squall passed over and the phosphorescence completely disappeared. The air temp. fell from 82°F to 74°, and the sea temp. from 82·3° at noon to 80·1° at 1800.

Position of ship: 2° 40′N, 83° 00′E.

SPIDERS' FILAMENTS

at Montreal

m.v. *Roxburgh Castle*. Captain R. H. Pape.

The following is the text of a letter received from the Master dated 10th October 1962:

At 2000 GMT while the *Roxburgh Castle* was moored to her berth (Section 24) in Montreal, I was walking round outside my accommodation and noticed fine white filaments of unknown kind hanging around stanchions and topping lift wires of derricks.

Calling the attention of the Chief Officer, I pulled one of these strands from a stanchion and found it to be quite tough and resilient. I stretched it but it would not break easily (as, for instance, a cobweb would have done) and after keeping it in my hand for 3 or 4 minutes it disappeared completely; in other words it just vanished into nothing.

Looking up we could see small cocoons of the material floating down from the sky but as far as we could ascertain there was nothing either above or at street level to account for this extraordinary occurrence.

Unfortunately I could not manage to preserve samples of the filaments as the disappearance took place so quickly.

I would be very glad to know what explanation, if any, can be given to account for the phenomenon.

Note. Mr. D. J. Clark, of the Natural History Museum, comments as follows:

"Spiders are, I think, responsible for the phenomena you describe. The majority of these particular spiders belong to the family *Linyphiidae*, and mature in the autumn. In the autumn on fine, warm and sunny days, especially with a fairly heavy early morning dew, the spiders begin to disperse and migrate in order to colonise new areas where the food supply is greater. The method they use is known as 'ballooning'. As the sun dries off the dew, upward air currents are created. The spider runs to the top of a plant, fence etc. and lifting the tip of the abdomen emits a globule of liquid silk. This silk is drawn out in a thread by the air currents and hardens as a result of this drawing out, not simply by contact with the air. When the thread is long enough to support the spider, it lets go of its support and flies away. The spiders sometimes are carried many miles. Eventually, they come down to earth and on landing cut free the 'parachute'. This again floats away and becomes entangled with other threads, sometimes quite thick bands are thus formed, and when this again settles down it is very conspicuous. The single thread is very fine and difficult to see unless the light is reflected from it, but when entangled together with other threads it is easy to see and quite tough and resilient.

I cannot explain the disappearance of these strands when held in the hand. It may be that the threads of the strand you describe were not so entangled and when handled broke up into individual threads thus becoming very inconspicuous. Spider silk cannot melt because heat does not affect it, it is on the whole less soluble than true silk."

WHALES AND FISH

South African waters

m.v. *Welsh City*. Captain A. B. Parkhouse. Glasgow to Durban. Observers, the Master, Mr. R. M. Gidden, 2nd Officer and Mr. C. T. Gillett, Radio Officer.

23rd December 1962. At 1200 GMT observed a shoal of large fish apparently being herded into a circle and eaten by what were taken to be Killer Whales. The fish were leaping into the air in an effort to escape but could not get away from their captors. A school of porpoise passed close to the dinner party, heading SE, but neither whales nor porpoise interfered with each other. Wind SE, force 4. Moderate sea and swell.

Position of ship: 29° 20′S, 13° 24′E.

GREEN FLASHES

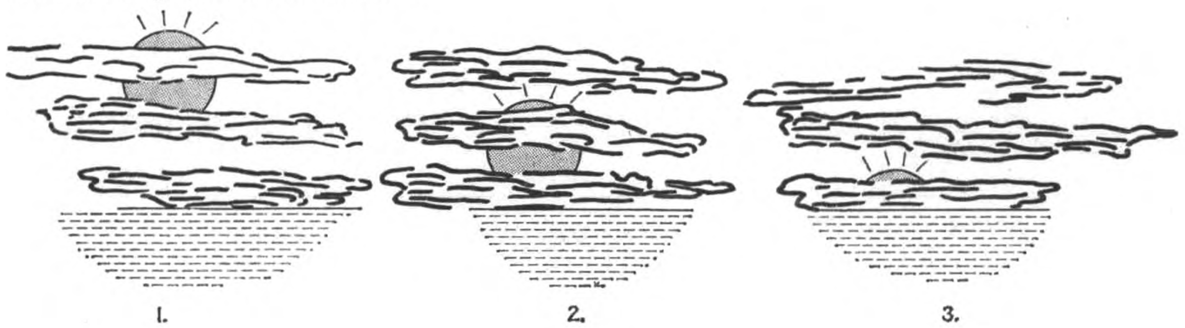
South Pacific Ocean

s.s. *Ceramic*. Captain N. S. Milne. Lyttelton to Balboa.

4th December 1962. Near sunset at 0130 GMT, three brilliant green flashes were seen as the sun's upper limb sank below three separate layers of Sc. (see the accompanying sketches). Air temp. 74°F, wet bulb 71°, sea 74°. Wind ESE, force 5. Visibility very good.

Position of ship: 13° 27′S, 109° 54′W.

Note. The green flash may be seen over mountains and clouds provided these are not higher than about 3° above the horizon.



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ABNORMAL REFRACTION

North Sea

m.v. *Catford*. Captain E. Clarke. River Tyne to London. Observers, the Master and Mr. L. Thompson, 2nd Officer.

8th June 1962. About 2000 GMT when about 12 miles south of the *Dowsing* L.V., objects were appearing double, with an image above the true object in an upside-down position. Sighted the *Dudgeon* L.V. at 12 miles distance with an apparent replica directly above. The flashing light of this L.V. was also very pronounced, with one light flashing above the other. It was also noted that smoke from passing vessels rose no higher than mast height (about 70–80 ft.) and then flattened out into long streamers extending for a considerable distance. The double flashing light of the *Dudgeon* L.V. disappeared at 7 miles distance.

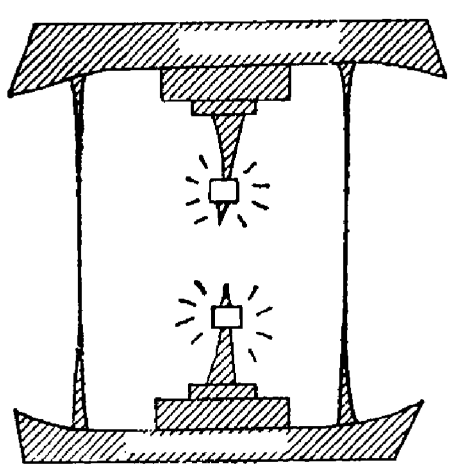
It was observed also that the radar was giving an exceptionally high performance, the coast line being excellently defined at 36 miles. This anomalous propagation was undoubtedly caused by inversion of temperature at about 4000 ft. and ducting of the VHF radio waves.

Weather: A veil of Cs. cloud covering nearly all the sky except directly over the ship. Air temp. 54·2°F, sea 49·3°. Light S'ly breeze. Sea slight, no swell.

Position of ship: 53° 24'N, 0° 54'E.

30th June. London to the River Tyne.

At 0150 GMT, when 8 miles due east of Felixstowe, shore lights in a N to NW



direction, distance 7 miles, appeared double. This applied to all street lights but not to Orfordness flashing light which is 93 ft. above MSL. The phenomena lasted only for about 10 min.

There was exceptionally high radar performance—receiving a very good picture of the coast line at 27 miles.

Weather fine with $\frac{1}{8}$ Sc on the horizon. Air temp. 50.0°F, sea 52·2°. Wind NW'N, force 3. Slight sea and swell.

Position of ship: 51° 57'N, 1° 33'E.

Note. The inverted type of mirage such as was seen on 8th June occurs when the sea is considerably colder than the air. The fact that the smoke flattened into a layer at about mast height indicates that the air temperature aloft was higher than at the surface. Such a condition is known as a temperature inversion. On the day in question an anticyclone covered the British Isles and the southern N. Sea, a type of pressure system in which temperature inversions invariably occur.

On the 30th June, although the air temperature at the surface at 0150 GMT was lower than the sea temperature, due to nocturnal cooling, the temperature aloft was nevertheless higher, providing the conditions necessary for the phenomena described in the report. As on the 8th June, an anticyclone, though less well developed, lay over England.

EXCEPTIONAL CLARITY OF THE SKY

Indian Ocean

s.s. *Dorset*. Captain J. S. Laidlaw. Australia to Aden. Observers, the Master, Mr. R. Lott, 2nd Officer, Mr. G. P. McGuigan, 3rd Officer and Mr. P. Simpson, Junior 3rd Officer.

23rd December 1962. At 0630 GMT when taking the noon meridian altitude of the sun, the planet Venus was clearly seen with the naked eye. It was 3° from the moon which was also plainly visible. The approximate azimuth of Venus was 260° and the altitude 40°. Air temp. 85·6°F, wet bulb 75·5°, sea 79°. Wind SE, force 4. Small amounts of Cu. were present.

Position of ship: 19° 13'S, 81° 53'E.

Note. By careful observation, one can follow Venus through the period of twilight to broad daylight to see her the whole day. Sometimes this can also be done with Jupiter, but it is much more difficult and it is exceptional to observe him up to the time when the sun reaches an altitude of 10°.

Such observations are facilitated when, as in the present case, the planet is near the moon which is an excellent guide in finding the faint, luminous point in the vast blue sky.

Conditions were favourable on the day in question, as the air was dry and there was some convection, as shown by the presence of the Cu. cloud, which would have dispersed any atmospheric haze.

METEOR SHOWER

North Atlantic Ocean

m.v. *Australia Star*. Captain G. Cameron Smart. Liverpool to New Zealand. Observers, Mr. R. J. Thake, 3rd Officer and Mr. A. Robertson, Sen. 2nd Engineer.

14th December 1962. Between 0400 and 0600 GMT very many meteors were observed, the frequency of sighting increasing towards the end of the period. The great majority originated from a region a little above Mars and fell towards or through the constellation Canis. Almost all were as bright as Sirius, or even brighter, and remained visible longer than most meteors. Towards 0600 the meteors were seen with a frequency of approx. 3 every two minutes. Only small amounts of Sc. were present. Visibility very good.

Position of ship: 25° 36'N, 57° 06'W.

Note. An article on Meteor Streams appeared on p. 85 of *The Marine Observer* for April, 1963.

UNIDENTIFIED PHENOMENON

Red Sea

s.s. *City of Liverpool*. Captain T. S. Dennis. Aden to Port Said. Observers, Mr. B. F. Keith, Extra 3rd Officer and many of the ship's company.

1st November 1962. At 2005 SMT a ball of what seemed to be dense white cloud was seen on a bearing of 260° at an altitude of about 7°. As it approached, and passed ahead of the vessel, moving in a NE direction, it assumed the form of a smoke ring, the apparent diameter of which, when bearing 330°, was about 5 or 6 times that of the full moon. The ring, which became elliptical in shape, as shown in the diagram (opposite p. 208), was thought to be rotating in an anticlockwise direction. By 2015 it had completely disappeared, having become increasingly indistinct as it receded from the ship. The sky was cloudless and visibility was very good. The moon, age 4 days, was setting on a bearing of about 252°. Air temp. 86·2°F, wet bulb 77·3°, sea 88·1°. Wind, light NW'ly airs.

Position of ship: 19° 37'N, 39° 10'E.

Note. We can suggest no reasonable explanation of the phenomena described above.

AURORA

We are very grateful for the auroral observations and sketches received from the ships listed below. These observations have been forwarded to the Balfour Stewart Auroral Laboratory of the University of Edinburgh by the Meteorological Office and the Ocean Weather Ship Base, and are for the period 1962 October–December (plus a report from s.s. *Birmingham City* which was received after publication of the last list).

The report for 30th October from s.s. *Pacific Fortune* has not been included in the list, as the position of the ship (34° 46′N) is so far south as to make it doubtful that the phenomena was, in fact, aurora, especially as the recorded level of geomagnetic activity at that time was low.

A new system of auroral classification is to be introduced at the beginning of the International Years of the Quiet Sun (1964 and 1965) and details of this will be circulated to all observers. The new classification is designed to help observers to report more accurately the details of a display. There are no radical changes in the names of forms, so that this new system will not affect the narrative style of reporting aurora by Selected Ships of the Meteorological Office. It will, however, help us to extract with more precision the data from the colourful descriptions (and sketches) which we hope to continue to receive from them.

Date (1962)	Ship	Geographic Position		Λ	Φ	I	Time	Forms
22nd Aug.	*Birmingham City*	59°37′N	52°12′W	030	70	+78	0050–0115	HA
1st Oct.	*Weather Reporter*	59°00′N	18°44′W	070	65	+72	0001	G
	Rialto	56°30′N	37°45′W	040	66	+74	0100	R
2nd	*Weather Reporter*	59°13′N	19°15′W	070	65	+72	0142–0215	G, RB
	Weather Reporter	59°03′N	18°52′W	070	65	+72	2145–2400	G
4th	*Weather Reporter*	59°00′N	18°56′W	070	65	+72	0100–0600	G
5th	*Weather Reporter*	59°04′N	18°58′W	070	65	+72	2010–2200	G, HA, RB, R
							2350	G
6th	*Weather Reporter*	59°06′N	18°54′W	070	65	+72	0530–0630	G
7th	*Weather Reporter*	59°00′N	19°04′W	070	65	+72	2210–0500	G, HA, RB, P
8th	*Bamburgh Castle*	53°03′N	24°24′W	060	60	+70	0030	RA, DR, R
	Huntingdon	48°43′N	63°03′W	010	60	+74	0001–0020	G, HB
	Weather Reporter	59°06′N	18°45′W	070	65	+72	2030–2055	G, R, P
9th	*Weather Reporter*	59°00′N	19°12′W	070	65	+72	0055–0530	G, RB, P
	Weather Reporter	59°10′N	18°41′W	070	65	+72	2220–0500	G, HA, RB, R, P
11th	*Weather Reporter*	59°09′N	19°16′W	070	65	+72	0531–0615	G, RB, R, P
13th	*Andria*	53°20′N	36°20′W	040	62	+72	2300	G, RA, DR, R
16th	*Bassano*	57°06′N	36°18′W	050	66	+74	2130	S
22nd	*Lindisfarne*	57°00′N	17°55′E	100	56	+70	0345–0355	R
	Weather Surveyor	59°12′N	18°30′W	070	65	+72	2245–0555	G, RA, R, S
24th	*Weather Surveyor*	59°00′N	19°12′W	070	65	+72	2045–0550	G, HA
26th	*Rialto*	49°00′N	62°00′W	010	60	+74	0001–0400	HA, RA, RB, R
	Weather Surveyor	59°30′N	18°50′W	070	65	+72	2145–2255	G, RB
27th	*Weather Surveyor*	59°18′N	18°55′W	070	65	+72	0245–0255	G
	Weather Surveyor	59°00′N	18°55′W	070	65	+72	2145–0455	G, RB
3rd Nov.	*Weather Surveyor*	58°54′N	19°20′W	070	65	+72	0001	G, R
							0300–0600	G
4th	*Weather Surveyor*	58°48′N	18°48′W	070	65	+72	0500	G
	Weather Surveyor	58°54′N	18°50′W	070	65	+72	2345–2355	G
5th	*Weather Surveyor*	58°50′N	18°50′W	070	65	+72	0145–0700	G, HA
6th	*Weather Surveyor*	58°12′N	16°42′W	070	64	+72	2030–2200	G, HA
	Weather Adviser	58°18′N	16°50′W	070	64	+72	2035–2130	HB, RB
16th	*Weather Adviser*	58°51′N	19°18′W	070	65	+72	1945	RA
							2020–2130	G
23rd	*Rialto*	58°12′N	21°36′W	070	65	+73	0001–0100	G
	Weather Adviser	59°06′N	18°48′W	070	65	+72	0300	DS
	Rialto	58°24′N	12°00′W	080	63	+71	2230–2400	L
24th	*Weather Adviser*	59°05′N	19°09′W	070	65	+72	0340–0540	G, HA, R
	Hororata	47°55′N	61°05′W	010	59	+75	0400–0440	HA
25th	*Hororata*	48°38′N	68°25′W	360	60	+75	0145–0330	HA, RA, DR, R, F
	Weather Adviser	59°03′N	18°45′W	070	65	+72	2345	G, R
30th	*Weather Adviser*	58°50′N	18°40′W	070	65	+72	0445–0645	G, R
	Hororata	48°33′N	68°44′W	360	60	+75	0500–0800	G, HA, RA, DR, R
7th Dec.	*Weather Surveyor*	52°30′N	19°40′W	060	59	+69	0500	G
9th	*English Star*	46°14′S	63°23′E	240	−52	−72	1130–1145	R
17th	*Bassano*	55°54′N	42°06′W	040	66	+74	2100–2115	S
	Weather Surveyor	52°24′N	20°06′W	060	59	+69	2300–0100	G
20th	*Weather Surveyor*	52°24′N	19°36′W	060	59	+69	0001	G
28th	*Weather Reporter*	58°43′N	18°56′W	070	65	+72	1900–0145	G
29th	*Weather Reporter*	58°56′N	19°12′W	070	65	+72	2000–2145	G
30th	*Weather Reporter*	58°59′N	19°17′W	070	65	+72	2145–0200	G

KEY: Λ = geomagnetic longitude; Φ = geomagnetic latitude; I = inclination; G = glow; HA = homogeneous arc; HB = homogeneous band; RA = rayed arc; RB = rayed band; R = rays; C = corona; S = surfaces (DS = diffuse surfaces); DR = drapery or curtain; P = pulsating; F = flaming; L = auroral light seen but no other details available.

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Sea Temperature Fluctuations in the Red Sea, the Gulf of Aden and the Arabian Sea

by G. A. TUNNELL, B.SC.
(Marine Division, Meteorological Office)

The seasonal and day-to-day fluctuations of sea temperature in the Red Sea, the Gulf of Aden and the Arabian Sea are largely generated by the monsoon system described in an earlier number of *The Marine Observer.*[5] The average sea temperature and its variability, reflected in the range of temperatures experienced, appear to be controlled by fluctuating vertical currents within the sea, which change with the seasonal movement of the inter-tropical convergence zone. These currents are also responsible for many of the interesting biological and oceanographical phenomena reported from time to time from this area in the Marine Observers' Log.

In July and August (see Fig. 3) the inter-tropical convergence zone is north of Aden and the south-west monsoon flows in a clockwise circulation over East Africa, the Gulf of Aden and the Arabian Sea towards the monsoon low of Northern India. During the cold months around December and January, the atmospheric circulation is reversed; the inter-tropical convergence zone is south of 20°S over East Africa and the north-east monsoon blows across the Arabian Sea and the Gulf of Aden towards Central Africa. (See Fig. 2.) These are great and influential seasonal changes in the wind regime.

It is the shape of the sea bottom in this area that enables the wind to have so great an influence upon vertical sea movements, particularly in the following locations. There is the sill between the Red Sea and the Gulf of Aden at the Straits of Bab-el-Madeb; at its highest point there are only about 30 fathoms of water. In the direction of the Gulf of Aden there is a rapid increase in depth to about 800 fathoms, with a rapid shelving around both the African and Arabian coasts of the Gulf. Towards the Red Sea there is a slower and more irregular increase in depth.

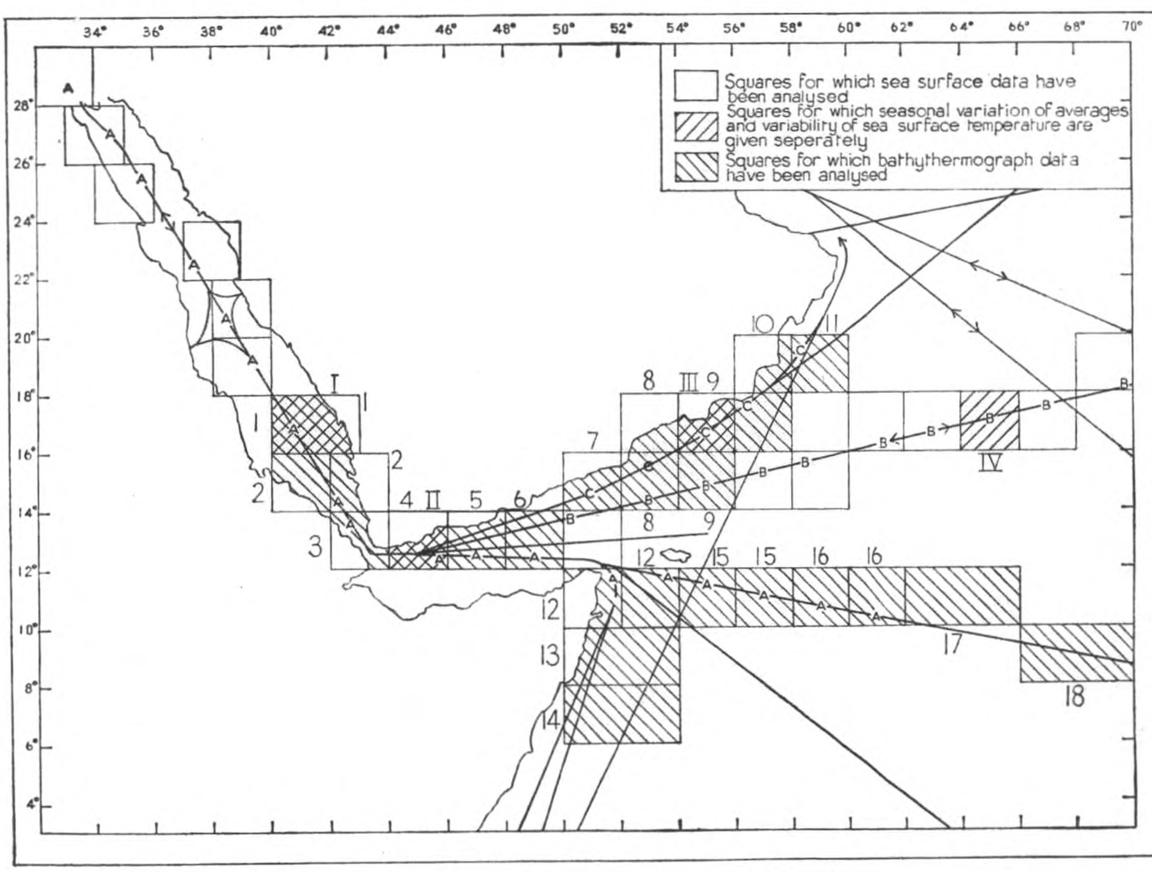


Fig. 1. Shipping routes and sea squares used in analysis of sea temperatures.

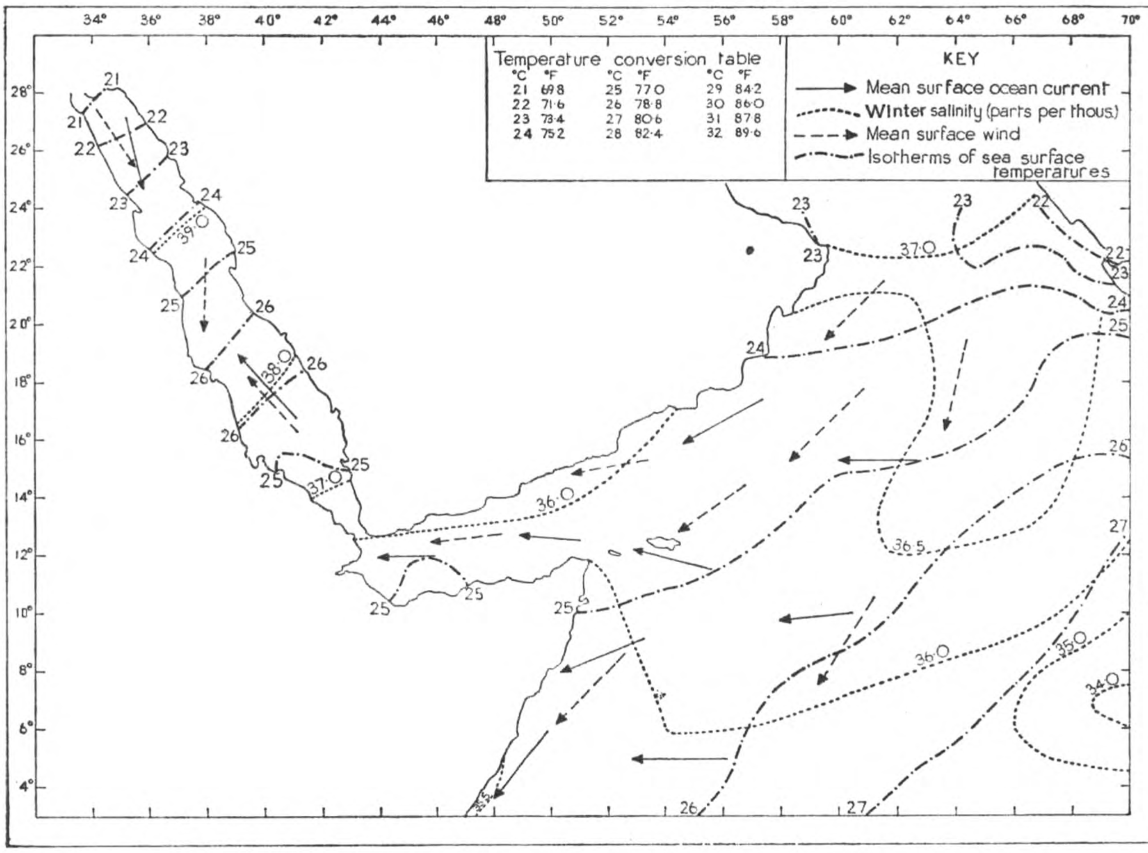


Fig. 2. Red Sea, Gulf of Aden and Arabian Sea—January. Ocean currents, mean winds and isotherms of sea surface temperatures (°c). (Mainly from marine data published by the Royal Netherlands Meteorological Institute.)[3, 4]

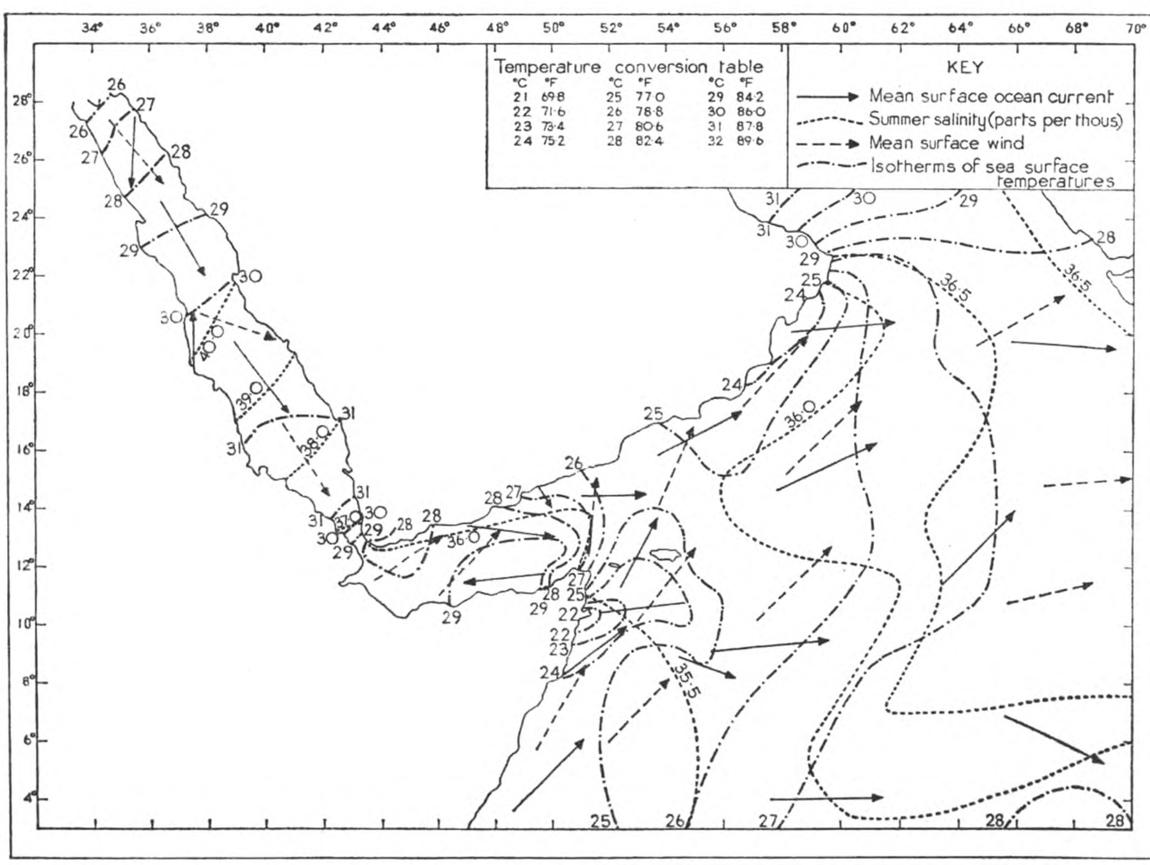


Fig. 3. Red Sea, Gulf of Aden and Arabian Sea—July. Ocean currents, mean winds and isotherms of sea surface temperatures (°c). (Mainly from marine data published by the Royal Netherlands Meteorological Institute.)[3, 4]

Socotra and its associated train of islands are on a shallow continental shelf separated from Cape Guardafui by a comparatively narrow but deeper channel. However to the south, i.e. east of Somalia, there is a rapid increase in depth to 2000 fathoms.

Lastly there is a further very rapid increase in depth to over a thousand fathoms off the south coast of Arabia east of 54°E.

Another factor which influences the vertical movements in the sea is high surface density due to salinity. This is an area of high surface salinity (see below) where the sea water is abnormally dense even when it is warm (see Figs. 2 and 3). At times there are large areas with the surface salinities exceeding 36 parts per 1000. In the winter months the northern Red Sea has 39 parts while the Gulf of Oman experiences more than 37 parts. In July and August in the northern Red Sea and Persian Gulf, salinities exceed 40 parts while in the eastern North Arabian Sea they exceed 36½ parts, but over the deep areas described above where sub-surface water is up-welling the surface salinities are less than 35½ parts. The high surface density can make the upper layers of the sea vertically unstable, i.e. it is possible for very light winds to up-well cold water from several hundred feet and for a relatively small decrease of surface temperature to set up convective currents. Conversely high temperatures or low salinities at the surface reduce the buoyancy of rising cold water by reducing sea density and tend to suppress vertical currents within the sea.

Many ships pass through this area and it is possible to choose a sequence of 2° latitude and longitude sea squares in which thousands of sea surface temperature observations have been taken. The squares chosen for this work are set out in Fig. 1 which also gives the squares for which bathythermograph data have been analysed, numbered from 1 to 18.

Merchant ship surface sea temperature data have been used from three routes: Route A—down the Red Sea, through the Gulf of Aden, west of Socotra and towards Ceylon; Route B—through the Gulf of Aden to Bombay, and Route C—along the south coast of Arabia towards the Persian Gulf. Tables A, B and C (on pp. 198 and 199) give average values and the 90% range (i.e. the range containing 90% of observations, 5% being above the upper limit and 5% below the lower limit) for successive squares along each of the routes. Values for each month are on successive lines with ranges equal to or exceeding 10°F. in heavy type and those below 5°F in italics. High variability is almost always associated with low average temperature. (This is particularly true, around July and August, where the sea bottom shelves steeply from a coast exposed to the south-west monsoon and also in the cooler months over the northern Red Sea.) These appear to occur with vertical currents generated within the sea either convectively when the very saline upper layers of the sea are cooled or when deep cold water is brought to the surface against a steeply shelving coast by the wind.

During the winter months December, January, February, Table A shows that average sea temperatures increase rapidly from Suez to 20°N, the limit of the northerly predominating wind (see Fig. 2). The north winds cool the very saline upper layers of the northern Red Sea, setting up convective currents within the sea and causing the sea temperature to fluctuate widely, producing a high range of 10°F. A cool dense water mass with a surface temperature of about 65°F is created, which, driven south by the wind, flows under the warm stable water of the southern Red Sea.

During this period Tables A, B and C show that the sea areas south of 20°N, including the Gulf of Aden and the Arabian Sea, have an almost uniform temperature of 77°F with a range of less than 6°F. As the year progresses towards June sea surface temperature rises generally in this area. The surface layers become less dense, suppressing convective currents, and ranges of temperature remain 6°F or below. It is however in the southern Red Sea only that this warming and low range continue right through the year until the decline of the sun towards winter.

From about May onwards, as the south-west monsoon develops, there is a rapid fall in mean sea surface temperature from 86° to 80°F south of Aden, from 83° to 74°

south of Socotra, off Somalia, and from 84° to 75° off South-east Arabia. The range of sea temperature in these areas then increases to almost 20°F. Off East Africa and South-east Arabia these conditions persist for over three months but south of Aden they are confined mainly to July and August.

Areas of low but highly fluctuating sea surface temperatures occur when the wind blows parallel to, or at an oblique angle with, the steeply shelving coasts described above; when friction between the atmosphere and sea and the effect of the earth's rotation combine to drive water away from the coast (towards the left when one is facing the wind). The steeply shelving sea bottom guides deep cold water upward to replace the warm water driven away from the surface.[1] As the wind is always varying, cold water comes to the surface irregularly, causing temperatures to fluctuate. Figs. 2 and 3 (based mainly on ships' observations) illustrate the relationship between onshore winds and resulting offshore currents. The resulting contrast between the average distribution of sea temperature during the north-east monsoon of winter and the south-west monsoon is self-evident.

It will be seen that in general during the north-east monsoon the surface currents flow south of east along the Arabian coast and East African coast and into the Gulf of Aden and southern Red Sea. In the Red Sea north of 20°N, however, there is a south flowing current necessitating the cold saline water mass to flow down under the warm water to the south. South of 20°N sea surface temperature is very uniform and varies mainly latitudinally.

Fig. 3 shows that in July during the SW monsoon the areas of very low sea surface temperature have developed. Ocean currents flow southwards down the whole length of the Red Sea and north-eastwards out of the Gulf of Aden and over the

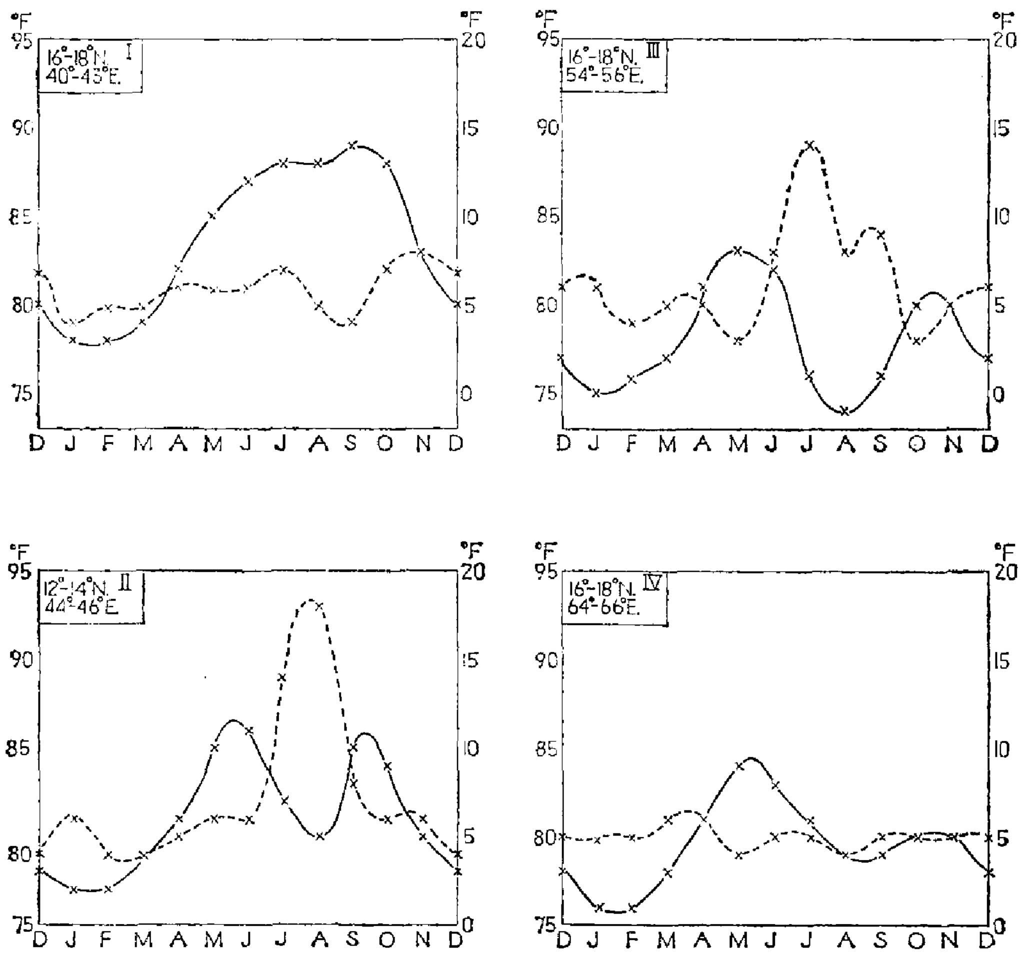


Fig. 4. Seasonal variation of average sea surface temperature and 90% range for specific 2° sea squares in the Red Sea, Gulf of Aden and Arabian Sea. Period of data 1855–1943.

Mean sea surface temperature (scale on left).

90% Range of sea surface temperature (i.e. range outside of which are only 10% of the observations; 5% above, 5% below) (Scale on right).

whole Arabian Sea. South of Aden and Socotra the cold water appears to be up-welling in a large clockwise circulation. Sharp gradients of surface temperature, and ocean currents, suggest that cold water flows north-westward into the Red Sea, and from south of Socotra towards the Gulf of Aden, but much of the cold water from off East Africa and off south-east Arabia flows east and north-east upwards over the dense highly saline surface water of the North-east Arabian Sea reducing surface sea temperatures over a very large area.

Fig. 4 (I, II, III and IV) shows more clearly the seasonal variation of average sea temperature and range for a number of representative squares marked in Fig. 1 with the corresponding roman numerals I, II, III and IV.

Square I in the southern Red Sea is throughout the year in the warm saline water which in winter and early summer covers most of the area under discussion. The average temperature follows approximately the seasonal variation of the elevation of the sun and the variability (i.e. the range) remains low except when the surface temperature is falling rapidly.

Squares II and III are located where cold water up-wells off a deeply shelving coast during the south-west monsoon. The low temperatures associated with high variability are self-evident. Variabilities (i.e. range) also tend to rise when surface temperatures are falling towards December and January as convective currents are set up within the sea.

Square IV located in the open Arabian Sea, well east of Arabia, is at the same latitude as square I above. Average sea surface temperatures in IV are about 1°F lower than those in square I in January and February but 9°F lower in August and September. From May almost to the end of the year the sea surface in square IV is cooled by cold up-welled water flowing east and north-eastwards from south of Socotra. The range of temperature however remains low and steady showing that this general upward flow of cold water over the dense saline water is orderly and not associated with the highly fluctuating surface temperature.

Analysis of Bathythermograph Data

Her Majesty's ships carrying out hydrographic surveys have made on many occasions valuable bathythermograph soundings to depths below 400 feet in this area. There are not sufficient soundings to give monthly or seasonal averages for all levels, but in Fig. 5 they have been summarised for squares numbered 1 to 18 in Fig. 1 for groups of months sufficient to get averages of several observations. For some squares there are more than 20 soundings but for others only one. Bathythermographs give accurately the vertical temperature changes but are subject to zero errors of several degrees. A constant for each square has been added to all average values to make the surface bathythermograph averages agree with the long period averages derived from sea bucket surface sea temperature measurements.

Figs. 5 (a to i) are a series of cross-sectional diagrams along sections of the three shipping routes A, B and C and a route southwards off East Africa. Values for successive squares, along the routes, are plotted horizontally against a vertical depth scale. The first sequence of squares (numbered 1 to 11) follows the southern Red Sea, the Gulf of Aden and the Arabian coast, squares 12, 15, 16, 17 and 18 go from Cape Guardafui towards Colombo and squares 12, 13 and 14 go from Cape Guardafui southwards off the Somalia coast. The periods are: October to January, the winter period of north-easterly atmospheric flow over the Gulf of Aden; February to May, the period of general increase in sea and atmospheric temperature; and June to September, when south-westerly winds predominate. Scarcity of observations has necessitated including the transitional months June and September with July and August.

Under stable conditions when flow is horizontal, or slowly up or down, isotherms are almost horizontal, although variations in salinity make stable conditions possible without horizontal isotherms. Under these conditions, or with flow parallel and adjacent to the sea bottom, water masses tend to take their temperature and

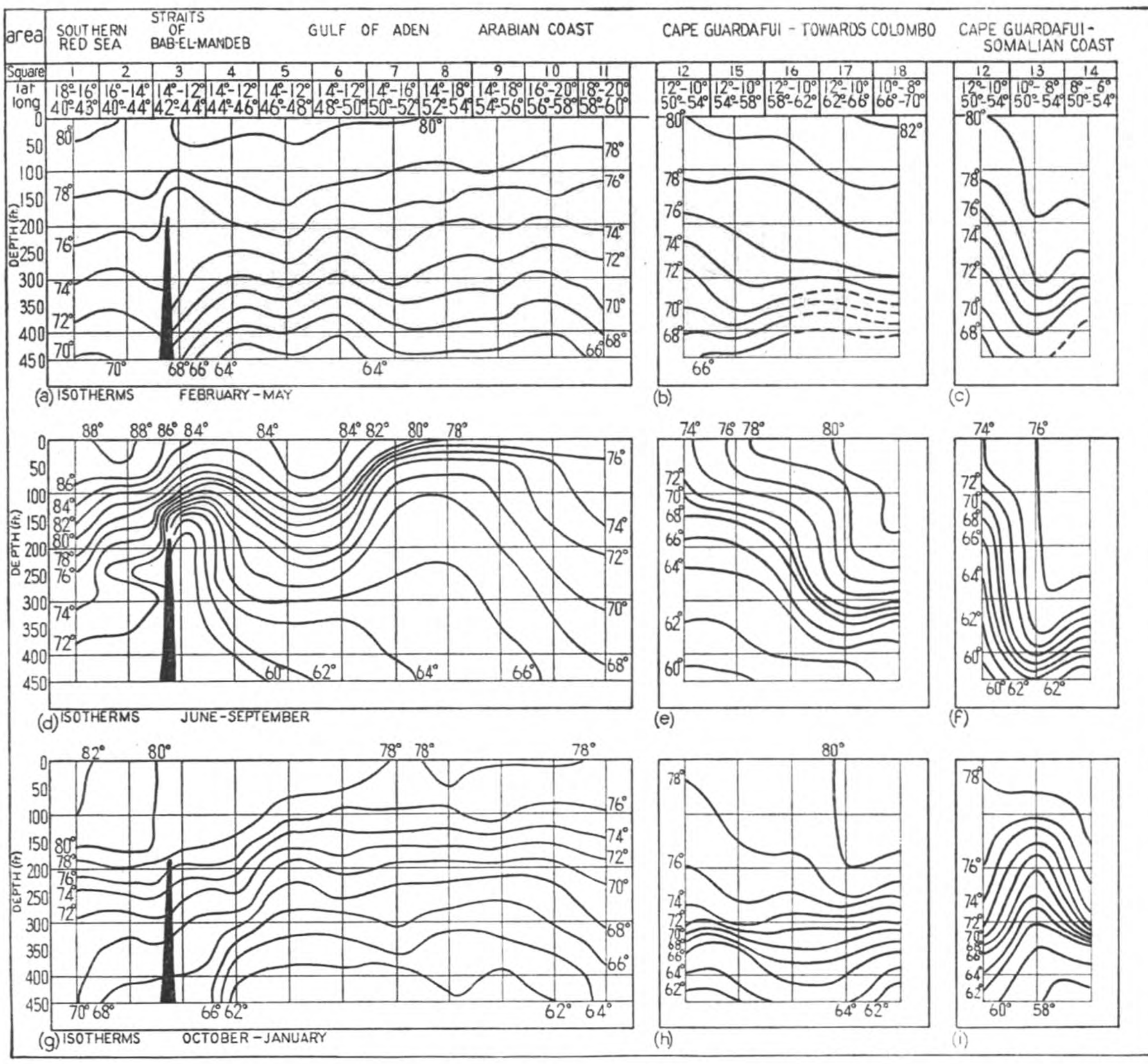


Fig. 5. Vertical variation of average sea temperature (°F) in southern Red Sea, Gulf of Aden and Arabian Sea.

vertical distribution of temperature with them and flow parallel with the isotherms. However when some external force, created by wind driven up-welling or subsidence, drives water upwards or downwards across smooth approximately horizontal flow lines isotherms tend to 'bunch up' across the added lines of flow and also to move with that flow. They are also closer together at a transition zone between a warm and cold water mass. When conditions are uniform in depth isotherms are wide apart or when variations are mainly horizontal they can be vertical. These rules have been used to deduce the following.

OCTOBER TO JANUARY (Figs. 5g, h and i). The widespread stable warm water mass, described above, is evident in the southern Red Sea (squares 1 to 5), extending downwards for 200 feet. Off the Arabian coast east of the Gulf of Aden the layer is only 100 feet deep (squares 5 to 11) but well east over the north Arabian Sea the layer is again 200 feet deep (square 18). Under this warm water mass is a transition zone to the cold water mass from the North Red Sea (the isotherms are closer together). In the vicinity of the Straits of Bab-el-Madeb (square 3) the isotherms are consistent with the smooth flow of deeper cold water at 200 feet (against the surface flow) into the Gulf of Aden. The isotherms suggest that the relatively heavy saline water mass of the transition zone tends to flow downwards as it crosses the sill into the Gulf of Aden and then upwards as it moves forward into the Gulf above even colder water. The counter flow below the surface over the sill at the Straits of Bab-el-Madeb is well known and it was reported by the survey ship H.M.S. *Stork* in 1898 and published on page 131 of the Red Sea and Gulf of Aden Pilot (10th edition 1955). The rate was given as about 1½ knots. Fig. 5i

ANNUAL VARIATION OF AVERAGE SEA TEMPERATURE (°F) AND RANGE (°F) RECORDED BY SHIPS PASSING DOWN THE RED SEA AND THROUGH THE GULF OF ADEN TO THE ARABIAN SEA.

(The range is a measure of variability, i.e. where temperatures are fluctuating greatly values observed by ships will be distributed over a wide range)

Table A

									Red Sea								Straits, B.-el-M.				Gulf of Aden								Arabian Sea							
Lat. °N Long. °E	28–30 32–34		26–28 33–35		24–26 34–36		22–24 37–39		20–22 38–40		18–20 38–40		16–18 40–43		14–16 42–44		12–14 42–44		12–14 44–46		12–14 46–48		12–14 48–50		10–12 50–52		10–12 52–54		10–12 54–56		10–12 56–58		10–12 58–60		10–12 60–62	
Square No.													I						II																	
Bathy-therm. Square No.													1		2		3		4		5		6		12		12		15		15		16		16	
Month	A	R	A	R	A	R	A	R	A	R	A	R	A	R	A	R	A	R	A	R	A	R	A	R	A	R	A	R	A	R	A	R	A	R	A	R
January	65	9	71	9	73	7	77	7	79	6	80	5	78	4	77	4	77	3	77	6	77	6	76	6	77	5	77	4	77	4	77	4	78	4	79	3
February	64	9	70	9	72	6	75	6	77	6	78	6	78	5	77	4	77	4	77	4	77	4	77	4	77	5	77	5	78	5	78	5	78	4	79	5
March	65	9	71	7	73	6	76	6	77	6	79	6	79	5	79	5	79	4	79	4	78	5	78	5	79	6	79	5	79	5	80	5	80	4	81	5
April	68	9	73	6	75	6	78	9	80	7	81	7	82	6	81	6	81	6	81	5	81	5	81	5	81	8	82	5	82	5	83	5	83	5	83	5
May	72	9	76	8	78	8	81	7	83	8	84	6	85	6	85	7	85	5	85	6	85	7	85	5	83	8	84	6	84	4	84	4	84	5	85	5
June	75	7	78	7	80	6	82	6	84	6	85	6	87	6	88	5	86	7	86	6	86	5	86	6	76	17	78	15	80	10	81	7	82	6	82	6
July	77	8	80	7	82	6	85	7	86	6	86	5	88	7	88	7	85	13	82	14	84	8	84	8	75	19	74	11	77	8	78	7	79	5	79	6
August	80	7	82	6	84	6	87	5	88	5	87	4	88	5	88	6	85	16	80	18	83	9	84	8	74	19	74	11	76	7	76	5	77	5	78	4
September	78	7	80	7	83	6	86	5	87	5	88	5	89	4	89	5	87	10	85	8	85	5	85	7	76	18	75	9	77	6	78	5	78	6	79	6
October	76	6	79	6	81	5	85	5	86	5	87	5	88	7	86	8	84	7	84	6	84	7	82	8	79	8	79	7	79	6	80	5	80	6	81	5
November	74	8	77	8	79	7	82	6	84	6	85	6	83	8	81	6	80	6	80	6	80	6	79	6	78	6	79	6	80	5	80	4	80	4	81	4
December	69	11	74	10	75	8	79	7	81	7	82	6	80	7	79	5	78	4	78	4	78	5	78	5	78	6	78	5	78	4	78	4	79	4	80	3

Table B

	Arabian Sea																			
Lat. °N Long. °E	12–14 50–52		14–16 52–54		14–16 54–56		14–16 56–58		14–16 58–60		16–18 60–62		16–18 62–64		16–18 64–66		16–18 66–68		18–20 68–70	
Square No.															IV					
Bathytherm. Square No.			8		9															
Month	A	R	A	R	A	R	A	R	A	R	A	R	A	R	A	R	A	R	A	R
January	77	5	76	*4*	76	6	75	6	76	6	75	5	76	5	76	5	77	6	77	6
February	77	*4*	77	*4*	76	5	76	5	76	*4*	76	5	76	*4*	76	5	77	5	77	6
March	79	5	79	6	79	5	79	7	79	7	78	6	78	6	78	6	79	5	79	5
April	81	6	82	6	82	5	82	5	82	5	81	5	81	6	81	6	81	5	81	6
May	84	6	84	*4*	84	*2*	84	*4*	84	*4*	83	5	84	*4*	84	*4*	84	5	84	5
June	84	9	83	7	83	7	81	7	82	6	83	*4*	83	5	83	5	83	5	84	5
July	83	**11**	78	7	78	7	77	8	77	7	79	6	80	5	81	5	81	*4*	82	5
August	81	**12**	75	7	75	6	75	6	75	5	77	7	78	5	79	*4*	80	*4*	80	*4*
September	82	**13**	77	8	78	7	77	5	77	5	78	6	79	5	79	5	80	*3*	81	5
October	80	**10**	80	8	79	6	80	7	80	6	82	*4*	81	*4*	80	5	81	5	82	5
November	78	7	79	6	79	6	79	5	79	*3*	79	5	80	*4*	80	5	81	5	81	*4*
December	77	5	77	6	77	5	77	*4*	77	*4*	77	*4*	78	5	78	5	78	6	79	5

Table C

	Off Arabian Coast									
Lat. °N Long. °E	14–16 50–52		14–16 52–54		16–18 54–56		16–18 56–58		18–20 58–60	
Square No.					III					
Bathytherm. Square No.	7		8		9		10		11	
Month	A	R	A	R	A	R	A	R	A	R
January	76	5	76	*4*	75	6	75	5	75	6
February	77	*4*	77	*4*	76	*4*	75	*4*	75	7
March	79	5	79	6	77	5	78	6	77	7
April	82	5	82	6	81	5	81	5	81	5
May	84	*4*	84	*4*	83	*3*	82	6	82	5
June	84	5	83	7	82	8	81	**10**	82	7
July	80	**11**	78	7	76	**14**	76	**13**	78	**12**
August	78	**11**	75	7	74	8	73	**10**	75	9
September	80	**11**	77	8	76	9	76	7	77	6
October	79	8	80	8	80	*3*	80	6	80	5
November	79	5	79	6	80	5	79	5	79	5
December	77	5	77	6	77	6	78	*4*	77	6

A = Average value for period 1855–1943
Ranges < 5°F are in italics
Ranges ⩾ 10°F are in heavy type.

R = 90% range, i.e. 5% of values are above top limit of range and 5% below the lower limit. 1855–1943.

suggests that at this time of the year upward flow of cold water has already begun off East Africa but in square 13 to the south of the main area of up-welling evident in Fig. 3.

FEBRUARY TO MAY (Figs. 5a, b and c). At this time except in the southern Red Sea where there is a slight cooling, the temperature of the upper layers generally have increased, confirming Tables A, B and C. As the year progresses intense surface heating by solar radiation sets up a downward fall of temperature within this warm water. It is also apparent that the lower cold water flows smoothly over the sill at the Straits of Bab-el-Madeb, and that up-welling continues off East Africa, but the location has moved northward to square 12 just south of Socotra.

JUNE TO SEPTEMBER (Figs. 5d, e and f). During this interesting period isotherms in Figs. 5d and e give the situation in the areas of intense up-welling south of Aden and off the south-east Arabian coast, while Fig. 5f gives a cross-section of the up-welling water south of Socotra. Cold water appears to flow up from below 450 feet all along the sea routes in the Gulf of Aden and south of Arabia. The isotherms also confirm the strong tendency for the cold water to break through the warm surface layer south of Aden and off the Arabian coast east of 50°E. In areas where this is not true the warm water masses that lie on the surface are about 100 feet deep. Isotherms also confirm that cold up-welled water flows back into the southern Red Sea but mainly below 100 feet while the warm upper layers remain undisturbed. Figs. 5e and f show that up-welling occurs over a narrow range of latitude off East Africa. There are insufficient data to construct reliable isotherms in Fig. 5e. However they suggest that a fairly deep horizontal flow of cold water occurs over a wide range of longitude to east of Cape Guardafui. Well east of the North Arabian Sea (square 18) there is a seasonal increase in temperature below 300 feet and the lowest isotherms have become closer suggesting downward flow of the upper warm water to compensate for the up-welling of the cold water off East Africa and Arabia.

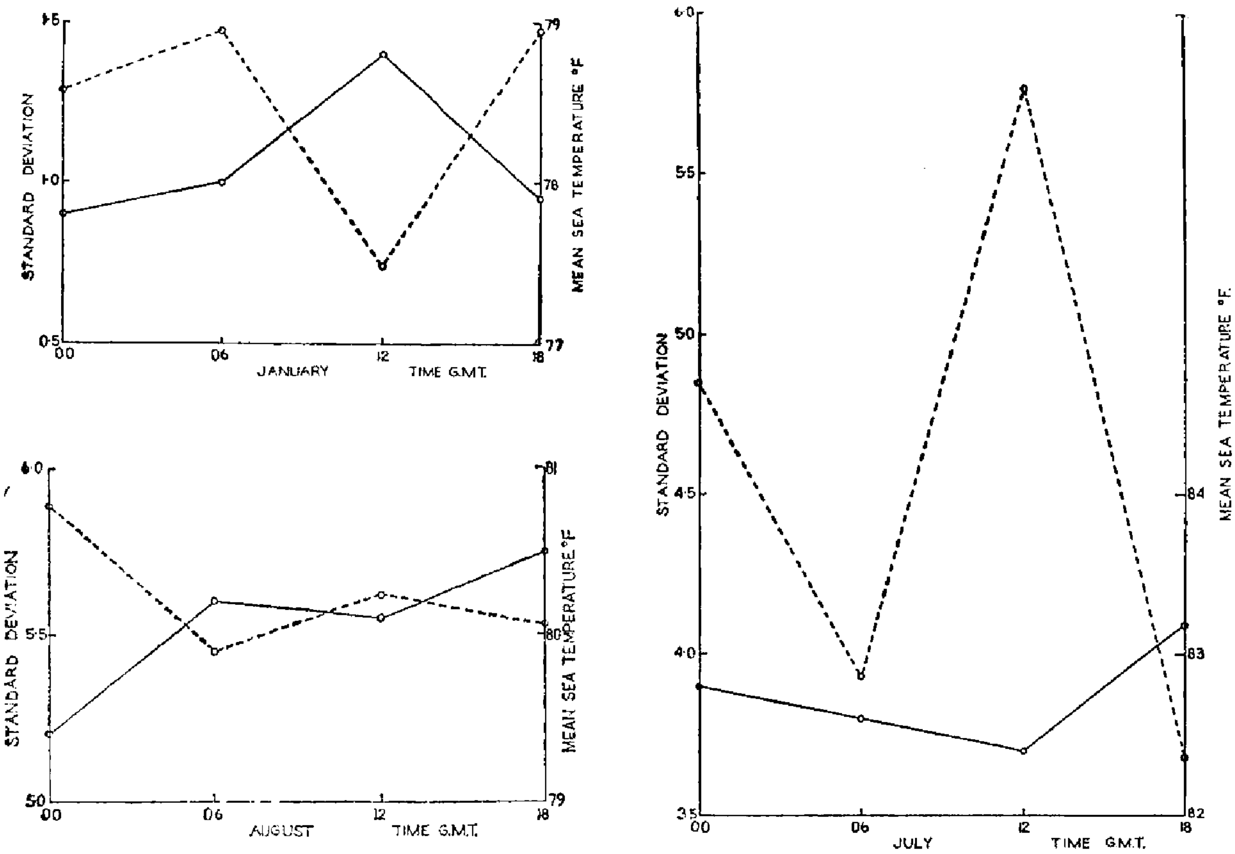
Diurnal Variation of Up-Welling

The diurnal variation of wind over the coast at Aden suggests that the up-welling south of Aden must have a daily rhythm corresponding to the seasonal changes described above which lowers the average and raises the variability of sea surface temperature. To examine whether this daily rhythm exists sea surface temperatures observed by ships passing through square II (marked in Fig. 1) over a period of 10 years had been analysed, for January, July and August.

Average values and standard deviations (which is a more efficient measure of variability than range) have been computed for each observing hour (00, 06, 12, 18h GMT). Samples of about 100 observations for each of the hours for each month were obtained. Results are plotted in Figs. 6a, b and c.

In July at the onset of the SW monsoon wind when the warm saline surface layers of the sea are relatively deep, it is only around 1500 local time (1200 GMT) that the wind, augmented by the sea breeze, is sufficiently strong and in a direction sufficiently favourable for the deep cold water masses to break through the warm surface layers. Thus in July there is towards 1500 local time a high variability and a low average (Fig. 6b). In August, although there is a similar sea temperature minimum and variability maximum towards 1500 LMT they are hardly evident because the general level of sea surface temperature is lower and the variability higher than in July. This is consistent with the warm surface sea water masses having been reduced in depth after a great deal of up-welling. The direction of the wind and its strength are then sufficient over many daylight hours to bring deep cold water to the surface causing almost continuous low sea surface temperatures and high variability.

In all months there is a maximum variability at night associated with a minimum of sea surface temperature. (This occurs at night even in January which has a day maximum of surface temperature associated with a minimum of variability.) The maxima of variability are probably caused by the low temperatures of the sea surface cooled by night radiation and cool winds off the land which set up convective



Figs. 6 (a), (b) and (c). Graphs showing diurnal variation of mean sea temperatures and standard deviations in square II (12–14°N, 44–46°E—Gulf of Aden).
– – – – Standard deviation.
——— Mean sea temperature.

currents within the sea. In January when there is no up-welling the surface layers warm up during daylight and convective currents within the sea are suppressed. This results in a minimum of variability.

We thus see that parts of the pattern of seasonal variations of sea temperature described fully above occur in a single day, as a result of changes of wind force and direction caused by land and sea breezes associated with the unequal daily heating of land and sea.

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551.501.1:551.507.2

Logbooks

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Every meteorological logbook received from a ship comes before the writer of this article for final scrutiny before it passes along to be permanently recorded on the punched cards. In the thirteen years that he has been doing the job, he has thus been through about fifteen thousand meteorological logbooks. On each of them he has written a letter of comment to the master of the ship and many of these letters have perforce had to contain a few notes on the errors or omissions which have occurred in the book and on the general way in which the work has been done. These remarks have always been intended to help and encourage, not to criticise, for he has not been so long ashore as to forget the irritation and frustration caused in a ship by criticism made long after the event, from a warm, dry office ashore.

With the same idea of helping and encouraging, it is felt that all ships might benefit from knowing of the various errors and omissions which have been noted in the last year or two. If these could be remedied the net result would be a saving of time and trouble both on the high seas and here in Bracknell.

Let us then run through the meteorological logbooks at present supplied, column by column.

Dates, Times and Positions

It is very important that the year of the observation shall be entered. To invite attention to this, the skeleton heading 'year 19..' has been shaded round in the newer printings of the book, but even so, many ships have not filled in the essential two figures. Their importance lies firstly in the fact that logbooks from ships on distant stations are sometimes a year or more old by the time they reach us and much time can be wasted looking up old calendars to find out to which year they belong. Secondly, although the observations will have long since been put on punched cards, the logbook itself may be referred to many years hence, when the knowledge of the year will be essential but even more difficult to determine if it has not been originally entered.

All days, dates and times should be in GMT. All too often have we found that a ship's time day has been used with a Greenwich time. This is a mistake which is so easy to make around the meridian of 180° and it is particularly hard to spot.

The day of the week (Y) must agree with the month and the day of the month in columns 2 and 3, and all three must be Greenwich.

Mistakes are so easy to make in the entering of Q (octant of the globe) and so many ships have made them, particularly in crossing both the 0° or 180° meridian and the equator on the same day. This mistake also sets us a problem here and a wrong appraisal may mean the misplacing of an observation by several miles.

The four synoptic hours (00, 06, 12 and 18) must all be correctly dated, with a Greenwich date of course. Obviously no more than four successive observations can carry the same date but we have frequently found that one date has been made to cover five observations, in one case even six! Another book, during a complete sea passage, put a fresh date against every 1800 observation instead of against the 0000.

Total Amount of Cloud (N)

It goes without saying that the total amount of cloud can never be less than the amount of low cloud, but it is surprising how many ships have recorded a lower figure under N than under N_h. One of the figures must be wrong but it is not for us to say which; therefore they have both had to be thrown out, which is a pity because one of them was no doubt correct.

Weather and Visibility (VV and ww)

Incompatibility between the figures entered for VV and those for ww is not uncommon. As this article is being written a meteorological logbook comes to hand with an entry VV of 93 against a ww of 28. Now VV = 93 indicates that the visibility is between 550 and 1100 yards whilst ww 28 indicates that there was fog in the past hour but not at the time of observation and that the visibility, though it *was* less than 1100 yards, is *now* more than 1100 yards (see Code Card). Thus, in this observation, either VV should have been entered as 94 or more to match the recorded ww of 28, or ww should have been entered as 42 or 43 to match the recorded VV of 93. But here in Bracknell we are in no position to say which was correct, so they have both had to go.

Past Weather (W)

This is defined as weather in the past 6 hours, using the highest code figure except where the phenomenon is confined to the past hour.

This means that the officer coming on deck for the 4 to 8 watch, anticipating the synoptic hour in say 10 minutes' time, will need to know the general pattern of weather, not only during the previous watch but also during the last two hours of the 8 to 12. It is reasonably certain that any officer coming on watch will always ask his predecessor what the weather has been like, but the entries under W, taken in conjunction with the remarks in the column, often make us wonder if he realises that the gist of this information is of as much value in the meteorological logbook and radio weather message as it is in his own head. For instance, one book had recorded in the remarks column a passing rain shower at 1510 but at 1800 W was recorded merely as 0 though it should have been 8 (the shower having occurred within the previous six hours and having the higher numerical notation). Thanks to the timely remark in the column we were able to correct the figure before the observation went on to a punched card, but the forecaster who had used the 1200 and 1800 radio weather messages from the ship remained ignorant of the fact that she had experienced a shower between them. This could have been important.

Pressure

Little comment is necessary on the simple reading of a simple instrument. But there have been occasions when the Gold Slide correction, though correctly entered in the 'as read' column, has been wrongly applied. More frequent is a mistake in the slide correction itself. This undoubtedly arises from officers not setting the Gold Slide before every reading. In a ship bound north or south, or in a ship which undergoes a large change of draught (say after a stay in port, though it may be only a few hours in a bunkering port on passage), a re-setting for latitude or height above sea level is essential. In order that we may occasionally check the readings, when we get suspicious, we particularly ask that the height of the barometer cistern be entered on every page of observations.

Temperatures

Here again, there can be no difficulty in reading a simple instrument. But lack of care and regular maintenance of the instruments can undoubtedly cause errors in the temperature themselves no matter how carefully they are read. Please remember always to hang the screen to windward, to change the muslin and wick frequently, to keep the reservoir topped up with distilled water and never to let the wick hang in a bight.

When we asked for the temperatures to be read to the decimal point, which happily most ships are now doing, we did not imply that anything so small as a Fahrenheit graduation could be divided up by eye into ten equal parts and then read off as such. But, where the mercury reaches just a shade above the graduation, that will be point one; a little more than a shade but not as much as a quarter would be point two; just a shade below a graduation would be point nine and so on.

A number of ships whilst reading the dry bulb to the decimal point have then only read the wet bulb and the sea temperature to the whole degree. This is a pity since for climatological research purposes, e.g. when investigating the exchange of energy between the sea and the air, it is necessary for us to calculate the dewpoint and air-sea temperature difference as accurately as possible. Large errors may occur unless the dry bulb, wet bulb and sea temperatures are all read to the nearest tenth of a degree. Thus it is most desirable that in any one observation, all three temperatures should if possible be read to the decimal point.

As seamen ourselves, we do of course realise that there are some occasions when it is unreasonable to expect either of the screen temperatures to be read closer than to the whole or half degree—the dark night on a winter Western Ocean passage or round Cape Horn for instance with the screen correctly hung to windward and the observer himself facing the wind. In these uncomfortable circumstances, both screen temperatures will perforce have to be read to the nearest whole or half degree only and the sea temperature should be read to match them.

Although it may be advisable to do so in connection with the ventilation of cargo etc., we do not, for the purpose of the meteorological logbook or radio weather message, ask you to work out the dewpoint or air-sea difference any closer than the whole degree. In any case, the synoptic code provides only for the whole degree, which is adequate for the forecaster. The refinement necessary for research can be done in this office, always provided of course that we have the actual temperatures to the decimal point to work from.

We feel that we should apologise to the vast majority of observing officers who already know, for pointing out that a temperature recorded as, say, 76·0 indicates that it has been read to the decimal point and just happens to fall on a graduation. If it were read to the whole degree only, it should be recorded as 76 and no decimal inserted at all. We mention this because a few meteorological logbooks have been received with a preponderance of 'point noughts' in the wet bulb column (usually accompanied by a point nought in the sea temperature column) against an actual figured decimal point for the dry bulb. We are perhaps suspicious by nature and we could not but suspect that, though the dry bulb had obviously been read to the decimal point, many of the wet bulb and sea temperatures had been read to the whole degree only. Our suspicions became a certainty with the book which had one complete page whereon all temperatures were recorded as "numeral point nought" for we were morally certain that no ship ever had sixteen dry bulbs, sixteen wet bulbs, and sixteen sea temperatures in four successive days, all reading precisely to a degree.

In short then, all actual temperatures (this does not include dewpoints or air-sea differences) should be read and entered in the book to the decimal point, but if this is impossible then all three temperatures in any one observation should be read to the same precision as each other. In cases, such as the rough weather one mentioned above, where it is impossible to read the temperatures closer than to the whole degree, that does not preclude temperatures in subsequent observations being read to the decimal point.

One final word about temperatures. The Fahrenheit scale is still in use in British observing ships and will remain so until they are provided with Celsius thermometers, but it is still likely to be some time before this can be done. We mention this because we have in the past year or so received a few logbooks containing temperatures in the Celsius scale. This mistake probably originated from a conversion table which was issued in an Admiralty Notice to Mariners but which did not unhappily make it clear that it was intended for use only in H.M. Ships, which have been using Celsius for some time. This notice still appears in each weekly edition of the Notices to Mariners but it now carries a note stating that British observing ships should continue to use Fahrenheit. The mistake received added impetus from one or two Port Meteorological Officers abroad who informed British ships that Celsius was now in force. We fear that these officers were 'jumping the gun' in this respect but the matter has been rectified by correspondence with their own headquarters. Ships are unlikely to be asked to *convert* from Fahrenheit to Centigrade again.

Clouds

This group (numbered group 6) has been found to be a prolific source of error.

When there is no low cloud present, but a certain amount of medium cloud, many books have recorded a nought under N_h. This error is very prevalent. The code lays down that where no low cloud is present, the figure under N_h shall refer to the amount of medium cloud. Thus in a sky which has no low cloud but which is overcast with medium cloud, N_h will read 8, not 0. N_h can only properly be 0 when there is neither low nor medium cloud present.

The figure nought which will appear under C_L in all circumstances where no low cloud is present is sufficient to tell the forecaster, or other person using the radio weather message, that N_h refers to the amount of medium cloud and not to the amount of low.

Sea Waves and Swell Waves

We have found in many logbooks that obvious sea waves have been entered in the swell column and vice versa. For instance, one book recorded a calm sea in a force 5 wind, but a swell which had the same direction as the wind. In this case we were able to transpose the columns with a reasonable degree of certainty but in most cases, both observations have had to be thrown out.

By far the most prevalent error however is the recording of sea and swell whose characteristics are so similar that it seems likely that only the one phenomenon is involved. The impression which the writer gets from these observations is that the observer has noted a sea wave with its direction, period and height and then, perhaps just when he has made up his mind about it, he sees the inevitable recalcitrant wave, with a direction 20° or so and a height a foot or so different from the general run, so he puts it down as swell. We must emphasise that it is only when a clear distinction can be made between sea and swell that we want you to record them both. An example of a difficult case could be given by a westerly wind blowing in the Southern Ocean. This would produce a westerly sea on a more or less permanent westerly swell. The difference of period between the two systems might enable the observer to separate them, but if no such clear distinction can be made the observer must judge whether the waves he is looking at are sea or swell, i.e. if they are caused by the wind blowing then they are sea; if not, they are swell. If they are clearly swell waves they must be entered and transmitted as the second of the groups commencing with a figure one, the first one would read 100Xo. If they are clearly sea waves (which will always have a direction approximating to that of the wind) there will be no need either to enter the second wave column nor yet to send a second wave group.

The fact that there are in the meteorological logbook two spaces for the recording of swell waves does not imply that there will very often be two swells present in addition to a sea. In fact, when there is a sea and two swells, the latter will almost invariably be very difficult to separate. It will probably be only when there is no sea at all that the two swells can be accurately recorded.

Not long ago a logbook came in with a sea and four swells recorded. Though scientifically possible, this is the sort of observation which could only be noted in laboratory conditions. At sea in a moving ship it would be of very doubtful value.

A blank space is always better than a doubtful observation.

Ice Group

There are not many observing ships in the unhappy position of needing to use this group very often and, perhaps because of this, the casual encounter with ice has seldom been recorded save in the remarks column or in the ice report at the back. Now, the recording of ice in either of these two ways is valuable and much to be desired, but in order that the ice observation may have an immediate value it should also be included as a group in the radio weather message. For though this group is largely concerned with field ice and its effect on navigation etc., it can be profitably used to give the bearing and distance of a single iceberg, e.g. ICE 90230 would mean "icebergs bearing towards east, distant 4–6 miles, not obstructing navigation".

The ice report at the back of the book should be completed, not only when ice has been sighted, but also when the ship has passed through ice areas without sighting any ice, e.g. on the North Atlantic lane routes during the spring and summer months. A NIL report of ice in this area is as valuable to us as a report of many bergs, but many ships have forgotten this.

But please bear in mind that a NIL report is not just a blank sheet; the form should be filled up to say that no ice has been sighted.

Remarks Column

This remains as the Cinderella of all the columns in the meteorological logbook. The heading shows the kind of observation which should be recorded here, e.g. shifts of wind, time and duration of precipitation etc. These are important for research purposes because where two successive observations show, for instance, a large shift of wind, it is necessary to know at approximately what time this took place, which way did the wind shift, was it a gradual shift etc. Again, if one observation shows heavy continuous rain (ww = 65) and the next one shows slight rain showers (ww = 80), it helps us to know approximately at what time the rain ceased or became showers. Again, if ww has been recorded as 81 (moderate or heavy showers) the remarks column could tell us if the showers are indeed moderate or heavy. During the period of the International Indian Ocean Expedition (i.e. until the end of 1964) full remarks on rainfall from ships in the Indian Ocean are particularly desirable. Until a satisfactory rain gauge for use in ships at sea can be devised, ww and W, amplified in the remarks column, are our only way of getting to know about rainfall at sea.

Examples of other things which could with advantage (but only too seldom are) be entered in the remarks column are the dates of changing of the muslin and wick, the date on which an instrument becomes unserviceable and a change is made to another (particularly desirable when it becomes necessary to change from bucket to intake for sea temperatures) and times, always GMT, of arrival and departure from ports, canal transits etc.

Wider observations can be entered in the Additional Remarks pages and the Marine Observers' Log bears testimony to the variety of subjects in which observers are interested. But many a potentially good observation has got no further than the page on which it was written because it was incomplete, e.g. the time, date and position of the ship were not given. There are certain observations which are useless without a time, for instance meteors (which require also a duration of flight). The most frustrating thing is when a drawing does not agree with a text and this is quite common in haloes, aurorae etc. All observing officers are urged to read chapters 8–12 of the *Marine Observers Handbook*, 8th edition (chapters 8–10 of the 7th edition, which some ships may still be using). These chapters contain information on phenomena likely to be seen at sea, together with hints on observing them and data which should accompany the observation in order to give them the greatest scientific value.

A brief note of the weather conditions at the time should always be included, but it must be fresh data. The phrase 'meteorological data as in book' which we see much too often on the Additional Remarks pages is not of any great value and may indeed be quite misleading, if the observation is not made near a synoptic hour.

Ocean Currents

We are glad to notice that most ships have now gone over to GMT for ocean current observations; by using this time instead of the Ship's Time we are able to treat these observations with a much greater precision. But some officers are still giving themselves far too much work by entering currents which overlap in time, e.g. one noon to noon current with a star to star current within it. It is always the short period current between true fixes which is the most acceptable. The noon to noon current, assuming the noon position to be the morning sight run up to a noon latitude, should only be entered if the ship is unable to get anything better.

The Radio Weather Message

Ideally, all four synoptic observations should be transmitted by radio to the appropriate meteorological office, through one of the detailed stations listed in *The Marine Observers Guide*, part IV.

Unfortunately for idealism, however, most voluntary observing ships, and indeed most British merchant ships, carry but one radio officer. Of the ships on the voluntary observing list in March 1963 (excluding 'Marid' ships and ships making observations not requiring the use of instruments), 382 were single operator ships; 69 carried two radio officers, whilst only 44 were manned by three or more radio officers, thus keeping a continuous transmitting watch. Thirteen voluntary observing ships were equipped with R/T only, operated by the master or deck officers.

Thus we are quite unjustified in expecting all voluntary observing ships to send four radio weather messages daily on time, though it is most encouraging to see from the logbooks, the number of ships which have endeavoured to do so.

The British Meteorological Office is in a particularly unhappy position in this respect, for in the Eastern North Atlantic, both the 0000 and 0600 observations fall outside the single radio officer's watch; he is just coming on watch at the time of the 1200 observation and just going off watch when the 1800 observation is made. Thus of the four observations, only the 1200 can both be made and transmitted during his watch. But the 1800 observation can still be fresh when it reaches the forecaster if it is made early enough for it to be sent before the radio officer goes off watch. This is quite permissible and GG should remain as 18 unless the observation has to be made before 1730, in which case it should be altered to 17.

Weather in the Eastern North Atlantic is subject to so many variations that the forecasters here are reluctant to miss even one observation. The 0000 and 0600 observations should therefore also be transmitted. It is too much to expect a radio officer to transmit either of them in his watch below, though we have noticed with gratitude that some have at least sent the 0000 observation. We would like both these observations to be sent along to the radio room and the radio officer asked to send them both as soon as possible after he comes on watch at 0800. It is appreciated that the 0000 observation will be more than eight hours old by the time that we get it and the 0600 will be more than two hours old. But to a forecaster, a view of the weather in retrospect is of considerable value and the number of Western Ocean meteorological logbooks which have come in, in recent months, showing all four observations to have been transmitted in this way is a healthy sign of the awareness of observing officers of this fact.

New Zealand and South Africa have gone further in this way, for in their particular areas, if it is not possible to get the radio message away promptly, they have asked for it to be sent up to 12 hours after the time of observation because the small number of ships in these areas at any one time makes the maximum number of reports essential for their forecasts for shipping and sea areas.

Only the United States has put a time limit on radio weather messages. In their areas (both Atlantic and Pacific) reports are not desired unless they can be transmitted within one hour of the observation being made.

Most countries have several alternative stations through which the messages may be transmitted and the choice is left to the radio officer of the ship. Here in Great Britain, however, we prefer them to come through Portishead because this station has a direct teleprinter link with the Meteorological Office, Bracknell, and the observations therefore get here more quickly than they would do if they were sent through any of the other G.P.O. coast stations. The United States prefers that their observations should be sent through one of their government stations or ocean weather ships—these are the stations which appear in italics in *The Marine Obersvers Guide.*

The information in the first and last columns of the logbook page concerning the disposal of the radio weather messages is essential, but we do still get a number of books in which these columns are not completely filled in. The idea behind these entries is that from them we can tell if the messages are going to the right people at the right time and also if the radio officer is experiencing any difficulty in getting them through. We do, from time to time, come across such difficulties and there may be a variety of reasons, not necessarily connected with the competence of either the sender or receiver of the message, which cause these difficulties to occur. If we can have precise details of any difficulty which the radio officer is having in getting the messages away we can pass them on to the meteorological service of the country concerned who, having been 'cheated' of an observation which was intended for them, will speedily take the necessary steps with their own country's radio organisation to effect an improvement. But we must have details, generalised complaints are of no use at all.

Changes Effective from 1st January 1964

A new group will be added to the code on 1st January 1964. This is to report ice accretion. Some readers may remember the tragic loss a few years ago of the trawlers *Lorissa* and *Roderigo*, thought to be contributed to by the amount of ice which had accumulated on their upperworks. In February 1956, m.v. *Marna* suffered an accumulation of ice in the North Sea as far south as 57° 06′N and the extract from her meteorological logbook, originally published in *The Marine Observer* of January 1957, is now mentioned in the Admiralty Pilot covering that area. Now it has been internationally agreed that a group reporting this danger to shipping would be worthwhile. Its form is $2I_sE_sE_sR_s$ where I_s is the cause of icing, E_sE_s is the thickness of ice in centimetres, and R_s is the rate of accumulation of ice (not in actual figures but in terms such as 'building up rapidly', 'melting slowly' etc.). Observing officers will be given full details of the new group before it is required to be used. Ice accumulation may also be reported simply by ICING followed by a plain language statement of the situation, and ships encountering this phenomenon are requested to report it in this way until the new code group is publicised.

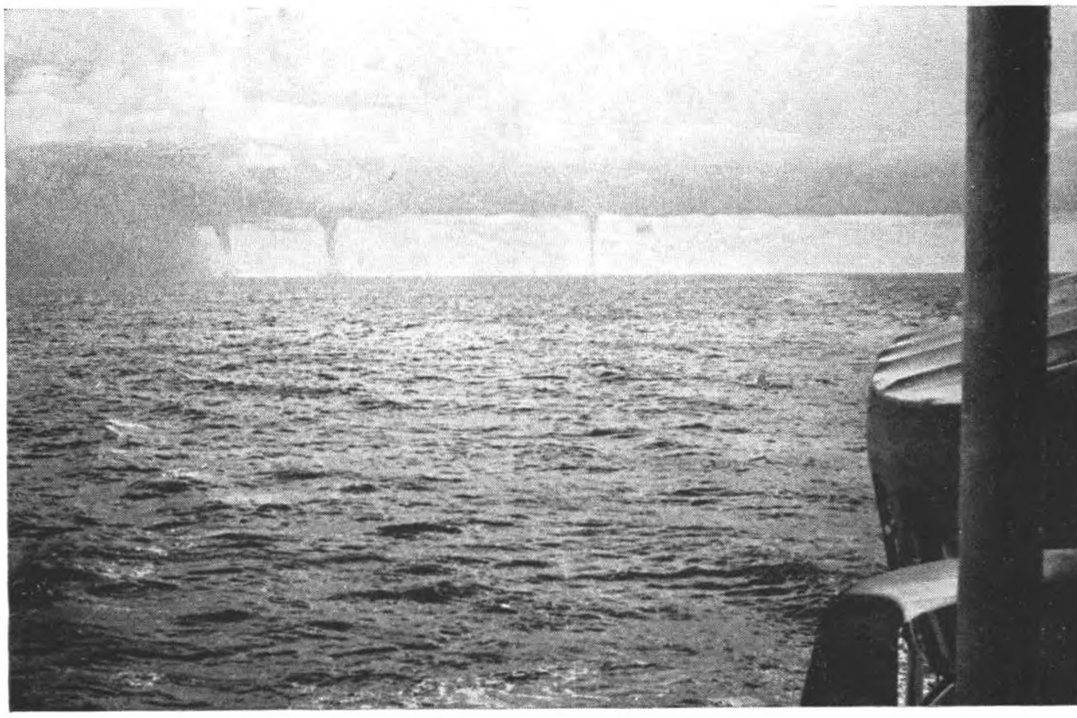
On 1st January 1964 also the symbol X, which hitherto has usually meant 'no observation', will be replaced by a solidus (/). This change has become necessary because an X when included in a message over the teleprinter, requires the teleprinter operator to shift a key twice whereas a solidus does not call for any key shift at all. The disadvantage is, of course, that a solidus can so easily be mistaken for a figure 1, especially if it is written in a hurry. Therefore we ask that observers shall make a little horizontal tick in the middle of their solidus thus ⫽. This will make it quite clear in the meteorological logbook and on the form which is passed to the ship's radio office that a solidus is intended and not a figure 1.

Finally, there is often cloud in the sky which is obviously made by man and not by nature, namely condensation trails from aircraft. If these are persistent they will often make a cloud which is large enough to be reported as such. But it is important for the meteorologist to know if he is dealing with a natural cloud or a man-made cloud, so if the observer knows that he is looking at the latter he should add the group COTRA at the end of the radio message and at the end of the observation in the meteorological logbook.

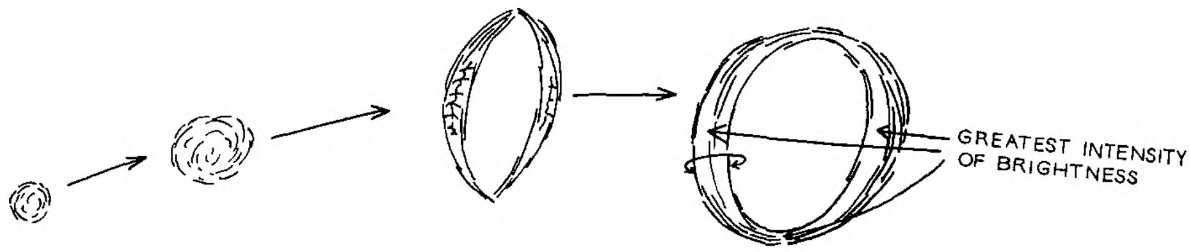
Areas of Observations

It is most encouraging here for us to note how many deep water ships are now continuing their observations in the English Channel and across the North Sea. We remember only too well the demands on an officer's time and the requirements of safe navigation around the coasts and we do realise that we cannot expect the observations to be quite as meticulous here as they might be out at sea. But they are vital to the provision of an efficient meteorological service for shipping and coastal sea areas and, even if a full observation is not possible, we are always glad to have a short one, which might be perhaps only a sea temperature, or an observation of fog or shortened visibility in the appropriate coded form. If there is no time even to enter it into the meteorological logbook, the radio weather message by itself is always acceptable.

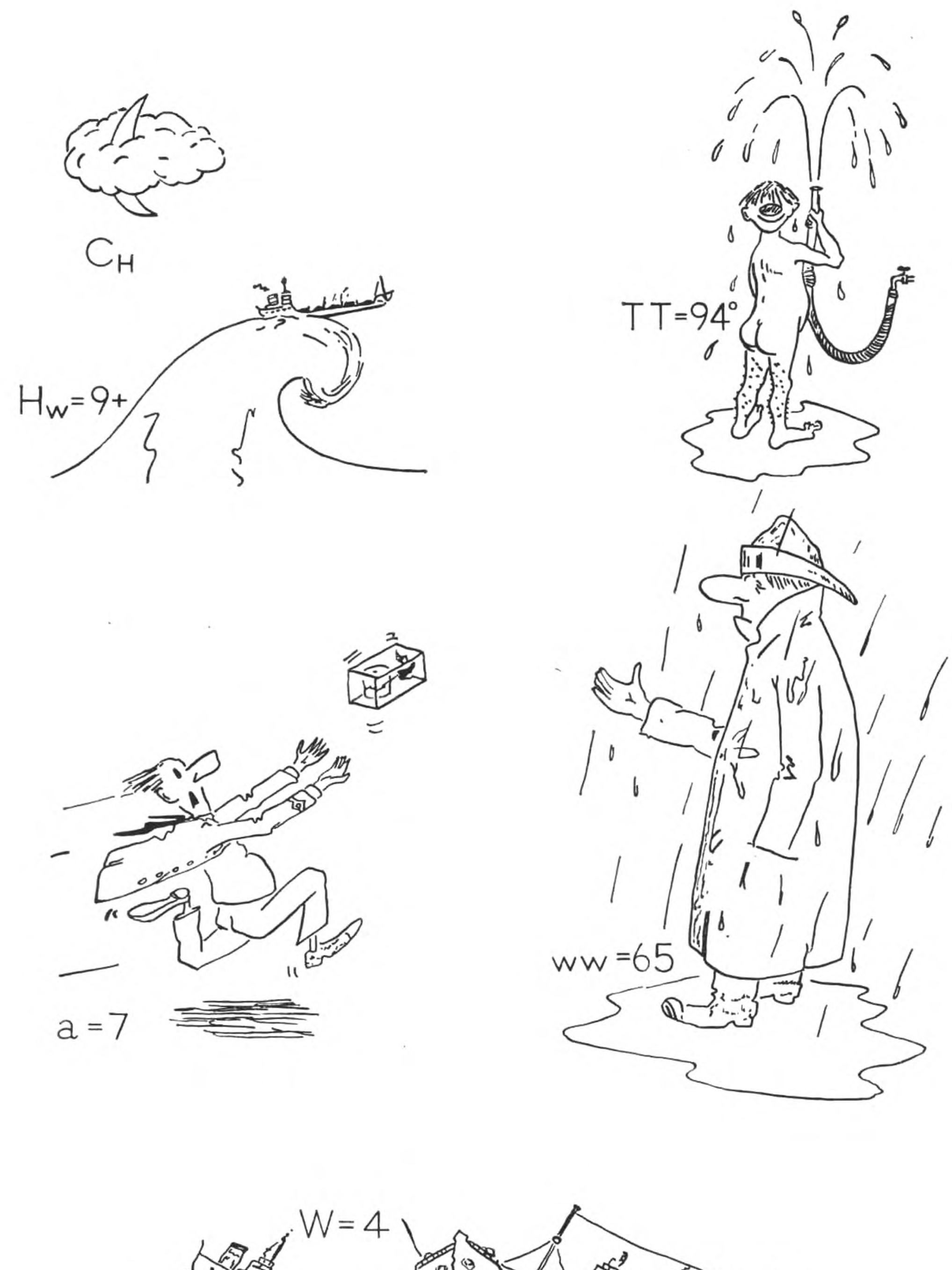
(*Opposite page 208*)



Waterspouts photographed from m.v. *Polynesie* (see page 183)



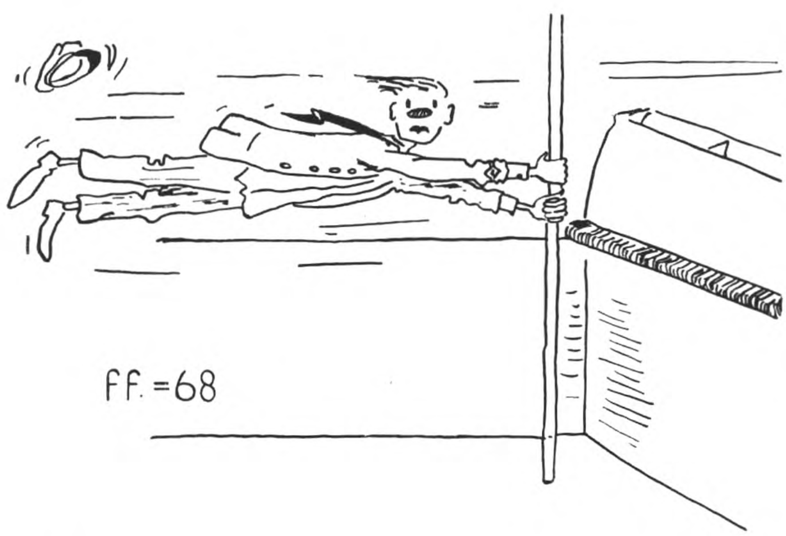
Phenomenon observed by s.s. *City of Liverpool* (see page 190)

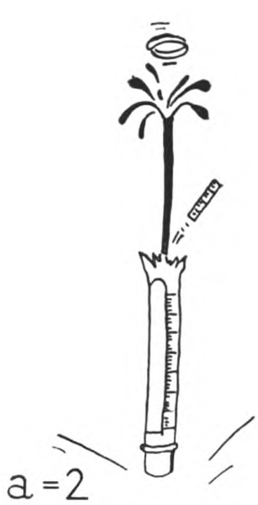


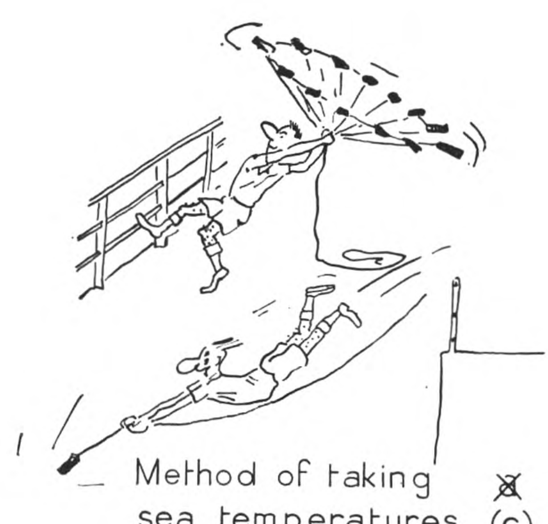
IN LIGHTER VEIN

These two pages are a copy of one of the 'Additional Remarks' pages in a logbook that we have received from m.v. *Bishopsgate*. The drawings are by G. Salter, 3rd Officer.

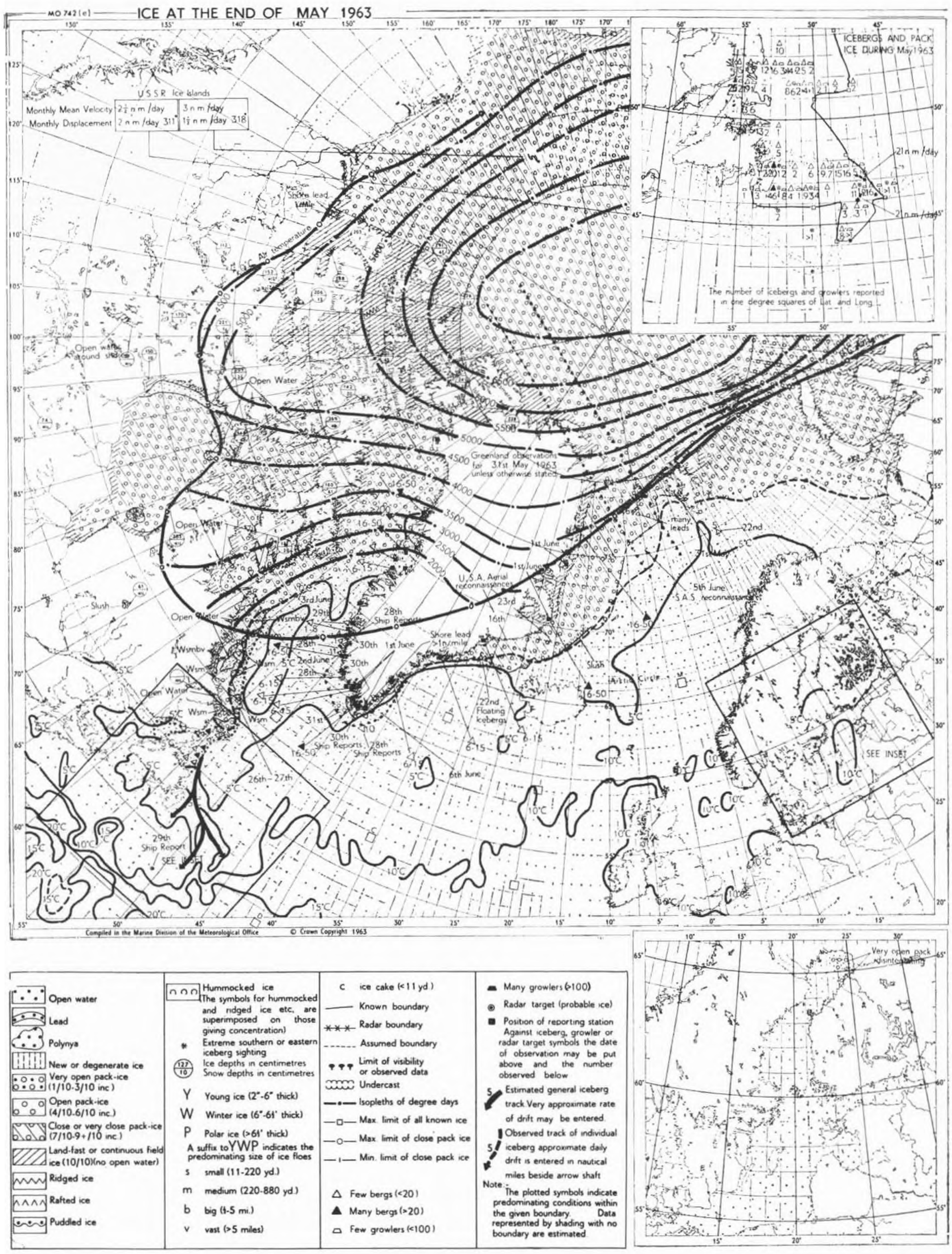

h =O


ff. =68


a =2


Method of taking
sea temperatures (c)

(*Opposite page 209*)



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

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

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

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

551.326.7(261)

NOTES ON ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM APRIL TO JUNE 1963

Relevant Weather Factors

April. Because of cyclonic activity atmospheric pressure was mainly below normal from west of the British Isles to North America, and over the Barents and Kara Seas. It was up to 5 mb. above normal over North-east Canada, Greenland, Europe and western Asia. There was warm surface air over north-western Canada with temperatures on average up to 4°C above normal while cold air continued over the Russian Arctic with surface air temperatures on average 2 to 4°C below normal.

May. Pressure continued below normal from Europe to eastern Canada and above normal over Europe. There were, on average, temperatures 3 to 6°C above normal from Europe across the Polar Basin to Alaska but there was abnormally cold air over and around Baffin Bay and over North-east Russia. Average temperatures down to 4°C below normal were experienced.

June. During this month the Polar Basin warmed up rapidly. The ice islands of U.S.S.R. reported temperatures above freezing point in the Polar Basin towards the end of the month. This was a rise of 10°C during the month and 25°C in 3 months. Cold air masses continued over and around Baffin Bay causing sub-normal surface temperatures. The high cyclonic activity continued between Europe and North America and to some extent over the Barents and Kara Seas with above normal pressure from Greenland to northern Europe. Pressure became below normal on the Canadian side of the Arctic particularly over Alaska late in the month.

Canadian Arctic Archipelago including Baffin Bay and Hudson Strait

April. The western half of this region, Hudson Bay and Foxe Basin have had a severe winter but less than normal snow. The extent in area and depth of fast ice have been above normal. Thicknesses of considerably more than 6 ft. have been observed locally. Hummocking has been generally less than normal.

Baffin Bay and Hudson Strait have had abnormally mild weather. The area of open water was in excess of normal.

Although the iceberg population was normally distributed it appeared less than normal numerically.

May. Very little change during this month apart from a retarded seasonal trend over Baffin Bay and an accelerated trend in the remainder of the Canadian Arctic. Large areas of open water appeared west of Hudson Bay in Foxe Basin and south of Hudson Strait.

June. The seasonal trend continued in all areas, and except in the north-west, everywhere was one month ahead of normal. Very large areas of open water developed in the Beaufort Sea and Amundsen Gulf with extensive leads developing from the deeper water over most of the archipelago in the far north. There was also extensive open water south of Smith Sound and off the West Greenland coast. Very little fast ice existed off eastern Baffin Island or on the West Greenland coast.

Over the shallower water of the archipelago ice thicknesses remained above normal at about 6 ft. During this season the greatest snow cover accumulated round the north-west of Baffin Island where it was 2 to 3 ft. during this month but it was decreasing.

There were no obvious changes in the iceberg population.

Davis Strait and Labrador Sea

April to June. This continued to be a light ice season from every aspect, i.e. in the extent of fast and pack ice and number of icebergs. Much Atlantic water seems to have occupied the surface layers and the Labrador current appears to have been less rapid and less extensive than normal. During May there were the seasonal increases in the southward drift of pack ice and icebergs when the extent of the Labrador current longitudinally increased temporarily.

At this time up to 50 icebergs were reported off the West Greenland coast by individual land stations with isolated areas of pack ice about 10 miles off the coast.

During June all types of ice decreased except west of Cape Farewell where there were extensive areas of pack ice with isolated large groups of icebergs (up to 50 at a single sighting).

Belle Isle Strait

April to June. At the beginning of the period areas of pack ice and nondescript ice almost filled the Strait but the extent of pack ice and the number of icebergs in the seaward approaches to the Strait were well below normal. Early in May pack ice moving southward temporarily obstructed the entrance to the Strait and at the same time numerous icebergs also moved south obstructing the sea routes to the Strait to the east of 50°W. There were 100 icebergs between 51° and 53°N. However, the abnormally warm water that covered the Great Bank caused these bergs to disperse rapidly south of the Strait. The Strait was passable with some difficulty after May 22nd when most of the pack ice in the Strait and sea approaches had disappeared. At the end of June only isolated icebergs and growlers in the approaches to the Strait remained but small amounts of pack ice continued along the Labrador coast to the north.

GREAT BANK AND EAST NEWFOUNDLAND COAST (see Table 1)

April. During this month pack ice cleared almost completely from the east of Newfoundland and the Great Bank. Only local patches remained off the north-east of Newfoundland. The number of icebergs drifting southwards was well below normal, only isolated bergs moved southward along the full extent of the Newfoundland east coast. Most accumulated and disintegrated between 45 to 50°N and 45 to 50°W moving about randomly at up to 1 knot.

May to June. At the end of May there was no pack ice. Isolated icebergs continued to move southwards along the East Newfoundland coast—some accumulating off the Avalon Peninsula and later moving slowly eastwards north of the Great Bank. At the end of May it was estimated there were no icebergs south of 44°N; this has only occurred twice in 50 years. Only one small grounded berg was south of 48°N and three small bergs were grounded south of 49° 40′N.

At the end of June a total of 24 icebergs only, had crossed south of 48°N. It was the second lightest iceberg year since 1952.

RIVER ST. LAWRENCE AND GREAT LAKES

April. The St. Lawrence Seaway opened on the 15th April; the motor tanker *Stolt Avenir* arrived at Cleveland, Ohio, on April 18th. However, there were navigational difficulties during the first half of April in the Great Lakes and along the River St. Lawrence. On the 5th April it was reported that navigation was blocked by ice jams between Montreal and Quebec. Four vessels were stranded in Three Rivers and 8 ocean-going freighters in Montreal. On the 9th it was reported that 20 ships were obstructed. Late on the 9th, however, icebreakers cleared the way through from Montreal to Quebec. It was also reported that in the western approaches to the Straits of Mackinac in Lake Huron a way had to be cleared in the ice and a vessel was freed from the ice in Lake Erie by a Coastguard cutter. By the end of April the River and the Lakes were generally navigable.

May and June. River St. Lawrence and the Great Lakes were ice free.

THE GULF OF ST. LAWRENCE AND CABOT STRAIT

April. Towards the end of the month there were isolated patches of pack ice off Prince Edward Island, off the Atlantic coast of Nova Scotia and in between Belle Isle and Anticosti Island otherwise this area was ice free. Cabot Strait had been filled with pack ice during March but throughout April it had steadily retreated from the Newfoundland side. A passage through the ice into the Gulf existed throughout the month.

May. By the last week in May the area had become completely clear of ice well ahead of normal. The Canadian Department of Transport described the season as 'Moderate to

Table 1. Icebergs sighted by merchant ships in the North Atlantic

(This does not include growlers or radar targets)

Limits of Latitude and Longitude		Degrees North and West									
		62	60	58	56	54	52	50	48	46	44
Number of bergs reported south of limit	April	*	*	*	*	*	> 352	> 349	> 245	50	0
	May	*	*	> 347	> 342	> 342	> 257	> 187	> 149	14	0
	June	*	*	> 463	> 462	> 457	> 316	> 113	3	0	0
	Total	*	*	*	*	*	> 925	> 649	> 397	64	0
Number of bergs reported east of limit	April	> 352	> 352	> 352	> 352	> 349	> 296	> 260	> 147	16	0
	May	> 348	> 347	> 342	> 342	> 261	> 119	67	27	0	0
	June	> 463	> 462	> 460	> 440	> 329	> 198	93	19	0	0
	Total	> 1163	> 1161	> 1154	> 1134	> 939	> 613	> 420	> 193	16	0
Extreme southern limit	April	45° 00′N 49° 00′W on 24.4.63									
	May	44° 05′N 48° 15′W on 5.5.63									
	June	47° 14′N 52° 54′W on 2.6.63									
Extreme eastern limit	April	48° 15′N 44° 50′W on 7.4.63									
	May	46° 15′N 46° 25′W on 10.5.63									
	June	47° 35′N 46° 20′W on 27.6.63									

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

> indicates 'greater than' 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.

Table 2. Baltic Ice Summary, April–June 1963

No ice was reported at the following stations during the period: Kiel, Tonning, Husum, Emden, Lubeck, Gluckstadt, Bremerhaven, Stettin, Gdansk, Goteborg, Oslo, Kristiansandsfjord. No ice was reported at any of the stations during June.

Station	April 1963									May 1963								
	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
Flensburg	1	4	4	0	1	4	0	0	—	—	—	—	—	—	—	—	—	—
Riga	1	15	15	10	5	1	10	0	—	—	—	—	—	—	—	—	—	—
Pjarnu	1	27	27	21	6	1	5	21	—	—	—	—	—	—	—	—	—	—
Leningrad	1	15	15	7	8	8	7	0	—	—	—	—	—	—	—	—	—	—
Viborg	1	30	30	30	0	0	0	30	—	1	1	1	1	0	0	1	0	—
Klajpeda	1	10	9	0	8	4	0	0	—	—	—	—	—	—	—	—	—	—
Tallin	1	30	29	0	29	26	3	0	—	1	3	3	0	3	1	2	0	—
Ventspils	1	8	4	0	2	3	0	0	—	—	—	—	—	—	—	—	—	—
Helsinki	1	23	23	19	2	13	8	0	—	—	—	—	—	—	—	—	—	—
Mariehamn	1	24	24	21	2	23	0	0	—	—	—	—	—	—	—	—	—	—
W. Norrskar	1	30	30	0	30	2	1	27	—	—	—	—	—	—	—	—	—	—
Turku	1	21	21	16	2	10	9	0	—	—	—	—	—	—	—	—	—	—
Mantyluoto	1	29	29	29	0	8	21	0	—	—	—	—	—	—	—	—	—	—
Vaasa	1	30	30	30	0	0	4	26	—	1	2	2	2	0	1	1	0	—
Oulu	1	30	30	30	0	0	0	30	—	1	13	13	9	0	0	0	13	—
Lulea	1	30	30	30	0	0	0	30	—	1	15	15	12	3	4	1	9	—
Bredskar	1	30	30	26	0	4	3	23	—	1	4	4	0	1	4	0	0	—
Alnosund	1	30	30	29	0	4	0	22	—	—	—	—	—	—	—	—	—	—
Stockholm	1	30	30	30	0	0	30	0	—	1	5	5	5	0	3	2	0	—
Kalmar	1	30	19	0	19	14	2	0	—	1	2	2	0	2	2	0	0	—
Visby	1	7	5	0	4	0	0	0	—	—	—	—	—	—	—	—	—	—
Skelleftea	1	30	30	30	0	0	0	30	—	1	11	11	9	0	0	0	9	—
Roytaa	1	30	30	30	0	0	0	30	—	1	16	16	16	0	0	0	16	—
Yxspihlaja	1	30	30	30	0	0	0	30	—	1	8	8	8	0	1	1	6	—
Aarhus	1	3	3	0	3	0	0	0	—	1	3	3	0	3	0	0	0	—
Copenhagen	2	10	8	0	8	2	0	0	—	2	3	2	0	2	1	0	0	—

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

* These figures give a rough measure of first the probability of the formation of sea ice, and later the progress of the growth of the thickness of the ice. They are derived from observations taken at 0600 GMT, and are the sum of the number of degrees Centigrade below zero experienced at this time for each day during the period of sustained frost.

occasionally heavy'. 236 ships were reported in the Gulf during the ice season; 130 calls for assistance were met by the Coastguard ice-breakers.

From March 15th an open water route had been possible from the Atlantic right up the St. Lawrence. Before this 18 ships proceeded from the open sea to ports west of Baie Comeau. Of these some were able to force their own way through the ice.

June. The area was ice free.

THE GREENLAND SEA

April. There was very little change during this month. The mass of Arctic pack remained greatly in excess of normal. However, aerial reconnaissance suggested that at the end of April the pack was opening up between north-east Greenland and Spitzbergen although there remained open pack west of Spitzbergen and towards Bear Island with isolated icebergs. The warm Atlantic waters west of Spitzbergen were moving slowly northwards.

May and June. During this period there was a general retreat westward of the edge of the polar pack except immediately north-west of Iceland and many leads developed between Greenland and Spitzbergen. However sea temperatures became lower west of Spitzbergen. During the month there was much ice in the fjords of western Spitzbergen but Bear Island was free of ice although isolated icebergs continued to be reported in its vicinity.

Individual land stations of eastern Greenland reported up to 50 icebergs moving southwards within the polar pack. The seasonal retreat and gradual dispersal of coastal fast ice was also apparent at the end of June.

DENMARK STRAIT

April. Very little change from March. The large area of polar pack north of the Arctic Circle although fluctuating in area slowly decreased. Up to 15 icebergs were reported within this pack ice moving southwestwards.

South of the Arctic Circle the area of polar pack continued well below normal. The East Greenland current appeared to continue weak and narrow with Atlantic water filling most of the Strait.

May. Atlantic water continued to fill the Strait. Sea surface temperatures at the end of the month were on average 3°C above normal over much of the area. The ice situation had not changed greatly.

June. There was again little change in the ice situation but sea surface temperatures had become widely just below normal.

BARENTS SEA AND WHITE SEA

April to June. Sea surface temperatures increased generally from the south-west. The area of polar pack east of Spitzbergen continued well above normal but it was retreating extensively north-eastwards.

The White Sea cleared of ice early in May. Archangel was operating by May 13th. It was likely, however, that the entrance and approaches to the Kara Sea remained obstructed with widespread pack ice.

BALTIC SEA (see Table 2)

April. By the end of April most of the Baltic had become free of pack ice but hummocked and fast ice 2 to 3 ft. thick continued in the north of the Gulf of Bothnia. There was much continuous field ice off South-west Finland and around the Aaland Islands and very open pack off central Sweden. Much open and very open pack continued in the Gulfs of Finland and Riga.

May and June. By the end of May only small amounts of ice remained in the north of the Gulf of Bothnia. In spite of the very severe season the Baltic had cleared rapidly and ahead of normal.

G. A. T.

551.501.8:551.507.2

RADAR AND METEOROLOGICAL CONDITIONS

(Reprint of a report from the Radio Advisory Service)

Anomalous Propagation

Radar waves are influenced by the refractive index of the atmosphere through which they travel, and any departure of meteorological conditions from the standard or normal will affect radar detection ranges. The definition of a standard atmosphere is an arbitrary one, but in brief it depends on the barometric pressure and temperature decreasing uniformly with height and on the relative humidity remaining constant with height. This results in a refractive index which decreases with height, causing the radar beam to bend with the curvature of the earth, so that in standard atmospheric conditions, the radar horizon is some six per cent greater than the visual horizon.

Meteorological conditions may cause the refractive index to depart from the standard in either direction, that is to say, the rate of change of the refractive index with height may be more or less than the standard rate of change.

SUB-REFRACTION

A reduction in the rate of decrease of the refractive index may be caused by the decrease of temperature being more rapid than standard or by the relative humidity increasing. This will cause less bending of the radar wave and a reduction of the radar horizon range. Hence under conditions of sub-refraction targets of low elevation may not be detected until at shorter ranges than under standard conditions.

SUPER-REFRACTION

A greater than standard rate of decrease of the refractive index may be caused by either a less than standard decrease of temperature with height or a decrease of relative humidity with height. This will cause more severe bending of the radar wave and an increase of the radar horizon range. Under conditions of super-refraction, targets of low elevation may be detected at greater ranges than under standard conditions.

Note. In some areas of the world, atmospheric conditions giving rise to super-refraction may prevail for several months of the year. Allowance should therefore be made for the presence of this phenomenon when assessing the operational performance of a radar in detecting low lying targets. In more nearly standard atmospheric conditions shorter ranges will be observed on comparable targets, but this should not be taken to imply a decrease in radar efficiency. Areas where super-refraction is known to exist for long periods are: west coast of Africa, Cape Blanco to Dakar, Madeira Islands, Red Sea, Gulf of Aden and south coast of South Africa.

SUPER-REFRACTION AND DUCTING

A very pronounced decrease of relative humidity with height in conjunction with a sudden increase of temperature with height (temperature inversion), produces severe super-refraction or ducting of the radar beam. In such cases, radar energy can be returned as echoes from targets well beyond the maximum range of the scale in use.

SECOND OR MULTIPLE TRACE ECHOES

The travel of the 'spot' from the centre to the edge of the display on each scan or sweep occupies only a part of the time interval between successive pulses. This interval is determined by the pulse repetition frequency (PRF). During conditions

PRF	RANGE SCALE IN USE	SECOND TRACE RANGES	THIRD TRACE RANGES
500/sec.	0–12 Miles	162–174 Miles	324–336 Miles
500/sec.	0–48 Miles	162–210 Miles	324–368 Miles
1000/sec.	0–12 Miles	81–93 Miles	162–174 Miles
1000/sec.	0–48 Miles	81–129 Miles	162–208 Miles
1500/sec.	0–12 Miles	54–66 Miles	108–120 Miles
1500/sec.	0–48 Miles	54–102 Miles	108–156 Miles

Radar bearings of these echoes will be correct within the accuracy of the radar. Echo shape will be greatly distorted.

of super-refraction or ducting, echoes may be received from extremely long range targets and may be displayed not on the scan corresponding with the pulse causing the echo, but on the second or successive scans.

In these cases a knowledge of the PRF will be necessary for the estimation of a true range. Echoes which would arrive between the end of one scan and the commencement of the next will, of course, not be displayed.

The table on page 213 will be found useful in understanding the problem.

Atmospheric Discontinuities

Sharp changes in the lapse rate or rate of change of temperature or humidity a few hundred feet above sea level may give rise to echoes of an indefinite character, rather like second trace echoes of land, but extending over several miles. These echoes have been observed when there has been no possibility of multiple trace echoes of land, nor echoes from rain or cloud. These echoes are usually seen at ranges of over 10 miles and may be 20 miles or more in length.

CANADIAN EXCELLENT AWARDS

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

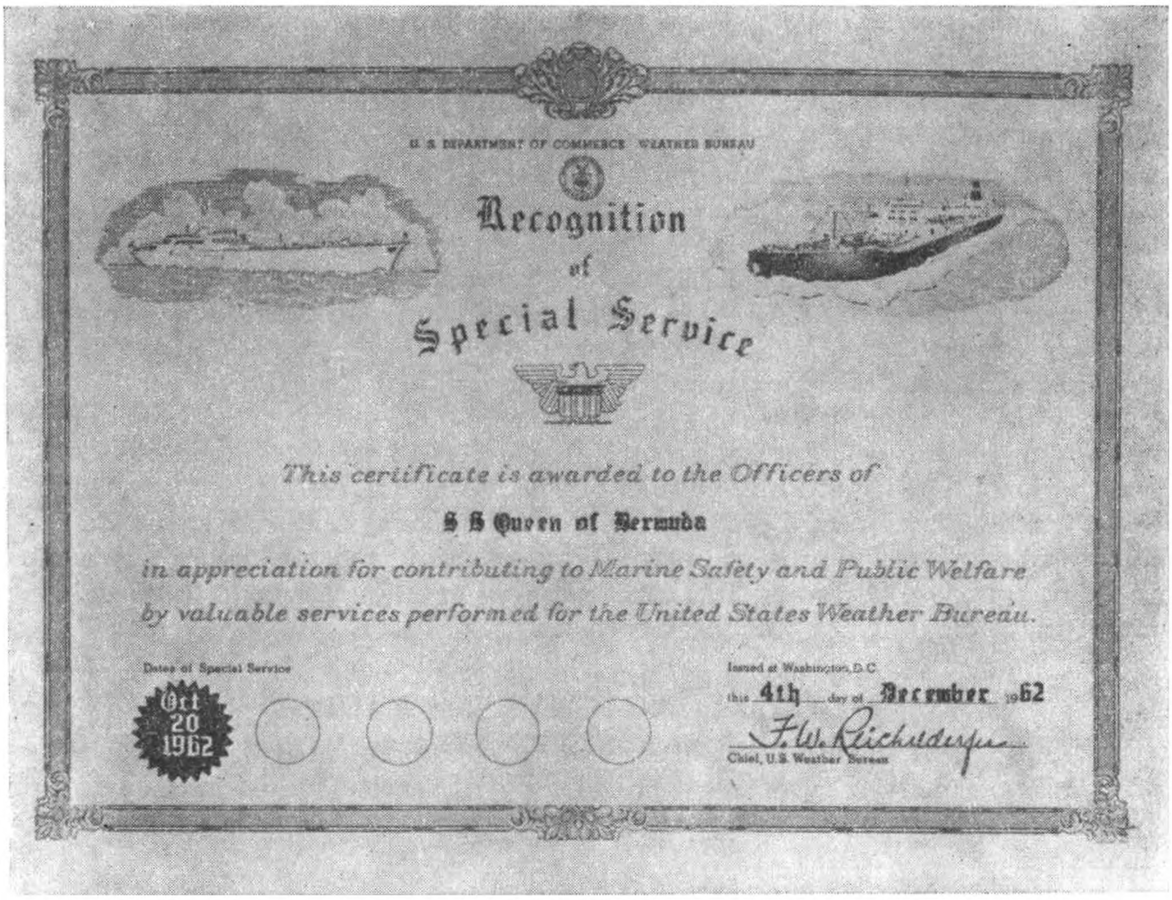
We have recently selected the ships in the Canadian Voluntary Observing Fleet and the names of the officers who are to receive Excellent Awards for outstanding service in marine weather during the observing year 1962.

Thirty-five awards, in the form of books, were presented to the Captain, Principal Observing Officers and Radio Officers who made a noteworthy contribution to the Canadian Marine Weather Programme.

A copy of *Book of Canada* by William Toye was presented to the Masters of the twelve ships in our Observing Fleet which had done the best overall work throughout the year. Twelve Awards were made to the Principal Observing Officers whose weather records were judged to be the best throughout the year. They received a copy of *Whaler's Eye* by Christopher Ash. Eleven Radio Officers also received copies of *Book of Canada.*

Sixty-nine ships were engaged in weather observing last year, and they made a total of approximately 22,000 reports.

Ship	Observing Officer Receiving Award	Radio Officer Receiving Award	Owners
Abegweit	—	—	Canadian National Railways
Acadia	H. J. Martin	—	Government of Canada
Baffin	A. R. Turnbull	F. A. Webb	Government of Canada
Bluenose	H. Whitehead	D. Vail	Government of Canada
Cyrus Field	G. C. Dale	C. Kearney	Western Union Telegraph Co.
d'Iberville	—	B. A. Laxon	Government of Canada
Emerillon	M. Wagner	—	Shell Canadian Tankers
Imperial Quebec	—	—	Imperial Oil Limited
Imperial St. Lawrence	C. H. L. Ritcey	V. M. Dykeman	Imperial Oil Limited
John A. Macdonald	—	N. Kristensen	Government of Canada
Kapuskasing	—	—	Government of Canada
Labrador	—	A. Murray	Government of Canada
Lakemba	C. L. Cleveland	F. Issac	Pacific Shipowner
Letitia	W. Shields	—	Donaldson Line
Lord Kelvin	D. S. McGarvie	—	Western Union Telegraph Co.
Maxwell	Captain S. Baggs	—	Government of Canada
Oriana	—	E. R. LeGear	Orient Line
Princess Helene	W. J. Goodwin	C. F. MacMillan	Canadian Pacific Railway Co.
Wabana	—	—	Dominion Shipping Co. Ltd.
Waihemo	—	G. Ward	Union Steamship Co. of New Zealand
Woodville	O. Volle	—	Klaveness Line



UNITED STATES WEATHER BUREAU—AWARD OF SPECIAL SERVICE CERTIFICATES TO BRITISH SHIPS

The Marine Observers' Log has frequently contained a narrative, extracted from a ship's meteorological logbook, of a North Atlantic or Eastern North Pacific hurricane. Such narratives, whether published or not, have always been copied and sent to the U.S. Weather Bureau, the authority concerned with research into the structure and development of the storms, to supplement the information which the ship has already given them in her radio weather messages.

But many British ships have been merely on the outskirts of the storms or perhaps have not been sufficiently involved in them to make a narrative worthwhile. These ships have, however, given the U.S. Weather Bureau a great deal of help by sending extra radio weather messages during the period.

Commencing with the 1962 hurricane season, the Bureau is recognising these special services by the issue of a certificate to each of the ships concerned, with a seal showing the date or dates on which she sent the special radio weather messages. A reproduction of the certificate is shown above and a list of British ships awarded it is given below. The wording on the certificate is blue and the seal is gold in colour.

We have received these certificates and they have been forwarded to the Master of each ship, addressed c/o the owners. In asking us to undertake the distribution, Dr. Reichelderfer, the Chief of the U.S. Weather Bureau, states that as special weather messages are received during subsequent hurricane seasons, additional seals will be sent to us for distribution. He also asks us to express to the captains and officers of the ships the grateful thanks of the Bureau for their co-operation on these occasions.

The ships awarded certificates are as follows.

1. Ships on the U.K. Voluntary Observing Fleet List:

Bishopsgate, British Ambassador, Camito, Catalina Star, Ceramic, Golfito, Jamaica Producer, Journalist, Loch Gowan, Manchester Trader, Mauretania, Ocean Monarch, *Orsova, Otaki, Pacific Envoy, Pacific Unity, Port Fairy, Queen of Bermuda, Rathlin Head, Regent Falcon, Silverpoint, Trevaylor and Woodford.*

2. Ships not on the U.K. Voluntary Observing Fleet List:

Achatina, Alva Star, Athelduke, Athelstane, Avon Ranger, Barlby, Baron Minto, Cardiff City, Craftsman, Demeterton, Diplomat, Elizabeth Bowater, Esso Norway, Federal Monarch, Finnamore Meadow, Ganges, Halia, Haustellum, La Estancia, Labiosa, Naess Clarion, Nancy Dee, Newbury, Orient City, Oti, Overseas Courier, Pallium, Picardy, Queda, Sugar Exporter, Sugar Producer, Sugar Refiner, Sugar Transporter, Sulaco, Sunek, Thessaly, Thirlby, Tidereach, Townsville Star, Troutpool and Wave Baron.

We congratulate these ships on this recognition of their special services.

The award of the certificates can only emphasise the fact that, though the United States Weather Bureau now has several meteorological satellites in orbit (see the article by Dr. Singer in the July number of *The Marine Observer*), each one sending back to earth general overall pictures of cloud formations, weather systems etc., the ship's detailed observation is still of vital importance in the tracking of hurricanes and for the purpose of issuing hurricane warnings to other ships and to coastal and island communities which may be threatened.

L. B. P.

SPECIAL LONG-SERVICE AWARDS

Every year since 1948 annual awards of inscribed barographs have been made to the four voluntary marine observers whose length of service for us and quality of meteorological logbooks sent in by them are considered as deserving special recognition.

As soon as an officer's personal record card, which is started as soon as the first meteorological logbook bearing his name is received, shows him to have sent us meteorological logbooks in 15 separate years, he comes within the zone of a special award. The inevitable appointments to ships which are not on the voluntary observing fleet list, the time spent ashore studying for a certificate, the sale or lay-up of ships and the six years of the second world war will almost invariably mean that these 15 years cannot be continuous. In actual fact, they are often spread over 35 years or more.

This year 64 officers came into the zone; their cards were taken out as in previous years and their records mathematically worked up on the basis of the number of years of actual voluntary observing service and the quality of their individual logbooks. This effectively places them in an order of merit and the first four are selected to receive the special award.

This year, the Director-General of the Meteorological Office is pleased to make the awards to the following shipmasters.

1. CAPTAIN L. J. SKAILES (Port Line) who sent us his first meteorological logbook in 1929 when he was in the *Port Wellington.* Since then he has in 17 years sent us 30 logbooks, 29 of which have been classed 'excellent'.

2. CAPTAIN E. C. HICKS (Pacific Steam Navigation Co. Ltd.) an observer since 1926 when we received his first meteorological logbook from the *Loriga.* In 21 years of observing, Captain Hicks has sent us 61 books, 25 of them being classed 'excellent'.

3. CAPTAIN F. LEWIS (Manchester Liners) whose first meteorological logbook came from the *Manchester Producer* in 1937. Of the 42 logbooks which Captain Lewis has sent us in 19 years of observing, 23 have been awarded the 'excellent' classification.

4. CAPTAIN W. HINE (Manchester Liners) who commenced his voluntary observing in 1930 when he was in the *Manchester Hero,* since when he has in 20 years sent us 48 logbooks, 22 of them being classed 'excellent'.

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

Book Reviews

At Home in Deep Waters, by Bruce Fraser. 8¾ in. × 5¾ in. pp. 328. *Illus.* Newnes, London, 1963. 42*s.*

"People start sailing offshore in different ways. One that is becoming increasingly popular, judging by the newspapers, is to buy a boat, often quite unsuitable and sometimes the result of high-pressure salesmanship, wait for the next fine day and set off into the blue, telling the nearest reporter that you are going to sail round the world. These people don't often get beyond the next port to leeward, and they are frequently towed in there by the lifeboat." This is one of the author's comments on the first page of a book intended mainly for the "people who potter about in small boats, yearning to make the jump to something bigger, but somehow never do".

The first essential of sea-cruising is to find a suitable boat. The author deals with variously designed boats—centreboard craft, keelboats large and small and catamarans are all discussed. For people considering buying a second-hand boat, the relative price and running costs, as compared with a new boat, are discussed. A number of cruising boats (motor cruisers are also considered) are described—details of their sailing qualities are discussed, and (a very important point) their prices are given. These are for the boat plus sails, plus a standard inventory which includes everything needed for cruising except bedding, cooking equipment, cutlery and navigation gear. (A compass is included, however.) The advantage of a comprehensive inventory covered by the price given is that the newcomer to cruising will know at once what the total outlay will be.

Also of great importance is the gear with which the boat is equipped. There are a number of things aboard a cruiser with which the dinghy sailor would have had little or no experience: topping lifts, winches, engines and bilge pumps. An inshore sailor also would not have had cause to use navigation gear (compass, direction-finding radio, echo-sounder) and the elements of using these are covered in three chapters on elementary navigation. These chapters also cover the planning of a passage, taking bearings and using these to get 'fixes'. Obviously, a beginner in offshore sailing would need to know these elements of navigation.

Handling a cruiser in a congested waterway can be tricky—wind, tide, other boats and obstacles to sea room all have to be watched and allowed for. Manœuvring in a crowded anchorage, clearing a fouled anchor and refloating after running aground are situations where the skipper of a boat needs to know what to do: if he has read this book thoroughly, and has it by him, he will be well briefed for coping with these occasions.

Other subjects which have a chapter each are: (*a*) Bad weather—fog and high winds and how to cope with them and the practical use of weather forecasts, allied with barometer readings, in order to be prepared for bad weather. A certain amount of basic meteorology is included, and the Beaufort scale of wind is published using criteria based on the performance of yachts up to 11 tons. (*b*) Sails and bosunry, which besides discussing the relative merits of Terylene and cotton for the sails, gives instructions for gybing a spinnaker and for changing headsails under way, neither of which the dinghy sailor would expect to need to do. Basic knots and, what is important with the new fibres now is use, knots that are not the conventional ones but which will not slip when tied in the smoother, slippery, synthetic fibres. (*c*) The domestic angle, which includes consideration of the safest stove for the galley, bunks and bunkboards that will ensure that the watch below can sleep without fear of being thrown out of his bunk as the boat rolls, and clothes suitable for sailing are described. (*d*) Glass fibre—the building of boats by this method, and its advantages and disadvantages are covered here.

Finally, there is a list of 'Do's and 'Dont's and a glossary of terms. The appendices include inventories of gear (including domestic, Bosun's kit and miscellaneous spares) and of consumable goods required for a three-week cruise to

Brittany by a crew of three. Another appendix gives extracts from the International Regulations for Preventing Collisions at sea.

This book seems to cover every aspect of offshore cruising, and when the reviewer manages to change from a dinghy to cruiser, it will certainly get a place aboard.

C. E. A.

Ships of Peace, by P. G. Parkhurst, 8½ in. × 5½ in. pp. 419, P. G. Parkhurst, M.B.E., 36 Duke's Avenue, New Malden, Surrey, 1962. 30*s*.

Though the years have produced many books about ships and many house histories of shipping companies, there has, until now, been no history of the administrative side of the British Merchant Navy. The general government of the service, now in the hands of the Ministry of Transport, was, until the second world war, carried out by a department of the Board of Trade. Even to-day, almost a quarter of a century later, it is not uncommon for the older hands to refer to the Ministry of Transport's officials as Board of Trade surveyors etc.; custom dies hard at sea.

Probably the most fruitful source of history is to be found in old letters, documents and records of government offices, but when, in 1935, these offices were empowered to throw open to public inspection all their records not less than 50 years old, there was only one 'customer' for the records of the Board of Trade and he merely wanted to write a treatise on Colonial Banking. Much historical material might therefore have been left to moulder on the shelves had not Mr. Parkhurst, who subsequently became librarian to the Ministry of Transport, taken on in his spare time the job of sifting the material, a job which he has continued since his retirement in 1950. The results of his labours is *Ships of Peace*, volume I of which is the subject of this review. Volume II remains yet to be published.

The genesis of the Board of Trade was in the reign of King James I when, from time to time, councils were summoned to advise the Crown on matters connected with the trade and commerce of the country. By 1697 these councils had grown into a permanent committee of the Privy Council named the Board of Trade and Plantations whose duties were defined to be the "Promotion of trade of the Kingdom generally and inspection of the plantations in America and elsewhere".

But it was not until the first half of the 19th century that the Government appears to have become concerned with the appalling and continuous loss of life at sea. In 1836 a select committee was set up to enquire into the cause of shipwrecks. Its findings did indeed reveal a parlous state of affairs: defective construction, inadequate equipment, imperfect repairs, improper and excessive loading, incompetency and drunkenness amongst masters, officers and crew—the whole sorry tale is told in detail. Perhaps the final spur to action emanated from the Foreign Office who asked all British Consuls to report on the character and conduct of British seamen abroad. Mr. Parkhurst prints many of the replies, not a few of which were indeed blistering.

Eventually, but not until 1850, a mercantile marine department was set up within the Board of Trade, charged with the duty of "improving the conditions of masters, mates and seamen and maintaining discipline in the merchant service". The act of 1850 which the new department was empowered to enforce contained some 124 sections, most of which, together with the steps taken to enforce them, are treated in detail in the book.

Other factors too were at work in the early 1850's with the object of reducing the loss of life at sea. Not the least of these was the conviction of an American Naval Officer, Maury, that if the governments of all maritime nations would encourage weather observing and the keeping of meteorological logbooks in their ships, such a knowledge of wind, weather and ocean currents, properly collated and interpreted, could result not only in a saving of life but in an improvement in trade. Thus were born meteorological offices in all maritime countries and it was natural that the British office should in its early days come within the framework of the new department. The author refers to us as "an offspring of the Marine Department".

But the Act of 1850 was only a beginning, it was quickly followed by the Merchant Shipping Act of 1854, most of which outlined a policy much of which is still in force to-day, e.g. examinations for masters and mates etc., and 55 more Acts of Parliament, designed for the welfare of shipping and seamen, were to be passed before the end of the period (1885) covered by this volume had been reached. Most of these Acts are described in greater or less detail. Perhaps the most significant one was the Unseaworthy Ship Act of 1875 which made the marking of a load-line compulsory, the result of a 20-year agitation by Samuel Plimsoll, to whose work the author devotes a chapter of 19 pages.

We have come a long way since 1840 when a seaman in the Australian trade was paid £2 per month and when there were as many as 500 ships lost every year, about one-fiftieth of the total number of registered ships. To those who would cast a glance astern over this stormy and uncomfortable passage, the reviewer can recommend this book and looks forward with pleasure to the appearance of volume II.

L. B. P.

High Latitude, by J. K. Davis, 8¾ in. × 5½ in. pp. 292. *Illus.* Melbourne University Press (for whom Cambridge University Press act as agents), Melbourne, 1962. 45*s*.

"They mark our passage as a race of men,
Earth will not see such ships as those agen".

This was John Masefield's epitaph on the sailing ship, and appropriately Captain J. K. Davis has used it as an early chapter heading in his book, for it was to the latter days of sail that he belonged, the days when these ships had become less lovely things, when there was little left to them in their dying struggle with steam except coal from South Wales or Australia to the west coast of South America and nitrates home to Europe.

We must be grateful to Captain Davis for the account of his life in sail, from 1900 when he was apprenticed to Hughes, Jones and Co. of Liverpool in their *Celtic Chief* to 1907 when he was second mate of Devitt and Moore's famous *Port Jackson*. He has not over-glamorised these days, neither has he overplayed the hardships and rough living, both of which so many writers are apt to do. This is indeed a factual account of the closing years of an era, moreover some of his descriptions are quite charming, one could easily go back to Conrad before finding their equal.

Weather wisdom naturally played a large part in those years and Davis early learned that "there are few better places to remember the truth that it does not pay to take the wind and the sea too cheaply". One of his best descriptive pieces of writing is in the four pages which he devotes to a hurricane experienced in the Pacific Ocean in 1902 at the end of which he writes . . . "I am inclined to think such an experience was a salutary one. I had seen what the wind could do; I had seen what a ship could stand. It was terrifying at the time, but it cheated the future of many vague fears."

In 1907 began John Davis' long association with the Antarctic when he went south as mate of the *Nimrod* for Shackleton's Antarctic Expedition. Though many books have been written about the 'Heroic age of Antarctic exploration', the off-shore side has never had very much attention. Captain Davis' book tells us much of the courage, skill, fortitude and seamanship required to operate an expedition ship. Here, again, the author's descriptive powers are ably shown. On first entering the ice . . . "One had always imagined ice to be white, but one found that in the steep faces of the bergs and in the deep water-worn caverns at their bases there existed every possible gradation of colour between dazzling white and electric blue and green, blended and fused with a refracted light that seemed to have in it a quality of magic . . . it seemed as if a hush had fallen upon all creation to mark the occasion of our entry into this strange new world of cold unimagined beauty and with this illusion was conveyed a feeling of indescribable loneliness. Nothing I had heard or imagined about the Antarctic had prepared me for this."

The historian must be grateful to Captain Davis too for finally, it is hoped, disposing of a story which reached many of the national newspapers, and has lived on in one way or another for more than fifty years. This said that whilst approaching Cape Royds for the initial landing, a struggle had taken place between Shackleton, the leader, and England, the master, on the bridge of the *Nimrod* and that one of the participants was knocked down. Says Davis: "I happen to have been there and know what really took place . . . Captain England had stopped the engines well off-shore . . . Shackleton was on the bridge and urged the master to go closer in shore. When he declined, Shackleton attempted to move the engine telegraph from Stop to Slow Ahead. Captain England placed his hand on the telegraph and stopped him. That was all. There was no scuffle or struggle. Both men realised in time the need for restraint and Shackleton left the bridge."

Command came to Davis for the homeward passage of *Nimrod*, which was in itself a minor voyage of discovery for, at that time there were shown on the Admiralty chart certain doubtful islands in the sub-Antarctic sector of the South Pacific Ocean, islands that had not been sighted since their reported discovery by former navigators. These were Emerald Island, the Nimrod group, and Dougherty Island but he sailed across their reported positions without finding anything. He also visited Macquarie Island and found thereon a seaman from an Australian sealer who was voluntarily spending the winter there, alone but for two small dogs, and preparing his own private store of oil. "If this oil brings a good price, I'll be buying meself a share in a fishing boat."

Davis next went south as master of the *Aurora* for Douglas Mawson's Australian Antarctic Expedition, in which he landed the main party at Commonwealth Bay and a subsidiary party 1,200 miles to the westward. The story of this expedition is told in Mawson's *Home of the Blizzard* which is aptly named, for Commonwealth Bay, in the first year, was found to yield an average windspeed of fifty miles per hour. Hourly velocities of over one hundred miles per hour were recorded and twenty-four-hourly averages of over ninety miles per hour were not uncommon. Nothing comparable to these Commonwealth Bay winds had ever been recorded over such a period. The job of supporting two parties so widely dispersed on an unknown coastline in such appalling weather conditions can barely be imagined. Added to these anxieties was the one of coal consumption. "As the hours went by I saw the outlines of the terrible choice that must confront me if the blizzard showed no signs of abating—whether to wait and perhaps jeopardise the eight men on the floating barrier on the coast of Queen Mary Land or whether to abandon my leader and his companions to the awful, wind-ridden solitude for another year of exile."

The First World War took Davis back to the normal occupations of the sea but in 1916 he went south again, once more as master of the *Aurora*, to rescue the survivors of the Ross Sea party of Shackleton's ill-starred trans-Antarctic Expedition, and his story ends with the arrival of *Aurora* in Wellington with this party in 1917. One could perhaps wish that he had gone on further, for many years later he went south again as master of the old *Discovery*, but then again, the Heroic Age, or as the author prefers to call it, the "Stone Age of Polar Travel", was ended.

This is undoubtedly a book which deserves a place on the shelves of any ship-master or officer not only for its historical value but also as a piece of very fine literature. L. B. P.

The Geometrical Seaman, by E. G. R. Taylor and M. W. Richey, $8\frac{1}{2}$ in. × $6\frac{3}{4}$ in. pp. 112. *Illus.* Hollis and Carter for the Institute of Navigation, 1962. 30*s.*

The authors of this very readable little book printed in large clear type require no introduction to most readers of this journal. An earlier book, *The Haven-Finding Art*, by Professor Taylor, reviewed in *The Marine Observer*, is a scholarly work on the evolution of navigation, and established her reputation as an authority on this subject.

The text of the many excellent photographs, in sequence, of actual instruments used at sea in the past gives concise and interesting details of how and when each was used, and why in many cases it was superseded. It is a pity an index has been omitted to such a pleasing book.

Evidence is provided that the basic principles of navigational methods still in use were known and used by navigators nearly four centuries ago, in an interesting photograph of the design of the title-page of Waghenaer's *Spieghel der Zeevaerdt*, dated 1584, which includes illustrations of the lead and line, globes, the astrolabe, sea-quadrant, sand-glass, dividers and the magnetic compass.

Those of us who have worried when making a landfall after a stormy passage without 'sights' or a check on the compass error for several days on end can well appreciate the problems which beset mariners before the 12th century, when it is thought likely that the first conventional magnetic compasses were used. We are told the usual equipment then used to indicate the course to steer consisted of a needle laid on a straw or thrust through a piece of cork and floated in a basin of water. A lodestone was then pointed at the needle to magnetise it, thus providing a very primitive form of compass. What practical seamen they must have been to have safely completed ocean voyages by such means, as undoubtedly many did.

It is, perhaps, worthy of note that with so many press-button aids to navigation to be found aboard the modern ship that the lead and line, the oldest navigating instrument of which there is any record, after well over 2,000 years, is still regarded by the prudent navigator as a reliable check on his ship's approximate position when in soundings and unable for any reason to get a 'fix'.

The navigational achievements of such men as Columbus, Cabot, Vasco da Gama and Cook can only be fully appreciated by a proper understanding of the limitations of the navigational knowledge and equipment available when their historical voyages were made. All interested in the art of navigation cannot fail to enjoy this fascinating book. It certainly deserves a place in any public library, and no doubt many mariners will wish to own a copy. A. D. W.

LETTER TO THE EDITOR

2nd November 1962

DEAR SIR,

There are one or two points in your last issue I would like to comment upon.

1. The apparent opposite mirage of a steamer. It is my view that the conventional theory of mirage does not cover the facts.

An opposite mirage is possible. Met Zeit XI 1894 gives a case of the Pilatus range, observed from a point above Zurich being seen mirrored in detail opposite, then gradually fading. The editorial comment was that it was not 'lateral refraction' at the boundary between two air masses (Föhn and moist westerly) but total reflection from condensation. Another instance was mentioned. Also in the literature are horizontal cases not of the conventional 'superior' type. (e.g. Plate in *Travels in the Air*, by Glaisher, and in *L'Atmosphere* by Flammion.)

2. Is the anomalous rainbow the quinary? It is stated that Mascart sometimes thought he had observed it.

3. As regards the vertical shaft of light in the sunset, this resembles a plate in *Im Reich des Lichts*, by H. Gruson 1895 (in Library, R.A.S.), showing a shaft through the Zodiacal Light as seen at Aswan. Though I do not think the author took steps to verify his assumption, he explained it as due to a mountain. In the case that you publish, could the existence of an island be established by known bearings?

Yours faithfully,

Cicely M. Botley

2 Park Road,
Tunbridge Wells.

The above letter has been received from Miss Cicely M. Botley concerning the Marine Observers' Log in *The Marine Observer* of October 1962, which contained a number of particularly interesting optical phenomena. We have looked into the three points raised and have come to the following conclusions.

1. The phenomena reported by m.v. *Glengyle* on 2nd December 1961 can occur when there exists rapid horizontal changes of temperature (or humidity). The watery refracted image seen on the WNW horizon of a ship actually situated to the south was probably caused by rapid changes associated with sea breeze phenomena. Very rapid horizontal changes of humidity and temperature are associated with sea breezes over the desert coastlines of the Red Sea.

2. The triple rainbow reported by m.v. *City of Khartoum* observed 26th November 1961 certainly appears to have contained a quintic (i.e. five reflections within the raindrops) rainbow (Bow C). We have carefully checked the report and the order of the colours in Bow C is clearly given. This must be a rare and almost unique observation and of considerable scientific interest.

3. On investigation there seems little doubt that the ray seen from ss. *Salween* on 31st October 1961 was the shadow from one of the numerous hills in the region of Somaliland and Ethiopia. However, some ambiguity in the report makes it difficult to pinpoint the actual hill. The observer says it occurred at 1430 GMT, about 5 minutes after sunset. In fact sunset at the position given was at 1402 and the bearing of the sun at 1407 (5 min. after sunset) would have been 235°, while at 1430 it would have been 239°, a difference of 4°. There is also a difference of 5°45′ of longitude in the position at which the sun would have been setting at these two times. It is reasonable to assume that 1430 was the actual time of observation as this is the more precise time, and this being so the shadow was probably caused by a large hill (over 4,000 ft.) in the region of Koorgerard, close to the border between Somalia and Ethiopia, or possibly one of the Durdorbo Hills.

Personalities

OBITUARY.—We regret to record the death aboard his ship, the *Port Brisbane*, in Melbourne, of CAPTAIN E. E. ROSWELL. He was to have retired from the sea at the end of the homeward passage of the ship.

Ernest Edward Roswell was born in September 1900 and joined the Commonwealth and Dominion Line, later to be known as the Port Line, in September 1915. He spent all his seafaring life with this company.

He passed for Master in 1926 and was appointed to his first command, the *Port Caroline*, in 1942.

In 1943, whilst commanding the *Port Sydney*, Captain Roswell went to the assistance of the Dutch ship *Madoera* which was on fire in the Pacific Ocean. The *Port Sydney* stood by her for some twenty-four hours and then supplied her with quantities of electric cable and wiring, much of their own having been destroyed in the fire. For this service Captain Roswell was awarded the Kruis Van Verdienste.

Later in the war, when in command of the *Lowlander*, a former Italian ship, Captain Roswell made his first contact with a Chinese crew, a unique experience for a Port Line officer. An officer who was with him at this time testifies to the extremely high esteem in which this crew held their captain whose maxim always was "never make one of them lose face in front of the others".

Captain Roswell was one of our more senior voluntary marine observers, having sent us his first meteorological logbook just 40 years ago when he was second officer of the *Port Pirie*. In 26 years since then he had sent us 45 meteorological logbooks, a large proportion of which had gained the 'excellent' assessment. He received Excellent Awards in 1931, 1933, 1949, 1950, 1953, 1956, 1957, 1959 and 1960. In 1953 he was presented with an inscribed barograph for his long and zealous service at sea on our behalf.

We offer our sympathy to his widow.

L. B. P.

RETIREMENT.—CAPTAIN J. C. NETTLESHIP, O.B.E., Commodore of the Shell Company's fleet, retired recently.

John Charles Nettleship was born in 1904 at Doncaster. Before going to sea in 1921 he spent six months in the Ellerman's Wilson Line Cadet School and was then appointed to their s.s. *Sorrento* as junior cadet. In 1925 he passed for second mate and was appointed third officer of Wilson's *Francisco*. He left the company in 1928 and joined the Anglo Saxon Petroleum Co., later to be merged into the Shell Tanker fleet.

He passed for master in 1931 and in 1940 was appointed to his first command, the m.v. *Tornus*.

Whilst master of the *Elona* Captain Nettleship was, in 1941, appointed Commodore in a convoy to North Russia. He arrived at Molotovsk on 24th December 1941, sixteen days out of Reykjavik and was then ice bound in that port until March 1942.

He was appointed Commodore of the Shell Company's fleet in June 1961 and given command of their s.s. *Serenia*. During the first nineteen months that he was in her she transported over 1½ million tons of crude oil from the Persian Gulf to Singapore. He was appointed to the O.B.E. in 1961.

Captain Nettleship's record of voluntary observing for us goes back to 1925 when he was in the *Francisco*. Since then he has, in twelve years, sent us 44 meteorological logbooks, a good proportion of which have gained the 'excellent' classification. He received Excellent Awards in 1957, 1959 and 1963.

We wish him health and happiness in his retirement.

L. B. P.

RETIREMENT.—CAPTAIN T. A. WATKINSON retired recently after nearly forty-eight years at sea, all spent in the service of the Clan Line.

Thomas Alexander Watkinson was born in Leeds in 1899 and signed indentures with the Clan Line in 1915. His first ship was the *Clan Macleod* which was sunk by shell fire from a German submarine in the Mediterranean whilst homeward bound from India in December 1915. Fourteen men were killed and four wounded in that action and Captain Watkinson was wounded in his left arm. Little more than a year later he was again to be sunk, this time in the *Clan Macmillan* which was torpedoed in the English Channel.

He was appointed fourth officer in the company in August 1918, whilst still serving his time and passed for second mate in 1921.

He passed for master in 1926 and was appointed to his first command, the *Clan Macbrayne* in 1940.

Captain Watkinson sailed unharmed through the second world war but had an interesting experience when in command of the *Bangkok II* in which he carried the embalmed body of the Shah of Persia, who had died in Johannesburg, from Durban to Suez where it was consigned to King Farouk for burial in Cairo. Because of security regulations then in force, the case containing the body was marked 'Natural History Specimen'.

Captain Watkinson's record with us goes back to 1927 when he was in the *Clan Macbeth*. Since then he has in fifteen years sent us 33 meteorological logbooks, 25 of which were assessed 'excellent'. He received Excellent Awards in 1953, 1956, 1957, 1958, 1959, 1962 and 1963.

We wish him health and happiness in his retirement.

L. B. P.

RETIREMENT.—COMMODORE R. G. REES recently completed his last voyage in command of the *Rangitane*.

Robert George Rees, who was born in Cardiff in 1902, joined the New Zealand Shipping Company in 1923 as 4th Officer, having served his apprenticeship with the Union Castle Line. He afterwards served in many of the New Zealand Shipping

Company's and Federal Line ships, receiving his first command, the *Somerset*, in 1940. This ship was sunk by aerial torpedo in May 1941, 200 miles west of Ireland, fortunately without casualties.

He was appointed Commodore of the combined New Zealand Shipping Company and Federal Line fleets in June 1959.

Commodore Rees' record with the Meteorological Office dates back to 1926, and in 20 years has sent in 38 logbooks, 33 of which were classed as 'excellent', and in 1927, 1928, 1952, 1959, 1960, 1961, 1962 and 1963 he received an Excellent Award. In 1960 he was presented with an inscribed barograph in recognition of his long and valuable service for the Meteorological Office.

We wish him health and happiness in his retirement.

J. C. M.

RETIREMENT.—CAPTAIN A. C. JONES completed his last voyage at sea in August in command of the *Corinthic.*

Arthur Conway Jones was born at Shepton Mallet in 1898, son of the Rector. His grandfather and great grandfather had been in command at sea.

He first went to sea in 1915 as an apprentice with the Ellerman Bucknall Line and stayed with that company until 1925 when he joined the Shaw Savill Line as 3rd Officer. He served in many of the company's ships, receiving his first command, the *Samrich*, in November 1946. He also attended, as Inspector, many of the new vessels constructed for the company from September 1947 until July 1949.

Captain Jones always took a great interest in the lonely island of Pitcairn and on many occasions has taken the islanders to and from New Zealand, and also to Henderson Island where they have farming property. In view of the prevailing winds, their boats are normally lifted on deck and launched off at Henderson Island and after the harvest is collected they sail back to Pitcairn Island.

Captain Jones's record with the Meteorological Office goes back to 1927 and in 17 years he has sent in 37 logbooks, 26 of which were classed as 'excellent'. He received Excellent Awards in 1956, 1957, 1959 and 1960.

We wish him health and happiness in his retirement.

J. C. M.

RETIREMENT.—COMMODORE T. W. STEVENS, C.B.E., R.D., retired from the sea after bringing the *Aragon* into London on 20th March 1963 completing over 45 years' service with the Royal Mail Lines.

Thomas Wilson Stevens joined the Royal Mail Lines as a cadet in November 1917 and served in many of their ships. He was appointed to his first command, the *Lombardy*, in May 1947 and subsequently commanded the *Pardo*, *Loch Garth*, *Darro*, *Drina*, *Loch Ryan*, *Empire Ken*, *Loch Gowan*, *Highland Brigade*, *Highland Monarch* and *Aragon.*

Commodore Stevens was mobilised on 3rd September 1939, serving successively as Gunnery Officer, Commodore of Convoys, Commander of H.M.S. *Girdle Ness*, and Maintenance Commander at Cuxhaven until he was demobilised in March 1947. At varying times during these 7½ years special mention was made of 'the inestimable value of his ability, tact, good humour and marked degree of leadership', his 'marked zeal and ability', 'the high regard in which he was held by all those with whom he came in contact' and 'the good example he set both officers and ship's company'. Commodore Stevens was awarded the C.B.E. in the Birthday Honours for 1962.

Commodore Stevens's record with the Meteorological Office dates back to 1921 whilst serving as a cadet, and in 18 years observing he has sent in 46 logbooks, 8 of which were classified as 'excellent'. In 1955, he received an Excellent Award.

We wish him health and happiness in his retirement.

J. C. M.

Notices to Marine Observers

WEATHER SERVICE FOR SHIPPING IN HONG KONG

A new edition of *Weather Services for Shipping* is being prepared as part of the marine weather service provided by the Hong Kong Royal Observatory.

The Observatory received 7,745 weather reports from ships at sea during the second quarter of this year, 2,610 coming from Hong Kong voluntary observing ships.

During the quarter under review, the m.v. *Halldis* of the Norwegian East Asia Line joined the Hong Kong Observing Ships, in making weather reports to the Observatory.

In his latest report on the work of the Marine Weather Service, the Director of the Royal Observatory, Dr. I. E. M. Watts, said that ships were requested to make special weather reports to the Observatory when the American weather satellites Tiros V, VI and VII passed over the China Sea during day time. As a result, 336 weather reports were received by the Observatory.

Hong Kong Notice to Mariners No. 20 of 1963 stated that from 1st June, 1963, the International Code Flag group ZX would be added to the list of port signals and its local meaning would be 'services of Port Meteorological Officer required'.

Ships using this signal should be prepared to indicate their specific requirements by visual signal through any of the port signal stations.

In asking us to publicise this notice, the Port Meteorological Officer in Hong Kong, Commander W. P. Goodfellow, D.S.C., V.R.D., R.N.R., states that to visit all the voluntary observing ships of different nations which call there is more than can be managed and this new signal is an attempt to serve all the ships which really require his services.

Note. The dredging operations at Tsuen Wan terminal were completed in July.

CHANGE IN SUPPLEMENTARY SHIPS' LOGBOOK

In the latest reprint of Form 918 (Supplementary Ships' Logbook) there is no column marked 'Aurora'. Observers are, nevertheless, requested to continue to report any auroral observations on the 'Additional Remarks' pages at the end of the book.

'STATE OF SEA' PHOTOGRAPHS

Most readers of this journal are familiar with M.O. 688—the 'State of Sea' card supplied to all our Voluntary Observing Ships—which depicts a series of thirteen photographs with the appearance of the open sea corresponding to each number of the Beaufort wind scale 0–12.

It has recently been suggested that mariners would be glad of more published photographs, showing the state of sea corresponding to the Beaufort wind scale in coastal waters. These would be particularly useful to yachtsmen and other small craft.

The editor will be glad to receive any such photographs with a view to reproducing them in *The Marine Observer*. The distance from the land when the photograph was taken should always be stated, and also whether the wind was 'on shore' or 'off shore'.

ERRATA

The Marine Observer, July 1963, page 107, Ocean Weather Ships, para. 2, line 3; *for* 23rd December *read* 23rd September.

The Marine Observer, July 1963, p. 102, second last para., line 4:

for since 1828 *read* since records began in 1871

line 5:

after coldest *add* anywhere in the London area.

THE MARINE OBSERVER'S HANDBOOK (M.O. 522) 8TH EDITION

There are several new chapters in this edition (in the 'Phenomena' section); other chapters have been re-written or have minor amendments. A set of photographs showing the state of sea corresponding to various wind forces is included.

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

Headquarters.—Commander C. E. N. Frankcom, O.B.E., R.D., R.N.R., Marine Superintendent, Meteorological Office (M.O.1), London Road, Bracknell, Berks. (Telephone: Bracknell 2420, ext. 282.)

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Lieut.-Commander L. B. Philpott, D.S.C., R.D., R.N.R., Nautical Officer. (Telephone: Bracknell 2420, ext. 283.)

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Thames.—Mr. J. C. Matheson, Master Mariner, Port Meteorological Officer, South Side, King George V Dock, Silvertown, London, E.16. (Telephone: Albert Dock 3931.)

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Humber.—Lieut.-Commander W. H. Carr, R.N.R., c/o Principal Officer, Ministry of Transport, Trinity House Yard, Hull. (Telephone: Hull 36813.)

Tyne.—Captain P. R. Legg, c/o F. B. West & Co., Custom House Chambers, Quayside, Newcastle upon Tyne. (Telephone: Newcastle 23203.)

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[*Subjects of* Book reviews, Editorials, Notices to Marine Observers, Photographs, *and persons named in* Retirement *and* Obituary *notices, are indexed under those general headings.*]

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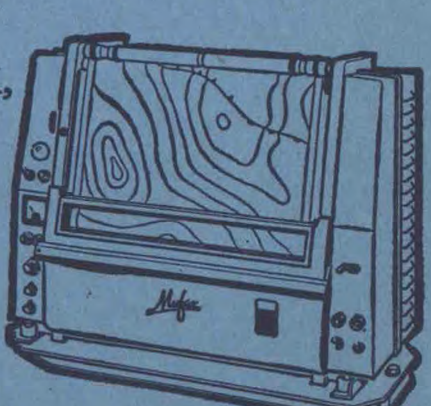
MUFAX IN SHIPS

M. S. UMANAK

A famous Danish captain stated: "All ships sailing to Greenland should have a Mufax Weather Chart Recorder in order to be well aware of the expected weather conditions and iceberg movements."

The Danish Government have endorsed this by installing Mufax in their vessels, one of these being the M. S. UMANAK, which plys the Icelandic waters.



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