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THE MARINE OBSERVER

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Editorial

In April 1955 *Lloyd's List* referred to an occasion when some vital machinery parts for a steamer disabled in the Atlantic were dropped in a specially strengthened oil drum alongside the ship by an aircraft. In order to make the drop, " the aircraft approached with full flap and undercarriage down; speed had been reduced to 90–100 m.p.h. and altitude to about 50 feet. One of the ship's lifeboats was ready in the water and the oil drum was dropped within 50 yards of the boat. Soon after midday the master of the ship reported that the package was on board and a further message from him at 10 p.m. stated that the repairs had been completed and that the vessel had resumed her passage to Montreal ".

It appears that the machinery defect aboard this vessel was so serious that had the aircraft not been able to drop this spare the ship would have had to have been taken in tow, with the consequent large expense and considerable delay.

This is by no means the first time aircraft have thus been used to drop spare parts to ships at sea. R.A.F. aircraft of Coastal Command have, on several occasions, dropped spare parts to the British ocean weather ships, varying from radio equipment to a compressed gas cylinder for the refrigeration plant. In such cases Lindholme watertight containers have been used to carry and float the equipment. Mails and newspapers are regularly dropped to the British ocean weather ships in this manner in all weathers. In the case of the weather ships the vectoring of aircraft on to the position of the ship is facilitated by use of the ship's M.F. radio beacon and the 10 cm. radar which she uses for upper wind observations and for providing navigational fixes to aircraft. This has an average range of about 100 miles on an aircraft target. The British weather ships are readily identified from the air by their bright yellow upperworks, but the location and identification of a particular merchant ship is much more difficult, although the ship can perhaps assist by giving M.F. bearings, by radio, to the aircraft during her approach. Very low cloud or very low visibility will obviously add to the aircraft's problem.

As the President of the Liverpool Shipowners' Association mentioned in a recent speech, although aviation and shipping are rivals, they are at the same time complementary services and each can benefit the other. Even if one accepts the opinion that aviation is merely a dangerous commercial rival to shipping, there is no doubt that aircraft have come to stay and one might as well take advantage of certain facilities which aviation can provide for the benefit of the shipping industry. The weekly reports which appear in the shipping papers about air freight activities show the many uses to which commercial aircraft are put nowadays in connection with shipping, e.g. delivering crews to ships abroad, or bringing crews home from ships " paid off " abroad, and delivering urgently needed items of machinery, up to the size and weight of a propeller. An extract from such a report, for example, reads " 21 seamen from Bombay to Bergen prompt and 2000 kilos of ships' machinery from Oslo to Santa Maria ".

A more spectacular use of aircraft in connection with shipping lies in the realm of air/sea rescue. Around the British coasts, aircraft of Coastal Command regularly play their part in endeavouring to locate vessels in distress, dropping flares, acting as communication links and guiding surface ships by radio to the scene of the casualty. On occasions such aircraft can drop airborne lifeboats or rubber dinghies for the benefit of the survivors. Thus aircraft played an important part in locating the *Princess Victoria* when she was in distress in the Irish Sea in 1953. When the coasting steamer *Citrine* foundered off Land's End last January, one of the messages from the Lizard lifeboat, which was still searching for survivors, read " request aircraft drop more flares "; this seems to emphasize the usefulness of flares in such cases. This work of Coastal Command aircraft is not without danger. When the Icelandic trawler *Einar Olafsson* was in difficulties about 200 miles west of Ireland in October, 1955, three aircraft of Coastal Command located and circled round the casualty and thus gave moral support and were able to guide surface craft to the vicinity. It is regretted that one of these aircraft (Playmate 66) was lost with all hands during her return to base. The trawler eventually repaired her leak and reached harbour safely.

Of recent years helicopters have come on the scene and have played a prominent part in more than one marine casualty. An outstanding instance was in the case of the wreck of the South Goodwin Lightvessel in 1954, when the sole survivor was snatched from death by a helicopter in very heavy weather when the vessel lay capsized on the Goodwin Sands. On this occasion, circumstances were such that a lifeboat could not have approached close enough to the wreck to effect a rescue. During the same day a Naval helicopter made several attempts in a 50 knot gale to rescue survivors from the fore end of the tanker *World Concord* which had previously broken in two in a heavy sea. The survivors were eventually taken off by lifeboat. When the Danish steamer *Jopeter* was caught in heavy ice off the East Greenland coast, after losing her propeller, in September, 1955, 19 passengers and 10 of her crew were rescued by helicopter. The remainder were later taken aboard the steamer *Kista Dan*, a vessel which is specially strengthened for navigation in ice, and which made an unsuccessful attempt to tow the *Jopeter* out of the ice. The British steamer *Judith Mary* went aground in very heavy weather off the Finnish coast in December, 1955, and rescue attempts were severely hampered by thick snow and heavy seas which continually froze on the wrecked steamer's superstructure. Helicopters and lifeboats co-operated in repeated rescue attempts; the rescue was eventually made by a pilot vessel which followed an icebreaker to the casualty.

The Royal Navy have recently made successful trials with a simple apparatus which can be lowered from a helicopter and used to scoop survivors out of the water.

Conventional aircraft and to a lesser extent helicopters, are somewhat dependent on suitable weather conditions for their operation, and even a helicopter is necessarily limited as to the number of people she can carry at a time. It seems inevitable that at times the shore-based lifeboat or (in the case of a ship on the beach) the rocket apparatus and breeches buoy, provides the surest and safest means of rescue when the ships' boats are not available. Recently there has been a tendency for ships' lifeboats to be supplemented by inflatable dinghies having an inflatable canopy, and there is little doubt as to the valuable part that such dinghies can play in certain weather conditions or when the ships' boats are smashed or cannot be lowered for any reason.

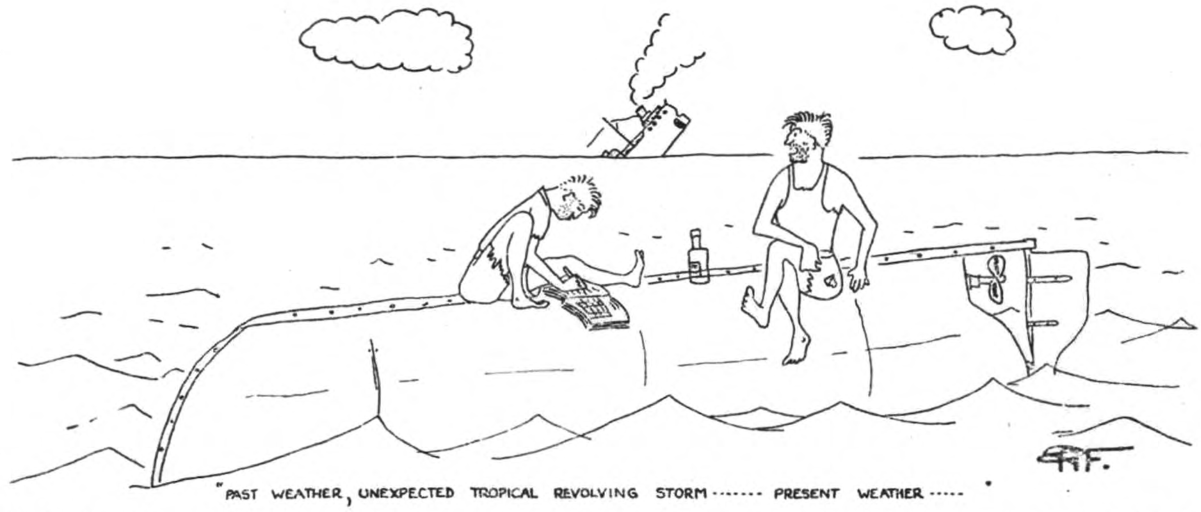
Around the British coast, the lifeboats maintained by the Royal National Lifeboat Institution are so constructed, and their crews are so trained, that they can operate in virtually any weather. During 1955 a total of 387 lives were saved by these lifeboats; in 1954 the figure was 495. Since the Institution was formed in 1824 they have been instrumental in saving nearly 80,000 lives around the British coasts. Every year one reads of gallant and daring feats of seamanship carried out by coxswains and crews of these boats in effecting rescues from disabled and sinking ships. Nevertheless accidents inevitably happen from time to time involving the lives of the lifeboat men themselves. In 1953 the Arbroath lifeboat capsized in mountainous seas while attempting to enter the harbour after answering a distress call. Six members of her crew lost their lives.

Ships at sea can in their turn provide aid in various ways to aviation. Aircraft are so much dependent upon accurate weather information for their successful operation, that every weather report which a ship sends by radio indirectly benefits aviation. In the North Atlantic the picture which the meteorologist can provide for aviation over the ocean is better than in other oceans because the weather ships provide upper air as well as surface observations. The surface picture also is particularly good in this ocean because of the large number of reports available from merchant ships. In all the other oceans, except for a portion of the North Pacific occupied by weather ships, the meteorologist is entirely dependent upon surface observations from merchant ships and he has to build up the upper air picture as best he can from reports provided by aircraft and from radio sonde stations in scattered islands.

The captains of all aircraft make regular meteorological observations during their flights and report these to meteorological centres just as voluntary observers aboard ships do. These weather reports from aircraft play their part in assisting the meteorologist to provide forecasts for shipping because the development and movement of weather systems at the surface is to some extent dependent on conditions aloft. Aircraft observations in the case of tropical storms are particularly valuable, and in the Caribbean and China Sea area, United States aircraft make frequent reconnaissance flights, usually in accordance with a predetermined flight plan, whereby the aircraft track makes a square " box " around the storm centre and often flies right into the eye of the storm.

If an aircraft is in distress, any ship is a potential rescue centre. The aircraft can be vectored by radio to the position of the ship and ditch alongside her. The International Civil Aviation Organisation have recently developed a " Q " code message to enable a merchant ship to indicate to an aircraft about to ditch the surface pressure (to enable the aircraft to adjust his altimeter before descending to the surface) as well as wind, sea and swell conditions. Having received this information the captain of the aircraft has to decide the best method of carrying out the ditching operation; in heavy weather when the waves are high, it has been found by experience that ditching along the waves instead of across the waves is sometimes more advisable as the aircraft is less likely to break up quickly under such circumstances. If an aircraft is about to ditch it is probably undesirable that the ship should use oil to smooth the sea because of fire risk to the aircraft. A ship can however, smooth the sea to some extent by steaming at maximum speed in a circle. All trans-oceanic aircraft carry rubber dinghies and enough Mae Wests for all on board. So, if a distressed aircraft does not ditch alongside a merchant ship, a merchant ship may still be in a position to rescue the survivors. Fortunately, the number of occasions on which trans-oceanic aircraft have been forced to ditch has been rare.

MARINE SUPERINTENDENT



This drawing by Mr. A. Ferguson was on the dust cover of the meteorological logbook received from S.S. *Helicina* (Captain W. C. Loughlin). Other drawings from this ship have appeared in an earlier number of this journal.

THE MARINE OBSERVERS' LOG

April, May, June

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

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

Responsibility for each observation rests with the contributor.

DEEP SEA SHARK
Indian Ocean

S.S. *Kent*. Captain D. A. G. Dickens. Fremantle to Aden. Observers, the Master and all Officers.

25th May, 1955. A small fish of unknown species was landed on deck. Attention was first drawn to it by the presence of a greenish glow at a distance of 50 ft, a luminosity which was later found to be a natural function, mainly on its under side. The fish, found to be alive, was placed in a salt water bath where it revived to a certain extent. It was noticed that the electric light disturbed the fish and caused it to swim frantically around the bath. In swimming it was observed that the top forepart of its head and the middle of its back were awash. The swimming actions were seen to be slow with powerful movements of the tail section and little real body movement.

The fish was placed in a bath at 2200 and observed to be in good condition at 2359. At 0400 on 26th it was found that the fish had given birth to four young. The 2nd Officer says he witnessed the birth of two while the fish was swimming slowly on the surface. At 0700 two more had been delivered, bringing the total to six. The condition of the parent fish was seen to have deteriorated and at 0800 was found to be dead although the young were alive.

The fish and four of the young were placed in a bottle of methylated spirit. An effort was made to keep one of the young in a warm darkened bottle, but this proved unsuccessful. One other of the young was badly damaged in the transfer. It was observed that each of them was attached to a glandular type of globe by means of a small vein. The bottle has been kept in a cool dark place without any apparent material change taking place.

Position of ship: 23° 10′S., 101° 58′E.

Note. Mr. N. B. Marshall, of the Fish Section of the Natural History Museum, has commented on this observation as follows:—

"This is a deep sea shark, *Euprotomicrus Bispinatus* (Quoy and Gaimard). It has no popular name and seems to be a rare species. However, it is known from various localities in the Indian Ocean and eastern Pacific ocean.

"The observations on the luminescence of this shark seem to be the first that have been made. There are many thousands of small light organs (photophores) along the under parts of the shark and as the ship's officers observed the luminosity was mainly on the underside of the body. The embryos and attached yolk sacs are particularly interesting. Again this is the first information we have on the reproductive systems of this shark. The young develop within an oviduct of the mother; deriving nourishment from the attached yolk supply, and when the latter is used up the young are born. What the ship's officers saw was a series of premature births. Actually I found two more embryos in the oviduct, so that makes 8 in all.

"The deep sea shark probably spends much of its time in the ocean depths at several hundred fathoms from the surface. But from time to time it comes to the surface and there is one other record of its having been washed aboard a merchant ship."

FISH

Arabian Sea

M.V. *Worcestershire*. Captain F. C. Brooks. Colombo to Aden. Observers, the Master, Mr. R. M. Bessant, 2nd Officer and Mr. P. R. Carling, 4th Officer.

7th June, 1955. 0600 to 0800 G.M.T. Numerous dead fish were observed. They were approximately 3 to 6 in. long and red in colour. It was noted at the time that the flying fish were not affected. Temperature: air 84·0°F, sea 83·6°.

Position of ship: approximately 10° 12′N., 61° 54′E.

Note. This observation was sent to Dr. H. W. Parker, Keeper of Zoology, British Museum (Natural History) who commented as follows:

"Although it is not possible to give a precise identification, Mr. Marshall of the Ichthyological Section suggests that the red fishes that were observed were deep water Berycoids. This might account for the fact that the Flying Fish were apparently unaffected. It is conceivable that the deeper layers may have been affected by a toxic substance which was not present in the upper layers where the Flying Fish live. The area of the South Arabian Sea and the Somali coastal waters, is one in which there is periodic upwelling of water rich in phosphates and other nutrient salts which induce a very heavy crop of phytoplankton. This in turn is followed by the development of an abundant zooplankton and finally by decay on such a scale that the whole of the sea is polluted, with consequent death to vast numbers of marine organisms, particularly fish. In the area in question this usually happens between June and September with July and August as the peak months. The observation made by Captain Brooks is well outside the area where the upwelling has been recorded, but it is quite possible that the surface waters in which the noxious effects develop may spread into the deeper waters offshore. We are very grateful to have the observation for record."

Red Sea

S.S. *New Australia*. Captain J. W. Hart. Suez to Aden. Observer, Mr. A. S. G. L'Estrange, 3rd Officer.

30th April, 1955, 1042 G.M.T. A belt of discoloured water, 034°–214°, was passed through. The belt was about 400 ft wide and extended from horizon to horizon. It was wider and more clearly defined to port than to starboard, and in colour sandy or light buff. The sea temperature was taken in the belt and after passing through it, and remained unchanged at 80·4°F. A sample of the discoloured water was obtained.

Position of ship: 21° 55′N., 37° 40′E.

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

"It (the sample) was taken somewhat north of the region where early observations of very extensive discoloration by Isidore Geoffrey St. Hillaire, quoted by Montagne, were made. It shows bloom* concentrations of the pelagic filamentous "blue-green" alga (which contains at least one red pigment also): *Trichodesmium erythraeum*. Probably the classical discolouring agent of the Red Sea and first examined microscopically by Ehrenberg at Tor in 1821 (publ. 1838).

"The bearing of the belt suggests that the beneficent N. wind had been operating a bit earlier in the year than usual. This does not imply that we can yet explain how these 'wind-lane' effects achieve sharply demarcated aggregations of bloom-forming organisms, but they do, and Cdr. Bary in New Zealand has done some work on the subject."

* Bloom is the name used for a sudden increase or "flowering" of a constituent of the plankton due to some reason such as accretion of nutrient salts in the vicinity.

DISCOLOURED WATER

West African waters

M.V. *Dominion Monarch*. Captain B. Forbes Moffatt. Las Palmas to Cape Town. Observers, Mr. D. Hammerton, 2nd Officer, Mr. W. Gibson, 5th Officer.

6th April, 1955, 1500 G.M.T. A line of white and brown scum was observed on the surface in a direction 330°–150°, approximate width 12 ft. Numerous sea birds were collected along this line and several whales were seen.

Position of ship: 21° 07′N., 17° 44′W.

Note. Dr. T. J. Hart, of the National Institute of Oceanography, comments as follows:— "There is a place there where the 40-fathom line sticks out a long way and we have several times met with unusual profusion of marine life of various kinds there in the course of the *Discovery* investigations. R.R.S. *Discovery* saw a trichodesmium bloom there in 1925. We marked sei whales there in 1936 and saw them there again in 1937. It certainly seems a point of interest to have some independent confirmation of the continued recrudescence of local concentrations thereabout. Though we have seen sei whales there on two occasions at least, sperm whales also are quite often to be seen in the area."

DRIFTING DHOW

Bay of Bengal

S.S. *Yoma.* Captain W. D. E. Campbell. Colombo to Rangoon.

31st December, 1954. Sighted a dhow in distress. On investigation the dhow was found to be of the small coastal type and had only the tattered remnants of the sail remaining. On going alongside there was found to be a crew of seven who stated that 21 days previously, while on passage from Kyaukpyu to Akyab (Burmese coast) they had been blown away from the land by a severe squall and had since been drifting. An effort to take the craft in tow was abandoned and the crew were taken aboard. Our position at the time was 12° 08′N., 89° 46′E., which showed that the dhow had drifted S. 22°W., a distance of 500 miles at the rate of 1 kt.

Note. During December the current in the eastern part of the Bay of Bengal may set in any direction, with a considerable predominance of westerly sets. The drift of the dhow would, however, have been produced more by wind than by current. Off the Arakan coast of Burma, north of lat. 15°N., the predominant wind in December is N. to NE., while between lats. 10° and 15°N. it is NE. to E. This agrees quite well with the resultant drift observed.

LINE OF DEMARCATION

Indian Ocean

M.V. *Scottish Eagle.* Captain R. R. Baxter. Kwinana to Persian Gulf. Observers, the Master and Mr. C. K. Rawnsley, 3rd Officer.

22nd May, 1955, 0525 G.M.T. A distinct line of demarcation was encountered, running ENE.–WSW. Small, confused breaking wavelets were seen on either side of the line, which appeared to be formed by the change in general direction of these wavelets. An appreciable change in the colour of the water, from a dark to a lighter hue was also apparent. On entering the lighter stream the ship's head swung rapidly to starboard through about 5° before being checked.

Position of ship: 00° 24′S., 81° 11′E.

RIPS

West African waters

S.S. *Edinburgh Castle.* Captain H. A. Deller. Cape Town to Southampton. Observer, Mr. J. Kemp-Luck, 4th Officer.

24th June, 1955. Between 1600 and 1630 G.M.T. about eight parallel strips of disturbed water were observed running 120°–300° and curving slightly in an easterly direction. Each strip extended for several miles, about ¼ mile wide. The distance between strips was about 2 miles where the sea was smooth to rippled, but in the disturbed strips there were waves 2 to 3 ft high which frequently broke. Wind WNW, force 2.

Position of ship: 10° 50′N., 17° 00′W.

Gulf of Aden

M.V. *City of Johannesburg.* Captain R. J. Ricketts, O.B.E. Penang to Aden. Observer, Mr. D. W. Asquith, 3rd Officer.

10th May, 1955, 0840 G.M.T. A marked tide rip was observed, setting apparently in a N'ly direction. The water was ruffled and some scum and seaweed were seen on passing through it, but not outside the area of broken water. The ship's wake was seen to be definitely set to the northward.

Position of ship: 12° 10'N., 51° 05'E.

CLOUD

South Atlantic Ocean

S.S. *Helenus.* Captain S. G. Ellams. Takoradi to Cape Town. Observer, Mr. R. M. Simpson, 2nd Officer.

1st May, 1955, 0830 G.M.T. The photograph (see opposite) of C_M3 was taken with a yellow filter, exposure 1/100th sec. An hour and a half after these clouds had fully developed the C_M3 receded to eastward, and was replaced by C_M5.

Position of ship at 0600: 19° 48'S., 10° 30'E.

West Australian waters

M.V. *Scottish Eagle.* Captain R. R. Baxter. Kwinana to Persian Gulf. Observer, the Master.

25th June, 1955, 0300 G.M.T. (ship's time approximately 1000). The photograph (see opposite) shows the beginning of development of large Cu towards Cb at between 2,000 and 3,000 ft.

Position of ship: 24° 36'S., 106° 48'E.

Note. The photographs sent from the above two vessels are excellent examples of cloud photography.

PASSAGE

Nauru to Panama

The following account has been forwarded to us from the Hydrographic Department, Admiralty, to which it was sent by Captain F. W. Tector, master of M.V. *Daltonhall.*

"At present I am on the last leg of a voyage from Dunedin, N.Z., to the U.K. via Nauru and Panama Canal. On the passage Nauru to Panama I laid a course to take full benefit of the Equatorial Countercurrent. This is the first occasion I have had to use this route and I fully expected to find a continuous east-going stream, also as the sun was almost at its most northerly declination I was prepared to find the current running well north.

" Now having completed the passage, the countercurrent appears to be made up of a series of north and south-going streams between the North and South Equatorial currents.

" On sailing from Nauru I set a course to pass between Makin and Marakei, in the northern Gilberts. Stellar observations were taken morning and evening and A.M. and P.M. longitudes by the sun, also of course a noon observation and cloud conditions allowed for this over most of the passage. I realise now that on 28th May when west of the date line I must have passed through the countercurrent and did in fact alter course to due east, but the evening star position again showed a strong set to the NW. and I therefore altered course again to 061°(T).

"After searching up to 9°N. I again brought the vessel to the south and consider I was back again in the countercurrent on 5th June, and remained in it until off Panama Bay. After 5th June, however, many current rips were sighted, on occasion two or three times in a day, all of which ran either NNW/SSE. or NNE/SSW.

" On 16th June the evening star position put me 3 miles inside the north limits

Photograph taken aboard S.S. *Essex Trader* on 22nd June 1955 (see page 88)

Photograph of Altocumulus taken aboard S.S. *Helenus* on 1st May 1955 at 19° 48′S., 10° 30′E. (see opposite)

Photograph of large Cumulus taken aboard M.V. *Scottish Eagle* on 25th June 1955 at 24° 36′S., 106° 48′E.

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Presentation of barographs in the Air Council room of the Air Ministry on 7th November, 1955. Left to right, Capt. J. J. Youngs (representing Capt. H. D. Horwood) New Zealand Shipping Co., Mrs. Fasting (wife of Capt. A. B. Fasting, Cunard Line) Capt. J. Trayner, Union Castle Line, Mrs. Trayner, Sir Graham Sutton, Director of the Meteorological Office, Capt. Sir Gerald Curteis, Deputy Master of Trinity House.

Medley & Bird, Ltd.

Mr. S. P. Peters, Deputy Director of the Meteorological Office presenting the barograph to Captain S. W. Keay aboard the *Empress of France*. Commander Cresswell is seen in the background.

of Germaine Bank as shown on chart No. 786; no bottom was found at 120 fathoms, continuous soundings being taken 10 miles each side of the position."

Note. The above letter was accompanied by a sheet containing 29 current observations which will be valuable in adding to those we already have for this region. Although the Equatorial Countercurrent of the North Pacific Ocean is in general more constant than the Equatorial Countercurrent of the open part of the North Atlantic Ocean it can hardly be described as a continuous east-going stream. Between Nauru (long. 156° 56′E.) and long. 168°W. little information about the countercurrent is available. Eastward of long. 168°W. to Panama Bay the current chart for June to August, computed in the Marine Division, shows that between lats. 4° and 8°N. there is a marked predominance of sets in directions from N. to SE. inclusive. The constancy and strength of currents in these directions varies to some extent in different longitudes. The remainder of the observed currents set in other directions, including westerly ones. During June to August, the resultant flow of water between lats. 4° and 8°N. is to the north of east, a flow which in some longitudes carries east-going water to lats. 10° or 12°N. There is also a northerly component in the west-going flow of the South Equatorial Current, southward of lat. 4°N., and it is clear that some water eddies northward and north-eastward from this current into the countercurrent.

It is obvious that M.V. *Daltonhall* experienced a larger number of currents with westerly components than would normally be expected; they outnumbered those with easterly components in the ratio of 9 to 5. On the other hand she observed 3 currents with northerly components for every one with a southerly component, which agrees with the indications of the current chart that the resultant flow of the countercurrent has a northerly component.

PHOSPHORESCENCE

Gulf of Aden

M.V. *Cambridge.* Captain P. P. O. Harrison. Aden to Fremantle. Observers, the Master, and Mr. R. Burton, Chief Officer.

8th June, 1955, 1930 S.M.T. Several feet under the surface of the water ' blobs ' of phosphorescence could be seen up to two feet in diameter, not sharply defined, and apparently inanimate. It appeared as though these only became visible when in the glare of the accommodation lights. No other kind of phosphorescence was seen. The 10 in. signalling projector was switched on and revealed thousands of red and yellow points of light which were jumping about like shrimps; but these were in no way connected with the ' blobs '. As an experiment, an ordinary hand torch was shone alongside and wherever the beam appeared the ' blobs ' of phosphorescence came to life as if by magic. If the light was shone far out the ' blobs ' trailed it as though running after it, and yet each individual ' blob ' was as still as a jellyfish. When the moon rose the ' blobs ' disappeared altogether.

Position of ship: 12° 15′N., 49° 07′E.

Strait of Hormuz

M.V. *British Escort.* Captain N. Leybourne. Dar es Salaam to Fao. Observers, the Master, and Mr. L. Mackay, 2nd Officer.

25th June, 1955. At 2210 faint waves of light under the water were observed to cross the vessel from port to starboard. The waves increased in brilliance until the sea was quite brightly illuminated. They approached the vessel from a general direction of 220°, and the ship, drawing 18 ft, in no way interrupted or broke the direction, rate or shape of the waves, which stopped on the port side of the vessel and continued on the starboard side in the same continuous line. The waves were visible as far as could be seen (about 2–3 miles) and were about 20 ft wide, spaced 60 ft apart, with a frequency of about 70 per min. Although equidistant the waves were not always straight lines, but sometimes approached in a V formation and deviated 20° to 30° on either side of the initial track. By 2235 the waves had disappeared. Sky cloudless. Visibility at least 25 miles. Wind and sea calm, no swell. Temperatures, air 88°F, wet bulb 83·5°, sea 91°.

Position of ship: 26° 11′N, 56° 45′E.

Gulf of Siam

M.V. *Lotorium*. Captain N. Clarke. Singapore to Bangkok. Observer, Mr. P. H. W. Atkins, 2nd Officer.

31st May, 1955, 1920 G.M.T. The vessel passed through a small area within which waves of light flashed very rapidly and quite brightly over the surface of the sea. The area was observed ahead about ¼ to ½ min before entering it. The light flashes continued for 3 to 5 min while passing through it. At one time the waves of light appeared to flash towards the observer, travelling in an easterly direction. Sky clear, considerable sheet lightning to N. and NE. Temperature, air 84°F, sea 82°.

Position of ship: 7° 34′N., 102° 23′E.

Western Pacific Ocean

M.V. *Cingalese Prince*. Captain B. R. Simons. San Francisco to Manila .Observer, Mr. J. F. Newton, 3rd Officer.

1st May, 1955, 1735 G.M.T. As a heavy rain squall approached from SE. many small patches of phosphorescence in the vicinity of the ship commenced to flash vividly. As soon as the squall reached the ship at 1740 the number of flashes noticeably decreased and ceased at 1742. At 1800 the rain lessened considerably in violence and a few isolated flashes were observed, which did not persist once the rain had ceased at 1805. Temperature, dry 77·3°F, sea 81·7°.

Position of ship: 15° 10′N., 133° 00′E.

PHOSPHORESCENCE SEEN IN THE AIR

Gulf of Aden

S.S. *Dunkery Beacon*. Captain G. A. Austen, Mombasa to Glasgow. Observers, the Master, Mr. J. McDonald 1st officer, Mr. D. Watson 2nd officer, Mr. D. MacFarlane 3rd officer, Mr. N. Wyatt, Radio Officer.

13th May 1955, 2106–2110 G.M.T. Shortly after leaving Aden for Suez bright pulsating waves of light having a period of 1·5 sec were observed emanating from the sea in close proximity to the ship. They were travelling in a direction of 070° for some distance and extended to a height of about 12 ft above the sea. This phenomenon was definitely not caused by the proximity of shore lights; there was no sign of phosphorescence in the sea at the time of observation. Sky cloudless; wind 100°, force 2; sea slight; visibility excellent; moon's alt. 7° 30′ approx.

Position of ship: 12° 43′N., 44° 56′E.

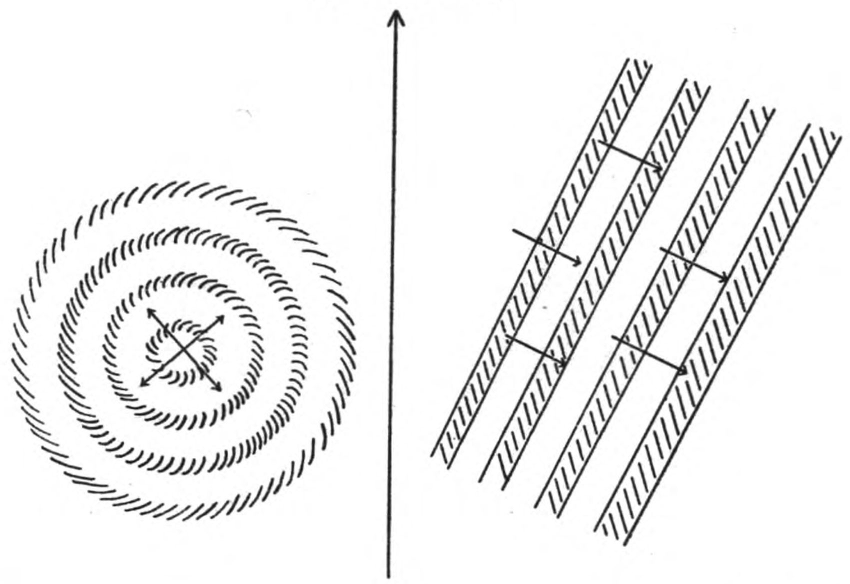
Note. This is a very interesting observation, making the seventh we have received of phosphorescence apparently seen in the air above the sea surface, see note to observation of S.S. *City of Khios* on page 149 of the July, 1955, number of this journal. All these observations either state clearly, or imply, that no phosphorescence was seen in the sea at the same time. The origin of this phenomenon is quite unknown. It is, for the time being called phosphorescence because it has a similar appearance to that seen normally in the sea and because it shows itself in various forms, including the rotating wheel, that are observed in the sea at other times. In a letter to this journal, published on page 233 of the October, 1954, number Dr. Rodewald made the suggestion that light-producing micro-organisms might possibly be carried up from the sea into the layer of air close above its surface.

PHOSPHORESCENT WHEELS

Persian Gulf

M.V. *Scottish Eagle*. Captain R. R. Baxter. Bandar Mashur to Kwinana. Observer, Mr. S. M. Grant, Chief Officer.

23rd April, 1955, 1625 to 1635 G.M.T. When approaching Jazirat Tunb Island a bright flashing light was observed on the port bow, distant about 1 mile. Almost simultaneously another was observed on the starboard bow. On approaching it was seen that these were two revolving phosphorescent wheels. The ship passed between them, the centres being about ¼ mile distant on either side. The wheel on the port side appeared to revolve anticlockwise, and that on the starboard side clockwise. The spokes of radius ¼ mile were from 6 to 12 ft broad at the tips with about 15 ft between them. They passed with a frequency of 1½ sec with a colour similar to that of a dull electric light. Immediately we had passed these two wheels, further phenomena were observed (see sketch). On the port side concentric circles were seen to radiate from a centre, with an effect similar to that of dropping something in still water. On the starboard side there appeared lines, apparently moving away from the ship in a manner similar to the wake. As the ship passed they gradually faded from sight astern and had been in sight 10 or 15 min. At 1700 a similar phenomenon was observed to the SE., distant about 7 miles.



The Master comments: The sky was overcast and the atmosphere appeared to have more than the usual amount of particles in suspension, but the all-round visibility was very good. Jazirat Tunb Light was about 20 miles away and its rotating beams were visible in the air throughout their complete revolutions. Above the sea surface there was apparently a layer of mist a yard deep.

The bands of phosphorescent light appeared to float on top of this layer, but on closer examination of the beams as they passed vertically under the observer it could be seen that the sea was affected to a considerable depth. Each band was similar in colour and appearance to the Milky Way, myriads of particles of light dust with brighter and larger specks here and there. My impression, especially during the concentric ring phenomenon, was of shock waves causing the millions of organisms to light up as the wave passed through them, then going dark until the next wave struck them. I do not believe the organisms themselves were on the move. The effect on the onlookers seems to have been a feeling of weirdness, bordering on fear, similar to that experienced by people ashore during earthquake tremors.

When the later distant phenomenon was observed it made a glow on the horizon and in the air to an altitude of about 3°. The flickering lights could be made out with binoculars but no shape or form. I believe this was another group of wheels covering more than a square mile. Temperature, air 81°F, wet bulb 75·6°, sea 78°.

Position of ship: 26° 11′N., 54° 55′E.

Note. This is an extremely interesting observation, for several reasons. It is a good observation of two phosphorescent wheels, the centres of which were clearly seen and nearer to the ship than in most previous observations. The phenomenon of the outward radiating concentric circles appears to be a very unusual, and perhaps a unique one. We entirely concur with the opinion expressed by the Master, that it could not have been due to the movement of the light-giving organisms, but must have been the result of one form of rapidly-moving stimulus. A final point of interest is the reflection of the eight beams in the sea having been observed on the top of the layer of mist close above the sea surface. It was known that this must be observable at times when such a layer of mist is present but hitherto we have had very little record of the reflection being seen.

Gulf of Oman

M.V. *British Patrol.* Captain J. A. Gilchrist. Abadan to Melbourne. The following is an extract from the journal of Navigating Apprentice R. A. Firman.

25th June, 1955. During the 12–4 a.m. watch I saw a very strange happening. The sea was already phosphorescent before the ' waves ' were noticed. These appeared at first as if streaks of sand were being blown across the surface of the sea. The interval between the waves was about one second; they came in an effortless, pulsating rhythm. These parallel waves lasted about 4 min then changed to what appeared to be arcs turned back at their centre, see Fig. 1. The same rhythm and frequency continued. This formation, too, lasted for about 4 min, after which four wheels appeared, one on each bow and quarter, see Fig. 2. On the starboard there were two concentric wheels rotating in the opposite direction to each other. The port bow wheel rotated anticlockwise. The port quarter wheel turned clockwise and the starboard quarter one anticlockwise. Once again the duration was about 4 min. The waves then commenced to move towards the ship parallel to our course.

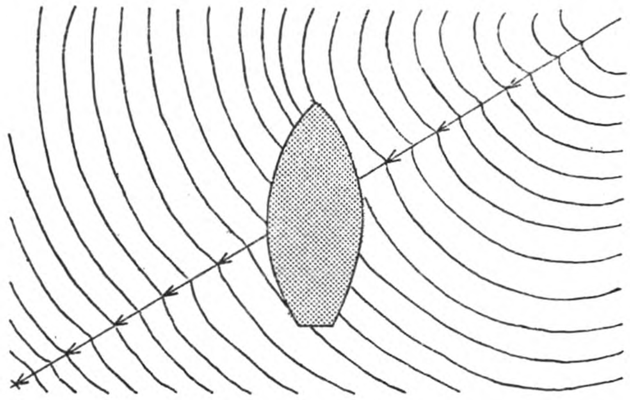


Fig. 1

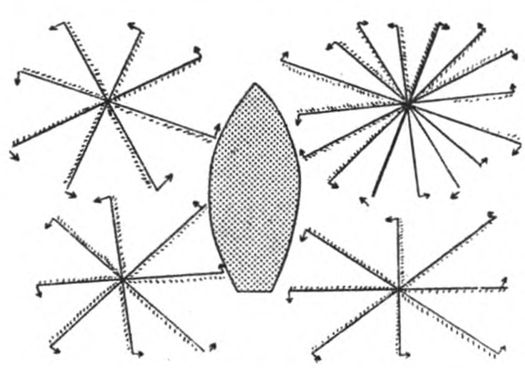


Fig. 2

At the same time other waves moved astern at right angles, see Fig. 3. This phenomenon only lasted about 2 min. and reverted back to the four wheels, but the starboard bow wheel was now a single one rotating clockwise. These wheels continued rotating for about 4 min and then began to fade, slowly, until they disappeared.

Throughout this phenomenon the rhythm and frequency were uniform. The waves looked about 7 or 8 ft wide and appeared to sweep the sea, without touching the ship. They stretched as far as the eye could see.

Course 143°(T), speed 14 kt. Temperature, air 88°F, sea 89°. Sea slight, sky cloudless, visibility very good. Wind NE, 3–4 kt.

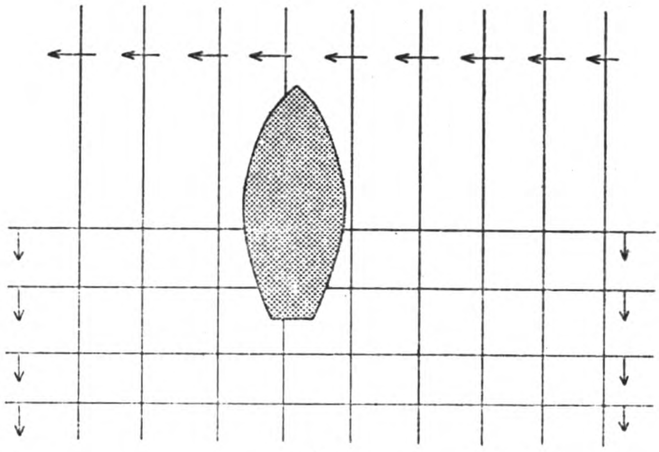


Fig. 3

Note. This is a very remarkable observation. The occurrence of parallel bands of phosphorescence previous to the wheel, and changing into the wheel, has been seen before and the reverse change has also been observed. The stage of the phenomenon shown in Fig. 1 appears to be transitional between the parallel bands and the wheels. The stage shown in Fig. 3 with two sets of bands moving at right angles to each other is very remarkable and may not have been recorded before. The appearance of four phosphorescent wheels seen simultaneously is unusual; three simultaneous ones were seen by M.V. *Rafaela* in 1953, (see the April, 1954 number of this journal.) The most amazing feature of this observation is the existence of two superimposed concentric wheels, rotating in opposite directions, which phenomenon, as far as we know, has never been seen before. It has been difficult enough, hitherto, to try to get a satisfactory explanation of the cause of the phosphorescent wheel, but a phenomenon such as this renders the mystery much more baffling. Mr. Firman is to be congratulated on being fortunate enough to see it and the rest of the complex series of phenomena which he has described so clearly.

ST. ELMO'S FIRE

Ligurian Sea

S.S. *Hector*. Captain G. R. Cheetham. Genoa to Liverpool. Observer, Mr. R. A. Warren-Perry, 3rd Officer.

16th April, 1955, 2000 G.M.T. A low Cu cloud giving slight drizzle passed over the ship; from this cloud a discharge of electricity was received in the ship's main aerial and seen in the form of numerous balls of " fire " about 2 ft apart all along the aerial each with a brilliancy of a bright torch bulb. The wireless operator reported heavy interference. The whole phenomenon lasted about 15 min. Just before it disappeared all the balls appeared to run along the aerial towards the forward end, making a series of sparks as each one ran into the next one. The aerials were not earthed. The drizzle appeared on the radar screen as quite an intense rain shower, but actually was only very slight drizzle and did not affect the visibility. There was a sudden shift of wind, from 300° veering to 100°, but the wind dropped completely while the cloud was overhead.

Position of ship: 43° 05′N., 07° 05′E.

WATERSPOUTS

West African waters

S.S. *Pretoria Castle*. Captain G. H. Mayhew. Southampton to Cape Town. Observer, Mr. H. Burgess, 4th Officer.

23rd June, 1955, 0850 G.M.T. A waterspout was observed about 3 miles on the port bow, moving northwards at about 10 kt. The appearance was that of a grey vaporous funnel, rotating anticlockwise, on the outer edge of a rain squall. The funnel reached from sea to cloud and the sea at its base was greatly agitated, spray rising to about 70 ft.

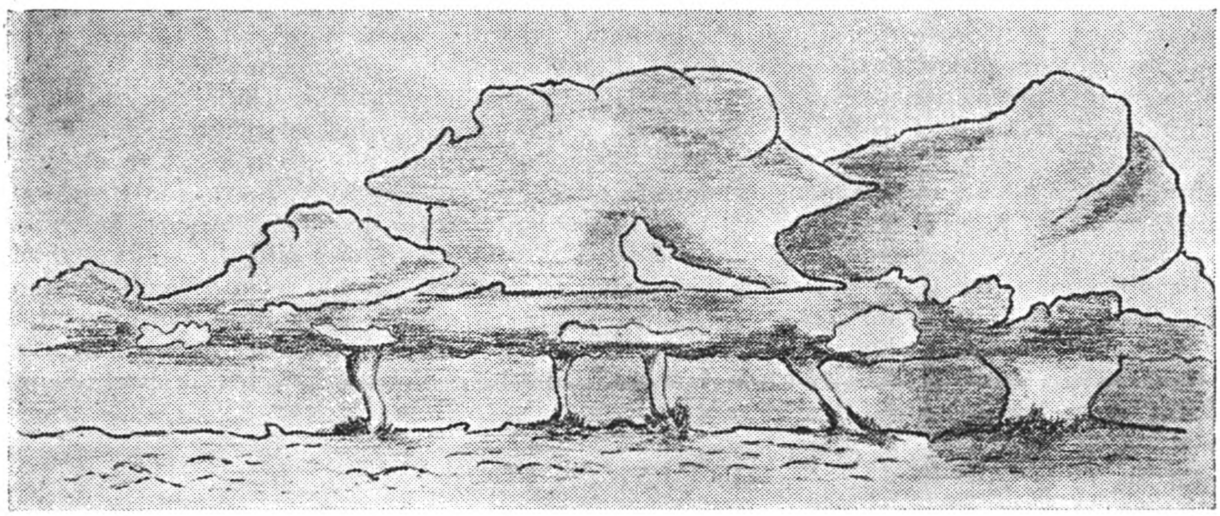
Cloud towering Cu, Sc and Fb; height of lowest 1000 ft.

Position of ship: 6° 30′N., 13° 38′W.

Mozambique Channel

S.S. *Umtata*. Captain D. L. Weston. Durban to Beira. Observers, the Master and all Officers.

23rd May, 1955, 0500 G.M.T. Two small waterspouts were observed to emerge from large Cu and Cb on the horizon to the south. Clouds were moving from S. to N. and a number were seen at intervals to form and disperse. At 0650 eight waterspouts were observed emerging from the cloud formation, with an exceptionally large one on the western side of the cloud formation, which had an approximate width of 200 ft. The sky astern was very dark and ugly looking. At 0710 the waterspouts moved ahead of the vessel to port, followed shortly afterwards by heavy rain which continued until 0845. The sky then began to clear from the S.



It was difficult to estimate the direction of rotation of the spouts, but surrounding wisps of cloud were moving clockwise. Wind variable in direction, gusts to force 5.

Position of ship, at 0500: 28° 10′S., 33° 14′E.

ABNORMAL REFRACTION

North Atlantic Ocean

O.W.S. *Weather Recorder*. Captain A. W. Ford. At Ocean Weather Station A. Observer, Mr. J. Ballantyne, 3rd Officer.

5th May, 1955, 2220–2240 G.M.T. Towards sunset abnormal refraction was observed, and for a while two suns were visible. A false sun was seen for half its

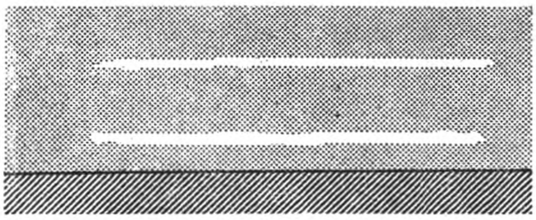
diameter on the horizon, and touching the real sun above. The real sun was partly obscured by cloud. The false sun persisted for 3 or 4 min after the real sun had set. A vertical ray with reddish coloration extended to about 4° above the real sun.

This effect of a vertical ray was also seen with the moon at about 2330. The ray extended on both sides of the moon and was white in colour. Throughout the period there was broken lenticular cloud in the area, mainly Sc.

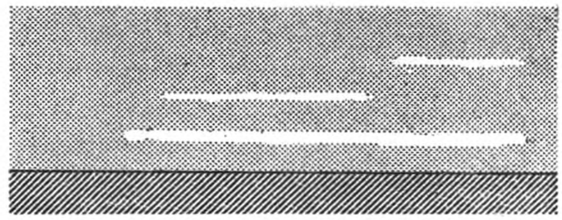
Position of ship: 62° 00′N., 33° 00′W.

Western approach to Gibraltar

M.V. *Powell*. Captain D. Cornwell. Liverpool to Palermo. Observers, the Master and Mr. A. C. Wehner, 2nd Officer.



5 miles



2 miles

2nd April, 1955. 0100 G.M.T. Approaching from N'ward the beam of the lighthouse was seen to be reflected from a layer of Ac and As. At 5 miles the reflection was in the form of a single beam. At 2 miles it was reflected at two levels. Close to, the effect was confused by reflections from successive flashes being seen at the same time. As distance was increased away from the light the phenomenon was repeated in the reverse order, ceasing at about 5 miles. Temps.: dry 60°F, wet 57°, sea 62°.

Position of ship: off Cape St. Vincent.

Baltic Sea

S.S. *Runa*. Captain T. Henry. Skelleftehamn to Preston. Observers, the Master and Mr. R. M. Gray, 2nd Officer.

26th June, 1955, 1100 G.M.T. The island of Bornholm was observed upside down when at a distance of 24 miles. Ships also appeared upside down at various distances; smoke from funnels also appeared inverted (see sketch).

Position of ship: 55° 37′N., 15° 07′E.

Red Sea

S.S. *Afghanistan*. Captain R. Connacher. Aden to Suez. Observer, Mr. A. A. J. Rotherham, 3rd Officer.

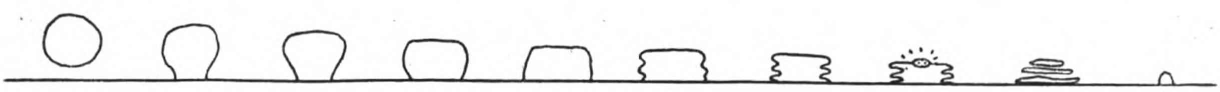
13th April, 1955, 2128 G.M.T. The moon was observed rising and appeared to take the shape of a wedge. The sky was coloured a deep red, very like a coal fire. At 2130 a definite wedge was visible, and on rising higher a gap was observed followed by the lower limb to one side, giving the impression of the moon being lop-sided. At 2135 the two parts visibly merged together, the lower limb being then clear of the visible horizon. Very slight amount of cloud in vicinity. Air temperature 75·5°F, wet bulb 68·5°.

Position of ship: 26° 17′N., 34° 45′E.

Persian Gulf

S.S. *Helicina*. Captain W. C. Loughlin. Mena al Ahmadi to Suez. Observers, the Master and all officers.

19th June, 1955, 1545 G.M.T. Our illustration shows the apparent distortion of



the setting sun, with the occurrence of the green flash just prior to disappearance. Sky cloudless with very slight haze. Sea smooth.

Position of ship: 28° 14′N., 49° 52′E.

FOG BOW

South Pacific Ocean

M.V. *Tyrone*. Captain N. Fraser. New Zealand to Panama. Observers, the Master, Mr. J. G. C. Campbell, 2nd Officer, and Mr. B. P. Telfer, 3rd Officer.

27th April, 1955. 0020 G.M.T. While passing through thick fog (visibility $\frac{1}{2}$ mile) a patch thinned and a small rainbow was observed. The max. length was about 100 ft equal to the length of the boat deck, and was about mast height. The duration of the rainbow was 15 min (until the fog thickened again).

Position of ship: 40° 11′S., 164° 07′W.

LUNAR RAINBOW

Great Australian Bight

M.V. *Saxon Star*. Captain R. J. C. MacDonald. Liverpool to Australia. Observer, Mr. I. Waller, 3rd Officer.

13th April, 1955, 1510 G.M.T. A bright lunar rainbow was observed astern of the ship. There was a half moon at altitude about 25°. The bow lasted for 10 min while a shower of rain passed across the stern. The colour of the bow was bluish white, and at its brightest period a faint arc of a secondary was seen for a couple of minutes. The sky inside the bow appeared much lighter than that outside.

Position of ship: 37° 15′S., 125° 11′E.

IRIDESCENCE

African Equatorial waters

S.S. *Umzinto*. Captain R. Harber. Teneriffe to Cape Town. Observer, Mr. J. G. Campbell, 2nd Officer.

3rd April, 1955, 0610 G.M.T. A vivid patch of iridescence was observed on medium cloud of Ac type (C_M7 and C_M5) with Cb in the foreground. The top of the Cb was at an approximate altitude of $32\frac{1}{2}°$ and its dark shadow made contrast with the lighter C_M7. Rays from the rising sun could be seen for a considerable distance upwards.

Position of ship: 6° 40′N., 14° 59′W.

Note. Two excellent sketches in colour were sent by the observer, which it is impossible to reproduce. They show that the spectacle was a very striking one. The delicate colouring was mostly red and green. The Cb cloud covered part of the iridescent cloud so that the colouring seen extended upwards from the well-defined upper edge of the Cb cloud, for a considerable distance.

SOLAR HALO

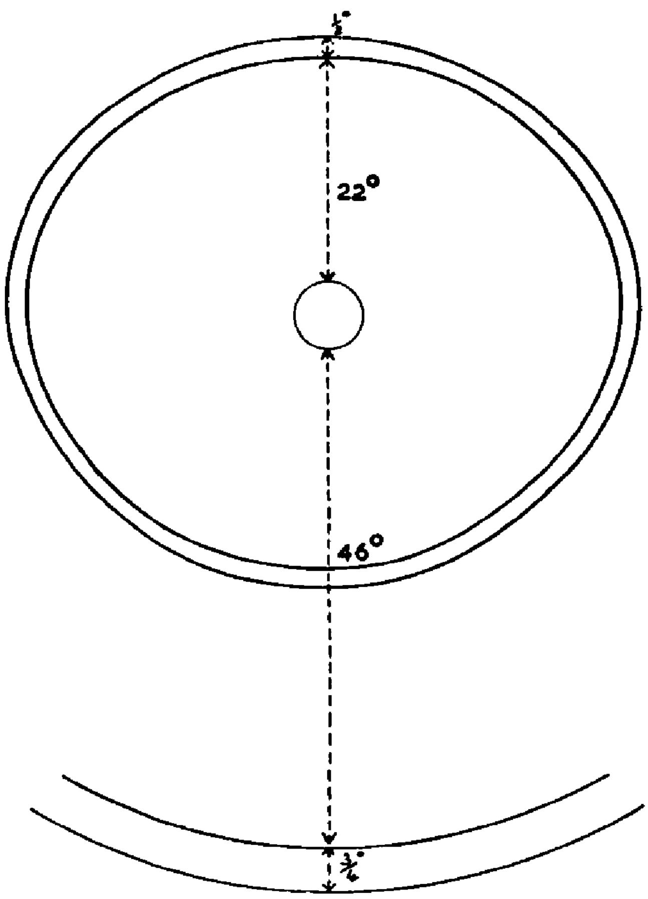
North Atlantic Ocean

S.S. *Manistee*. Captain F. Barber. Garston to Kingston, Jamaica. Observer, Mr. G. J. Edmonds, 3rd Officer.

25th June, 1955, 1315 G.M.T. A complete solar halo of radius 22° was observed; it appeared slightly elliptical in shape and generally whitish although colours were visible. The width of the halo was $\frac{1}{2}°$, and the altitude of the sun 58°. At 1320 a segment (about 45° of arc) of a second halo of radius 46° appeared below the sun. Its width was $\frac{3}{4}°$ and had vivid colours of the spectrum with red on the inside.

The segment of the larger halo ended where the Cs was broken, but although there was Cs for some distance above the sun no continuation of the larger halo was visible. At 1405 the larger halo disappeared, and by 1415 both halos had gone.

Position of ship: 33° 20′N., 44° 58′W.



Note. It appears that the phenomenon observed was not the 22° halo but the circumscribed halo which is coincident with the 22° halo at its top and bottom points. The circumscribed halo is formed from the upper and lower tangent arcs to the 22° halo and may be visible in the absence of that halo. The arcs vary in slope and position with the sun's altitude. At an altitude of about 30° the upper arc bends down and the lower arc bends up sufficiently for them to join, giving a loop beyond each side of the 22° halo, if this is present. The circumscribed halo at this altitude is a very irregular ellipse but the irregularities lessen with increasing altitude and between altitudes of 50° and 60° corresponding with that of the above observation a nearly perfect ellipse is formed.

LUNAR HALO

East African waters

S.S. *Dunkery Beacon.* Captain G. A. Austen. Mombasa to Glasgow. Observer, Mr. J. McDonald, Chief Officer.

9th May, 1955. 1915–2030 G.M.T. during which time the moon's altitude increased from 34° 30′ to 44° 30′. When first observed the halo seemed to be turning in an anticlockwise direction and throwing off the clouds at a tangent. The halo was elliptical in shape, but later appeared as a circle. Cloud was drifting in a SW. direction, Ci 4 – 5/8. Wind 200°, force 2.

Position of ship at 1800: 4° 48′N., 48° 30′E.

Note. Owing to the nature of its optical formation no circular halo can rotate, and even if it could, there would be no possible means of detecting the rotation if the brightness of the halo were uniform all round its circumference. The brightness of a halo, unless formed by a very thin layer of Cs without structure, is usually not uniform, the brightness of different parts varying according to the local density of the cloud, i.e. to different degrees of concentration of the ice crystals which form the cloud and give rise to the halo. What the observer

probably saw was a brightening of successive parts of the halo by the movement of non-uniform cloud, giving the illusion of rotation. The elliptical halo first seen was probably the circumscribed arc (see note to observation of S.S. *Manistee*, below). The circular halo seen later was probably the halo of 22°; the observer gives the diameter as 50°, but does not state whether this was measured to the inside or outside of the halo.

North Atlantic Ocean

S.S. *Mulberry Hill*. Captain G. Tait. Newport News to Lands End. Observer, Mr. R. B. Tarbuck, 2nd Officer.

12th June, 1955, 0600 G.M.T. A lunar halo commenced to form and by 0610 was complete. It remained very clear and bright until 0620 when it began to fade, and had completely disappeared by 0650. The altitude of the moon was 35° 40′ and approximate radius of halo, measured to its inner edge, 17° 20′. Cloud visible 1/8 Cu, 2000 ft.

Position of ship: 39° 55′N., 52° 50′W.

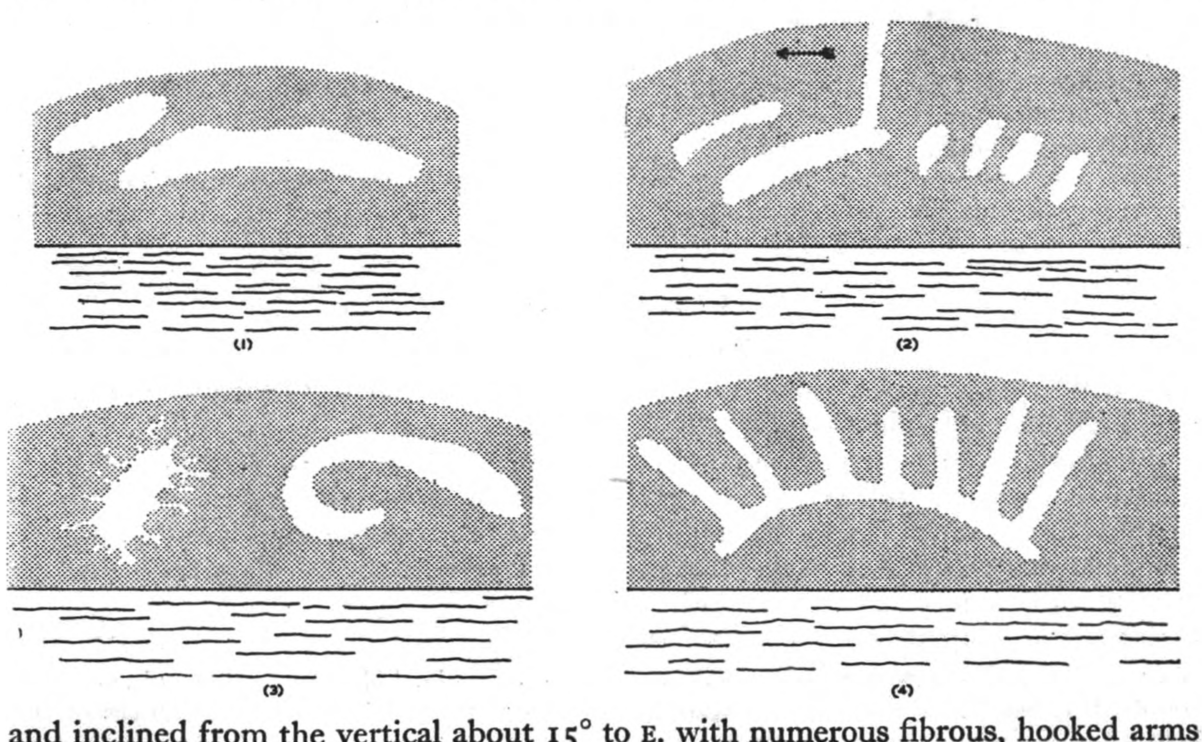
Note. **This is a good observation of the halo of 17° radius, known as Rankin's halo, from its first observer. The theoretical radius of this halo is 17° 06′, but it has been observed with radii a little more or a little less. In the April, 1952, number of this journal an observation by M.V. *Condesa* was published, the radius on that occasion being 16° 44′.**

AURORA

Mouth of River St. Lawrence

M.V. *Kaipara*. Captain D. M. Steven. Liverpool N.S. to Three Rivers. Observer, Mr. J. Chambers, 3rd Officer.

28th April, 1955. At 2125 E.S.T. an arc of white light appeared in the sky, centred approximately N., but stretching from 310°T to 030°T with its highest point at altitude 20°. Shortly afterwards (Sketch 1) a second arc above the first (about 5°) appeared to the westward, from 300° to 350°. At 2130 a shaft of white light was projected (Sketch 2) from the eastern extremity of the lower arc, and rapidly travelled W. breaking both arcs into 5° bands. The western end of the arc disappeared, and at 2135 the higher arc formed into a column of light about 10° across



(1) (2) (3) (4)

and inclined from the vertical about 15° to E. with numerous fibrous, hooked arms projecting from it. As this took place (Sketch 3) a third arc formed in the N. with its western arm curling back beneath it. The whole mass, including the western formation, rapidly developed into a brilliantly coloured drape covering an arc from

300°T to 030°T and extending from 15° to 70°. This mass was constantly changing shape, altitude and colour, with purples and greens predominant (Sketch 4). Gradually the colour moved to W. and by 2150 only white light was left, mainly radiating in bars spoke-wise from approximately N. From then to 2200 the luminosity decreased, and by 2210 the sky was clear.

Position of ship: 49° 16′N., 65° 09′W.

North Atlantic Ocean

O.W.S. *Weather Recorder*. Captain A. W. Ford. At Ocean Weather Station A. Observer, Mr. R. B. Hargreaves, Assistant Meteorological Officer.

27th/28th April, 1955. Aurora was first seen about 2330 G.M.T. on 27th to E. White rays made a curtain effect up to alt. 45°. The display moved overhead later. At 0345, 28th, vivid coloured bands gave rise to a horn or fan-shaped effect, commencing on the west horizon and reaching the zenith at the wide end. The bands were pulsating and giving the impression that whole was rotating; coloration green and purple.

Position of ship: 62° 00′N., 33° 00′W.

METEOR

Atlantic Equatorial waters

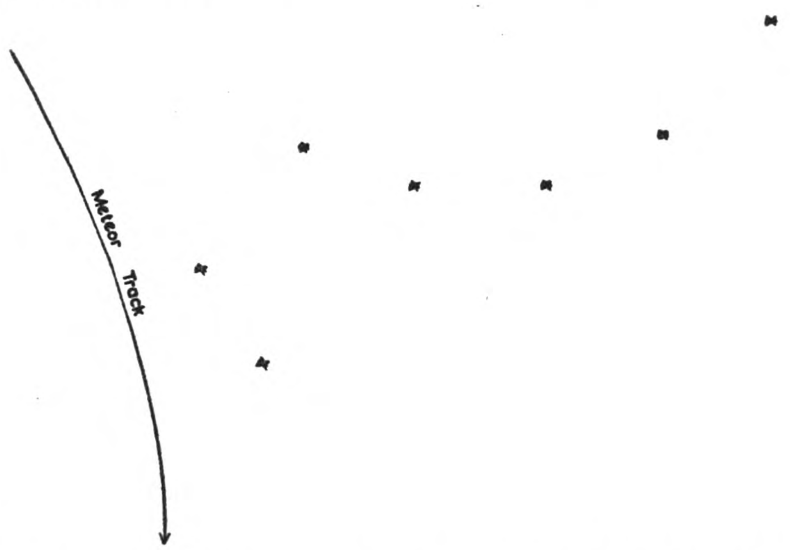
M.V. *Fremantle Star*. Captain C. R. Horton, D.S.C. London to Durban. Observer, Mr. C. T. Whitaker, 2nd Officer.

12th April, 1955, 0345 G.M.T. A meteor was observed, small and faint at first, bearing 150°T, altitude about 70°. It soon increased in apparent size and brightness and looked as large as a sixpence held at arm's length, of a brilliant whitish-blue. It moved in a diagonal direction across the sky. When its bearing was about 140°T and altitude 40°, the meteor suddenly developed a trail of considerable length and crimson in colour. It then began to diminish in size and brightness, and when the bearing was 130°T and altitude about 20° it disappeared, although the trail remained for 1½ sec.

Position of ship: 00° 35′S., 09° 90′W.

Indian Ocean

M.V. *Eastern City*. Captain H. W. Marshall. Singapore to Bombay. Observer, Mr. T. C. Rooney, 2nd Officer.



1st April, 1955, 1912 G.M.T. A large and exceptionally bright meteor was observed, with bearing at first 330°T; it fell from altitude 55° to 20° at an angle of about 10° to the vertical. When first observed the meteor was a brilliant white and lit up the whole of the sky for 3 sec. A bluish-green trail followed, and on reaching lower altitudes the meteor disintegrated into a number of smaller and less brilliant parts lasting for about 1 sec. These eventually turned to red and disappeared, the whole phenomenon lasted for 4–5 sec.

Position of ship: 5° 49′N., 87° 03′E.

Mozambique Channel

S.S. *Tenagodus*. Captain W. Broughton. Bander Mashur to Cape Town. Observer, Mr. F. I. Bodger, 2nd Officer.

17th April, 1955, 2010 G.M.T. A large meteor was observed two or three times the size of Jupiter and of intense brilliance. It was first seen at bearing 340°, alt. 20°, heading towards the horizon relatively slowly in a graceful arc. Its colour at first was a pinkish orange but towards the middle of its visible flight became white and later a very bright green. The meteor disintegrated into numerous particles at alt. 5°, bearing 280°, after being visible for about 5 sec. One particle, considerably larger than the remainder, continued in a direction almost vertically towards the horizon but disappeared just above it; the remaining particles became invisible almost immediately after the disintegration.

Position of ship: 15° 12′S., 41° 24′E.

METEOR AND CONTRAILS

North Atlantic Ocean

S.S. *Essex Trader*. Captain R. E. Bennett. Newcastle to Montreal. Observers, the Master, Mr. A. Findlay, 2nd Officer, and Mr. Z. Greiber, 3rd Officer.

22nd June, 1955, 0331 G.M.T. An exceptionally bright meteor was observed at bearing 035°(T) and alt. 30°, in the vicinity of Cassiopeia, and disappeared at bearing 055°(T) and alt. approximately 4°. During this very short time, about 4 sec, the sky was brilliantly lit up, with a colour similar to that of an electric arc welding. It then changed to yellow and died out with a greenish colour. It was followed after an interval of 30 sec by another meteor, comparatively small, at bearing 190°(T) and alt. 25°. Sky cloudless. Visibility excellent.

Position of ship: 46° 24′N., 52° 40′W.

Unusual tracks were observed in the sky just before daylight appeared, about 3½ hours after the appearance of the meteor and a sketch was made at 0705 G.M.T. when it was possible to observe them more easily. The tracks differed somewhat in colour in different parts, bluish, bluish-grey, silvery and silvery-grey. They were NNE. of the vessel, which was then 20 miles SSW. of Cape Pine, Newfoundland.

Note. Between 0325 and 0400 S.M.T., Mr. R. D. Wallace, Apprentice, made six photographic exposures of these tracks, two of which were successful and were sent to us. One of them is reproduced (see opposite page 76). He suggests that these tracks were the result of the passage of the meteor. This is very improbable after such a long interval, especially as the meteor is not stated to have left any luminous trail in the sky at the time of its appearance. It is much more likely that the tracks were condensation trails (abbreviation "contrails") produced by one or more aeroplanes.

METEOROLOGICAL HOWLERS

The following extracts from examination papers have been kindly supplied by Captain Topley, Principal Examiner of Masters and Mates:

Snow is the particles of moisture that have been carried up in a cloud and when the cloud has descended the pressure is increased and the moisture is flattened out and forced to the edge of the cloud and drops off in small pieces.

In the summer the land in China warms considerably, rises and causes the SW. monsoons. In the winter the reverse takes place.

The inch as measured on a mercurial barometer is shorter than the linear inch, so that the barometer may be made a practical size for use. If the inches used were the same as a linear inch the barometer would have to be about thirty feet long.

Meteorological aspects of the loss of *Lorella* and *Roderigo*

Affecting the Operation of Trawlers to North of Iceland in Winter

By R. F. M. Hay, M.A.
(Marine Division, Meteorological Office)

There were several features attending the loss of the Grimsby trawlers *Lorella* and *Roderigo* about 90 miles north-north-east of North Cape, Iceland, on 26th January, 1955, which make the case not only a very unusual one but also of exceptional importance to trawler firms owning vessels which operate in these waters.

The *Lorella*, a steam trawler of 559 tons gross was known to have been overwhelmed by ice accumulation shortly before 1500 G.M.T. on 26th January, and the *Roderigo*, a steam trawler of 810 tons gross, sank from a similar cause at about 1712 G.M.T. on the same day. The ships were believed to have sunk within a few miles of each other in an approximate position 67½°N., 21°W. During the preceding four days the weather had been extremely bad. By means of the working charts drawn at the Central Forecasting Office at Dunstable, and statements of trawler crews in the vicinity, it was established that there was an east to north-east gale force 8–10 for most of the time in the area, which probably became force 8–11 on the 26th, the day of the tragedy. There was also continuous slight or moderate snow for most of the period. Wave heights were estimated as having been around 33 feet and 40 feet on 25th and 26th respectively; figures which in no way conflict with the statements by individual members of the crews of trawlers which were at sea in the neighbourhood at the time.

The Court of Inquiry, which held an investigation into the case in August 1955, announced in its findings that " the vessels capsized and foundered due to the unusual and unpredictable combination of a heavy gale, high seas and the loss of stability due to the heavy accumulation of ice on the upper structures ". Stress was therefore laid upon the fact that the disaster occurred not as a result of prolonged north-easterly gales alone, but because they were associated with persistent low temperatures. The synoptic situation in which these gales occur is in fact a rather common one in that area. The January wind-rose chart of the Barents Sea Atlas (not yet published at the time of writing) shows that north-easterly gales in the Denmark Strait are more frequent than from any other direction; while information received from the Icelandic Meteorological Service suggests that about 30 such north-easterly gales lasting three days or more have occurred in the past nine years, most of them in the winter months. The special meteorological feature about this case which did seem to be unusual, to judge from the meteorological evidence and from that of experienced skippers, was the fact that such low air temperatures—well below the freezing point of sea water (28·6°F in that region)—persisted through the greater part of the four days (23rd–26th) before the ships were lost, while north-east winds were blowing mostly in the range of force 8 to 11 during the same time.

Although there were numerous references in the Press to " Black Frost " as being the cause of the disaster, these allegations can be shown to have little justification on physical grounds. Enquiries by the writer have shown that on the fishing grounds the phrase is used somewhat loosely by trawlermen to describe a fog which extends above the observer's level (i.e. usually above bridge level), the air temperature being below freezing at the same time. A " White Frost " describes similar conditions when the top of the fog is below the level of the observer. Both terms " White Frost " and " Black Frost " as used by fishermen evidently describe the phenomenon known among meteorologists as " Frost Smoke ", which was described recently[1] in *The Marine Observer*. The chief features common to nearly all descriptions of frost smoke are that it is very shallow—only a few feet

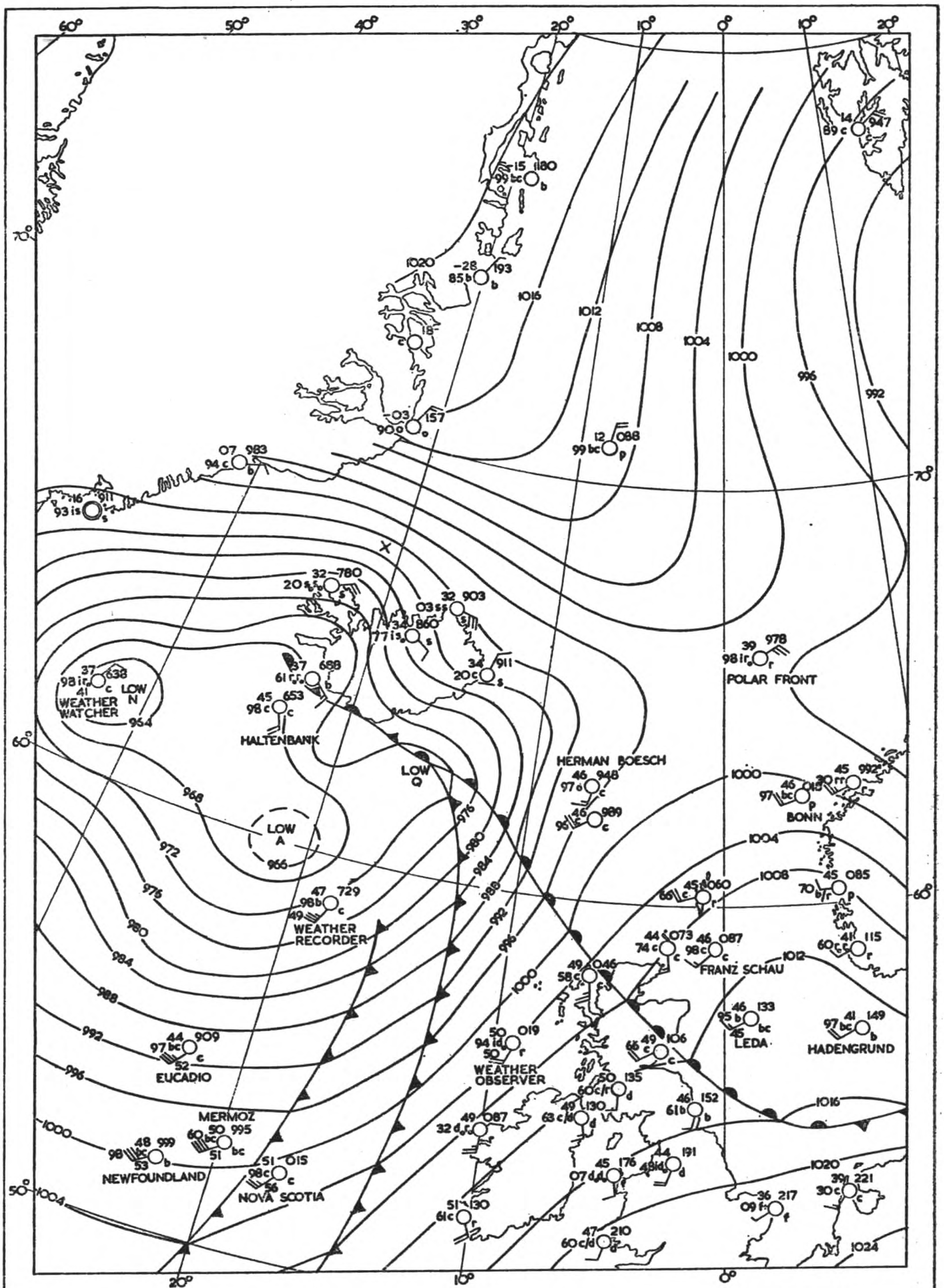


Fig. 1. Synoptic chart for 25th January 1955 at 0600 G.M.T.

X denotes the position, 67° 30′N., 21° 00′W. where the trawlers are believed to have been lost.

Note. Letters of identification, A, N, near each depression centre are those allotted by the Central Forecast Office, Dunstable.

thick—and only occurs when the air is considerably colder than the sea, and in these circumstances it is almost always associated with strong winds.[2]

There can be no doubt whatever from the evidence available about the experiences of many other trawler crews who were operating in much the same area as the ill-fated *Lorella* and *Roderigo* at that time; that the unusually severe weather led to ice accumulating upon the superstructures of these ships so rapidly during the hours that preceded the disasters, as to cause both ships to become unstable, and to capsize with the loss of all hands. No doubt a slight weight of ice was deposited on the ships by the impact of supercooled water droplets from fog (Arctic Frost Smoke) and from freezing drizzle and rain; also a certain weight of snow, which fell for much of the period, collected upon the ships. But the chief cause of the ships becoming unstable and unmanageable was certainly the freezing of sea spray, which was being taken over the bows and on various parts of the ships' structure in great quantities all the time. It appears from the evidence that both ships were hove-to or dodging most of the time. From observations by other skippers, as well as from theoretical considerations, we know that very high seas, of the order of 40 feet or more, were running for much of the time. Sea temperatures were around 34°F. Air temperatures varied a good deal during the period 22nd–26th, being as low as 20°F on the 24th, although there is reliable evidence to suggest that air temperatures at the position of the two ships rose to around 34°F during a brief thaw on 25th. The evidence of one skipper confirms this by stating that *Roderigo* was 2 miles away from him on that morning, apparently clear of ice and not in any difficulty. But soon afterwards the air temperatures quickly fell to around 23°F by midday on 26th, and there is little doubt that conditions were severe enough during this final period of about 24 hours to cause an accumulation of 50 tons of ice, or possibly more. We know that large quantities of spray were breaking right over the bows, and being blown back over the superstructure of the ships. At the prevailing air and sea temperatures some of this spray would freeze on impact; in such fierce cold winds the remainder, or nearly all of it, would be frozen to the superstructures before it had a chance to run back into the sea. A vivid picture of the conditions was provided by the evidence of skipper Norman Trolle of the trawler *Kingston Garnet* which at the time of the disaster was about 37 miles NE'N. of North Cape. He described the extent to which his vessel was iced up thus: " Shrouds and ratlines all in one, masts and halyards solid, radar tower frozen over, boat davits and boats all frozen solid, funnel frozen all round, handrails a solid sheet of ice, clear view screen solid, on the fore side of the wheelhouse the windows carried four inches of solid ice." It is important to remember that this vessel was some distance to the southward of *Lorella* and *Roderigo* and thus in more favourable temperatures.

We can thus establish that the fatal accumulation of ice upon *Roderigo* must have occurred in a period of a little more than 24 hours, and, if we accept the figures given above, the weight of " icing up " which would have occurred in this interval due to sea spray and the other causes described would be of the order of 50 tons or possibly more. Evidence given at the Inquiry by another witness showed that this weight of ice was just about the amount needed to overturn and capsize these vessels. It is perhaps significant that, while the two ships kept fairly close company, the *Roderigo* which was the larger ship (810 tons) sank about three hours after the *Lorella* (559 tons). An expert opinion was given to the writer that, some time before disaster overtook them, these ships had already accumulated an amount of ice which was more than enough to prove fatal, as soon as the ships' heads fell away from the wind; and that this accounted for their becoming unmanageable so quickly once they fell away from the wind, when the wind would have been able to exert an added pressure on their iced up superstructures.

There appear to have been few, if any, previous recorded cases of British-owned trawlers having been lost due to ice from freezing spray having accumulated on their superstructures. This does not imply that such losses have not occurred, but that prior to the days of W/T and regular listening schedules on R/T between trawlers,

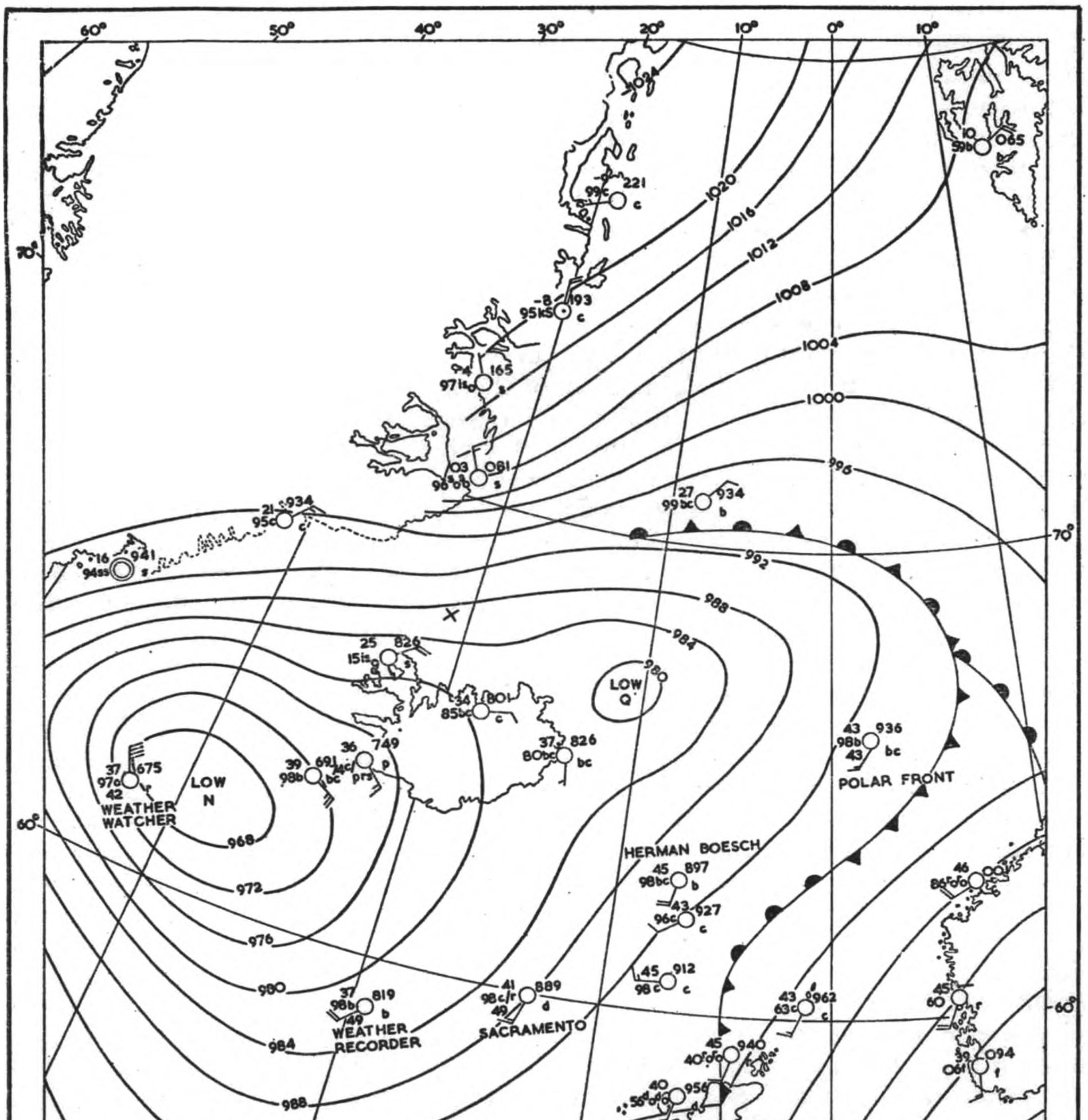
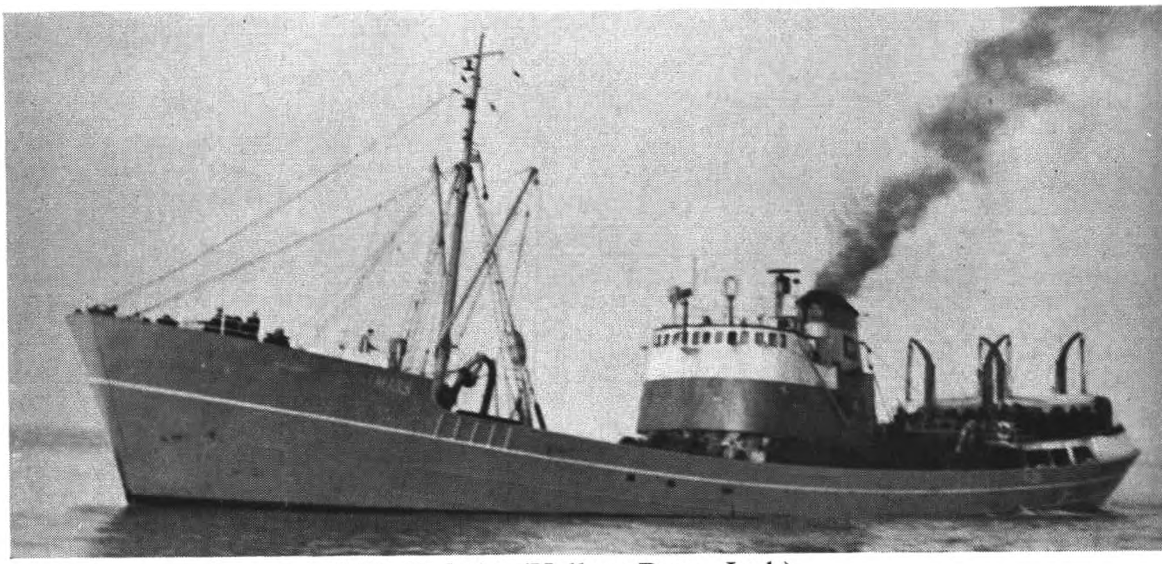


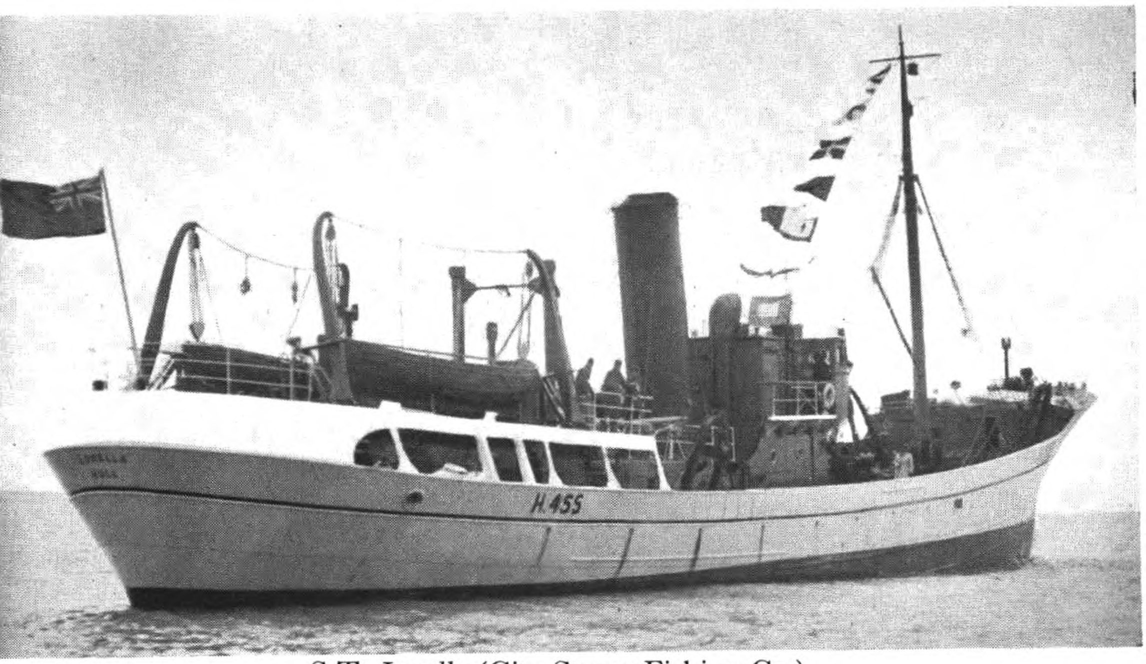
Fig. 2. Synoptic chart for 26th January, 1955 at 0600 G.M.T.

X denotes the position 67° 30′N., 21° 00′W. where the trawlers are believed to have been lost.

Note. Letters of identification, N, Q, near each depression centre are those allotted by the Central Forecast Office, Dunstable.



S.T. *Roderigo* (Hellyer Bros., Ltd.)



S.T. *Lorella* (City Steam Fishing Co.)

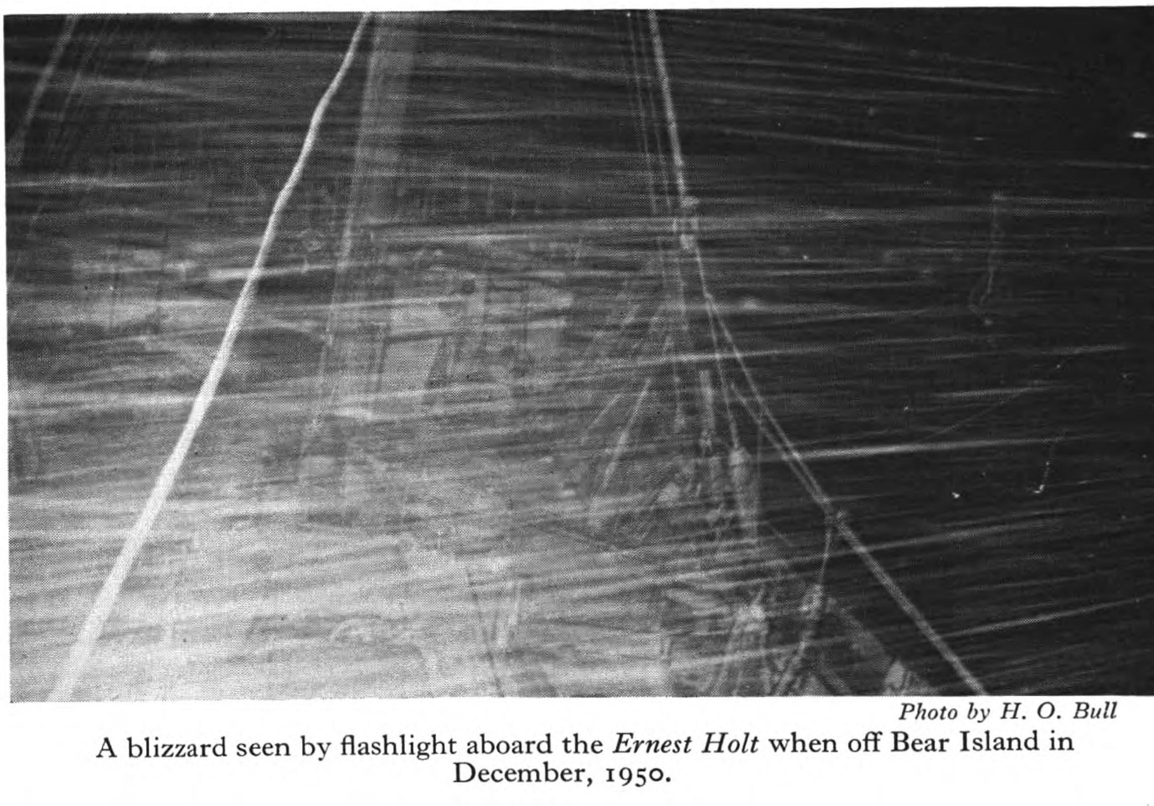


Photo by H. O. Bull

A blizzard seen by flashlight aboard the *Ernest Holt* when off Bear Island in December, 1950.

Opposite page 93

H.M.T.S. *Monarch* hove to on the 'cable ground'.

Slipping a cable buoy on the cable end in 700 fm. on Rockall bank in force 8 gale.

Chopping away ice, accumulated due to spray from breaking seas, aboard the fishery research trawler *Ernest Holt* after a storm in Arctic waters.

Photo by N. Reynolds

and between trawlers and shore based radio stations, the true explanation of many of the losses could never have been determined. However it is quite common for trawlers to get iced up and to have to seek shelter in order to get rid of the ice. Some days before the *Lorella* and the *Roderigo* were lost several trawlers had been iced up in positions well to the southward of these two vessels and had stopped to clear themselves of ice. As the nearer fishing grounds become ever more exhausted, while the populations of the countries bordering the Atlantic continually increase, the probability is that trawlers will need to voyage yet further than at present into Arctic waters to satisfy the ever growing consumption of fish. One purpose of writing this article is to ensure that trawler skippers are made more aware of these potential dangers due to " icing up " of the vessel. Reprints are therefore being made available to the fishing industry through the Ministry of Agriculture and Fisheries.

Skippers fishing in these waters are advised always to make use of all available weather forecasts and gale warnings for the area, whether from Icelandic, British, or German Meteorological sources. They should do this more particularly when they already mistrust the appearance of the sky from their own observations.

As soon as the onset of " dirty weather " is suspected or forecast in the area north of Iceland in winter time, a sharp watch should be kept on the barometer or barograph. The north-easterly gale of 23rd January, for example, was preceded by a considerable and rapid fall in the barometer all over the sea area to north of Iceland as a depression to the south-west of Iceland deepened and moved north-east.

Skippers of trawlers should take notice that north-east gales in the area north of Iceland frequently last three or more days in the winter months, particularly in December and January, and such gales will inevitably be accompanied by temperatures near or below freezing. Since the onset of such a gale in the winter is often quite rapid (in a few cases gale force winds replace a calm within a few minutes, although a few hours is the more usual time taken), the decision whether to run for shelter or not should be made as soon as the likelihood of a gale in the near future is established.

Owing to the extreme cold that usually accompanies north-east gales and the consequent risk of heavy icing, it seems that the most prudent action is to proceed to the southward into somewhat warmer temperatures, or to seek shelter in an Icelandic harbour—and the decision inevitably has to be made quickly. After such a gale has been blowing for some time the high seas and severe general conditions will often make it impracticable or dangerous to run before the wind and the vessel may therefore have to remain hove to or dodging. The inevitable result will be that instead of getting to the southward into warmer conditions, the vessel will have to continue being subjected to the risks of icing and, owing to the fact that she will probably make some headway to windward i.e. usually to the northward, may get into even worse conditions.

A further step well worth taking in the interests of safety is the fitting of trawlers with sea surface thermographs, which can readily be used to ensure that vessels do not approach the ice limit too closely in unfavourable weather. It has been found by experience that, provided the ship is not within the flow of one of the main cold currents, sea surface temperatures of 34°F and 31°F are associated respectively with an ice limit not more than 150 and 50 miles away. When a vessel makes away from near the ice limit to a region where sea surface temperatures rise substantially above freezing point (28·6°F), the icing risk is much reduced, and, except when there is a strong wind from off the nearest extensive ice-covered sea or land area, the air temperature also soon rises to a value near that of the sea surface.

Skippers should realize that the making of weather reports for synoptic purposes and transmitting them by W/T to a shore station is very much in their own interests. Without a close network of synoptic observations it is not possible for any Meteorological Service to make accurate forecasts. Such a network in the Denmark Strait and over the Arctic Ocean to east of Greenland is almost non-existent. The only ships which visit those regions—certainly in the winter months—are the trawlers themselves. If no observations are made by trawlers in this region the synoptic chart cannot be drawn to represent conditions over the area with any accuracy. The forecaster can only sketch isobars across the " blank " area to fit with and join on to isobars over adjacent areas, where their positions are shown with fair confidence, from the stations available. In consequence he often misses important developments, such as the initial development of a new depression centre, in an area of his chart from which observations are missing. Accurate eye observations are a great help to a forecaster, but instrumental observations of air temperature and pressure in addition are even better. As from 1st November, 1955, the British Meteorological Office has included in the Atlantic Bulletin gale warnings and forecasts of wind force and direction for the area Denmark Strait and N. Iceland as well as air temperature forecasts when sub-freezing temperatures are expected. By making and transmitting weather observations addressed to the appropriate Meteorological Service, skippers will be helping to make these forecasts more reliable and so contributing to their own safety.

Finally it is most important that skippers and crews of all trawlers operating in the area north of Iceland should realize that there is always a very rapid fall of air and sea temperature to the northward of Iceland in all seasons. More exactly the coldest air and water lie in a direction which is to the north-north-westward of Iceland, and the rate of fall is somewhat greater than 3°F per degree of latitude, i.e. about 1°F for every 20 miles moved to the north-north-west. This implies that the rate of icing due to sea spray will rapidly increase to northwards of Iceland, during a spell of prolonged dirty weather when high seas are running. The *Lorella* and *Roderigo* are believed to have been lost in a position about 90 miles to the north-north-east of North Cape, Iceland, which was a considerable distance to the north of any other trawlers in the region at that time.

The advice given above can be summarized as follows:—

(*a*) When a vessel is operating in the area north of Iceland during winter conditions (November to May) the skipper is advised to listen on the radio to the R/T and W/T forecasts and watch his barometer carefully.

(*b*) When in this area in winter time and an easterly or north-easterly gale is forecast, or the skipper decides from his observations and experience that such a gale is imminent, he is advised to run into somewhat warmer conditions (or for shelter) without undue delay.

(*c*) The shortest course leading to milder air and warmer water under such conditions is to steam to the south-south-eastward.

(*d*) Installation of a sea surface thermograph provides an additional safeguard.

Similar heavy icing on deck and superstructure is likely to be experienced in winter time when fishing in the Barents and Greenland Seas, or in the vicinity of Davis Strait. The normal position of the ice edge during the winter months runs south of Bear Island past South Cape (Spitzbergen) to the vicinity of Bell Sound. The west coast of Spitzbergen and the sea in the offing are usually ice free, the ice limit trending in a south-south-west direction from the vicinity of Hakluyts Headland (NW Spitzbergen) to Jan Mayen and thence southwards to the middle of the Denmark Strait. Vessels should clearly avoid approaching the ice edge where near-freezing sea temperatures are certain to be encountered and severe icing up is probable, given the conditions described earlier. In all these areas the worst icing due to sea spray is likely to be met with gale force winds from a northerly and easterly direction, and when these conditions are met, the most prudent action is to proceed with all convenient speed in a southerly direction towards warmer conditions.

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[2] JACOBS, L. Correspondence on Frost Smoke. *The Marine Observer*, **24**, pp. 113-114 (1954)

Weather and Sea Conditions in connection with Cable laying

By Captain J. P. F. Betson
(Commander of H.M.T.S. *Monarch*)

It may be of interest to readers of *The Marine Observer* to hear of some of the problems of laying ocean cables as they are affected by weather and sea conditions. At present we in *Monarch* are engaged in laying the first ocean telephone cable across the North Atlantic. This type of cable has its special problems compared with the telegraph cable on account of its having a repeater every 36 miles approximately throughout its length*. Each of these necessitates reducing speed to 3 knots or less in order to get it over the side without damage. Whereas the telegraph cable of usual type up to date can be laid at 7 knots without interruption apart from slowing down to change from one cable tank to another, the frequent reduction of speed to 3 knots in the case of the telephone cable and the handling of the vessel on each of these occasions to avoid the repeaters being in any way damaged as they pass over the stern sleeve, will make it obvious to readers that the finer the weather and the smoother the sea the better. However, as these ideal conditions, especially in the North Atlantic, are not usually continuous over a period of a fortnight or so, even between July and September inclusive, the other limit of workability arises. The question of avoiding storm centres whilst laying cannot, of course, be considered as the cable has to be laid upon a definite predetermined route and, therefore, if conditions do become too bad to continue the only action to be taken is to buoy the cable off and stand by until the improvement takes place which will enable the laying to be resumed. It is possible in a vessel of *Monarch*'s size, i.e. the size of many ocean-going cargo vessels namely, 485 feet in length and 55 feet beam, to continue effective laying operations of cable without repeaters, i.e. straight cable which can be laid at a uniform speed throughout, in moderate gale conditions with the usual accompanying sea and swell conditions. The difficulty arises if during such conditions the end of a section is to be reached and the cable buoyed off. The chances of successfully carrying out this operation in a wind force of 7 to 8 or more with rough sea and a short, heavy swell are not good. A long, heavy swell is not so bad as a short one—but probably the limit of undesirable conditions in which the work can be successfully undertaken may be considered as say wind force 7 with sea 5 and swell 5 (wave heights about 8 ft). It is, however, a matter of assessment of the prevailing combination of existing conditions of wind, sea and swell upon each occasion and in this connection the judgment of the right time to give it best and buoy off before worse comes is of prime importance.

In the matter of buoying off cable apart from the emergency buoying off, there are various considerations to be taken into account, e.g. for what length of time the cable will be required to remain buoyed, or the state of wind and sea, if buoying has been delayed longer than conditions dictate it should have been, and the buoying becomes somewhat of an emergency operation due to this. The method of " bottom buoying " the cable is used on most occasions where it is known that the buoy must remain for days or weeks. This involves attaching a mooring of 6×3 special steel wire rope† to the cable with a mushroom anchor shackled to this rope close to the cable end. A suitable length is then paid out according to the depth, which may be up to 2,500 or more fathoms, and the cable laid out on the sea bottom. A suitable size of buoy to support the weight of the mooring is attached to it and the buoy slipped from the cable ship.

* Repeaters amplify the electrical signal and so make good the losses experienced in the length of cable between the repeaters.

† A 6×3 rope is specially constructed for cable work and consists of 3 strands of 6-stranded rope laid up right-handed. Each of the 3 strands has a heart.

Surface buoying of a cable is used on occasions in deep water where the surface current is in the right direction, i.e. where it will not take the cable back in its already laid direction. This method is only used if it is probable that the period of buoying is to be a short one, say up to 12 hours or so. The idea is to attach the cable to the buoy by a short length of 6×3 rope, say 25 fathoms, and slip the buoy, using the cable as the buoy mooring. The size of cable and its weight in the depth in question are of course governing factors in the use of this method. The larger cable buoys support approximately a weight of 6 tons.

The lighting of buoys has been developed considerably in recent years and to come across a flashing light every 10 seconds, or other characteristic in mid ocean, should not necessarily give rise to the idea that a harbour buoy has broken adrift. It may well be a cable mark buoy or actual cable buoy.

The recovery of buoys and moorings at sea is effected by steaming up to the buoy and hooking the tail with a light grapnel. This tail is a length of 6×3 grappling rope supported by pellets or floats and is attached to the main mooring below the buoy. When the free end of this tail is hove up to the rail it is attached to a heavy steel wire rope led over specially constructed leads in the way of the buoy stowage in the forward rigging and thence to a capstan on deck, and the buoy and mooring are lifted to the rail where the mooring is then slipped from the buoy and taken on board over the bow sheaves.

The use of this method eliminates the requirement of having to send boats away at sea with the risk attached to so doing in other than fine weather and quiet sea conditions.

In conclusion I may say that the weather forecasts sent out by the various weather reporting and ice reporting bodies on both sides of the Atlantic are of the greatest assistance in the work of cable laying.

It is always a great help to have a co-ordinated report for the area in which one may be working, apart from one's own local assessment of probable conditions, which may help one to decide whether it will be necessary to buoy off and give the weather best in the case of an approaching storm or whether it appears probable that laying may be successfully continued through it.

ROYAL NAVAL BIRDWATCHING SOCIETY

Officers and Ratings of the Merchant Navy now eligible for full membership

On pages 160 and 161 of the July, 1955 number of *The Marine Observer* we published the Aims and Constitution of the Royal Naval Birdwatching Society.

Readers interested in the study of birds, and more particularly of ocean birds, will like to know that at its Annual General Meeting held at the Admiralty on 16th December, 1955, the Society passed the following Resolution.

> That para. 3(*e*) of the Constitution and Rules of the Royal Naval Birdwatching Society be amended to enable all personnel of Her Majesty's Merchant Navy to become members of the Society under the conditions and rates of subscription governing existing members.

The Annual subscription for Officers is 10s. 0d. per annum, and for ratings 7s. 0d. per annum. Members receive periodical Bulletins, a copy of the Society's Annual Report, and the Society welcomes the opportunity of assisting members in all matters connected with ornithology.

Enquiries should be addressed to the Honorary Secretary of the R.N.B.W.S., Commander C. E. Smith, R.N., H.M.S. *Ceres*, Weatherby, Yorks.

Five-year means of meteorological observations made at the Ocean Weather Stations I and J, 1948–52

By R. F. M. Hay, M.A.
(Marine Division, Meteorological Office)

Introduction

Before regular meteorological observations were started at ocean weather stations in the North Atlantic towards the end of 1947, it had not been possible to describe the climate of a fixed point in the open ocean in the same detail and to the same order of accuracy as in the case of a land station. The summary of weather and currents at the original ocean weather station positions I and J by Gordon and Barlow[1] which related to the period August 1947 to March 1950 was the first published summary which gave results derived from a continuous series of observations at a fixed point away from land. Since that time the manning of the ocean weather stations has been continued, and this note which is based on more complete information recently published elsewhere[2] includes monthly mean values of the principal meteorological elements based on the five years 1948 to 1952.

In 1948 station I was situated at 60° 00′N., 20° 00′W. and station J at 53° 50′N., 18° 40′W. By international agreement the positions of both ocean weather stations were shifted by approximately 70 nautical miles on 25th March 1950 to 59° 00′N., 19° 00′W. for I and 52° 30′N., 20° 00′W. for J. It has been assumed therefore that the mean values in tables 1–8 are the same as those which would have occurred at a spot midway between the positions of the ships before and after 25th March, 1950. Such an assumption naturally involves errors, but it is considered these will be relatively small in this region where horizontal gradients of temperature are not pronounced. Also, on several occasions, the weather ship manning station I was moved away for special purposes to a position some 150 nautical miles to east-north-east (61°N., 14° 30′W.). Data for the few days when this move happened during 1948–52 were excluded in computing the tables. The choice of the period 1948–52 was largely dictated by the fact that during 1953 removals of the ship on duty at Station I to the position 61° 00′N., 15° 20′W. were more frequent and because by international agreement Station I was located at 61° 00′N., 15° 20′W. from 29th August 1953 to 10th July 1954, after which it reverted to the position 59° 00′N., 19° 00′W. Observations are made aboard the ocean weather ships at the eight synoptic hours (00, 03, 06, 09, 12, 15, 18 and 21 G.M.T.) and the tables are based upon these observations except where there is a statement to the contrary.

The tables contain the monthly mean values for the five years 1948–52 of the principal meteorological elements observed aboard the ocean weather ships.

Wind

The mean wind speeds shown in Table 1 have been corrected to the standard height of 33 feet; in the British ocean weather ships the actual height of the anemometer cups is approximately 55 feet. For the relation of mean wind velocity, v to height, h, most writers assume a relation of the form:—

$$v = kh^{\alpha}$$

The value of α depends largely upon the kind of surface over which observations are made and is larger over a smooth than a rough surface. Carruthers[3] quotes some figures due to C. E. P. Brooks which give values of α of 0·13 over the open sea and 0·15 over low islands. The nature of the air flow over an ocean weather ship (or any ship) hardly seems comparable to the exposure which would be found over the open sea away from obstructions. Hence the exposure of the anemometers has been assumed to correspond to the conditions on a low island and a value of 0·15 has been assigned to α, in the expression $V_h/V_{10} = (^h/_{10})^{\cdot 15}$ where h is in metres. Taking the height of ships anemometers as 16·8 metres (55 feet) and the standard height as 10 metres (33 feet) this gives $V_{16\cdot 8} = V_{10} \times 1\cdot 08$ whence the factor to convert winds at 55 feet to 33 feet is found to be 0·93. The figures in

Table 1. Mean wind velocity in knots (1948-52)

Month	Station I		Station J	
	Mean	No. of Obs.	Mean	No. of Obs.
Jan.	22·9*	717	22·6	1,251
Feb.	21·5	1,026	21·2	1,117
Mar.	21·4	1,160	20·2	1,244
Apr.	20·0	1,179	17·7	1,219
May	14·9	1,190	14·7	1,255
June	14·1	1,173	14·2	1,207
July	13·6	1,175	13·7	1,209
Aug.	13·4	1,160	16·1	1,204
Sept.	15·8	1,019	16·5	1,189
Oct.	18·0	1,013	20·4	1,207
Nov.	19·6	1,188	20·3	1,203
Dec.	20·3*	846	22·4	1,175
Year	17·7	12,846	18·3	14,480

* Mean of 4 years only.

Table 2. Mean wind velocities (knots) for some windy locations

Month	Adélie Land 1912–13	Macquarie Island 1912–15	Macquarie Island 1948	Heard Island 1948	Hope Bay (Grahamland) 1952	Deception Island (S. Shetlands) 1944-5, 1947-50	Lerwick (Shetland) 9 Years Data	Valentia (Eire) 35 Years Data	I 1948–52	J 1948–52
Jan.	24·4	13·9	—	—	—	11·8	19·3	12·7	(22·9)	22·6
Feb.	28·1	12·7	—	10·5	—	12·4	18·2	12·2	21·5	21·2
Mar.	41·5	13·0	—	19·0	—	12·8	14·3	11·4	21·4	20·2
Apr.	40·8	12·8	16·6	17·4	—	16·2	14·3	10·5	20·0	17·7
May	45·7	14·1	11·3	17·0	23·5	14·4	12·9	9·5	14·9	14·7
June	42·5	14·3	18·4	19·1	16·7	16·5	12·6	8·9	14·1	14·2
July	45·8	14·9	13·1	20·3	18·5	15·0	9·9	8·8	13·6	13·7
Aug.	42·0	14·4	15·4	18·4	19·0	13·8	10·2	8·9	13·4	16·1
Sept.	36·6	15·6	19·0	18·1	18·4	16·4	13·0	9·1	15·8	16·5
Oct.	41·9	18·8	13·5	17·8	21·1	16·0	14·6	10·4	18·0	20·4
Nov.	32·2	13·0	15·8	17·3	17·0	14·2	16·7	11·6	19·6	20·3
Dec.	25·6	14·6	17·4	15·7	17·3	11·4	18·2	12·6	(20·3)	22·4
Year	37·3	14·3	—	—	—	14·2	14·4	10·5	17·7	18·3

Macquarie Island 55°S., 159°E. Adélie Land 67°S., 137°E. Deception Island 63°S, 61°W. Heard Island 53°S, 73°E. Hope Bay 63°S, 57°W.

Table 1 were obtained by multiplying the mean winds for the weather ships at the anemometer level by this factor.

Mean surface wind speed for the year is slightly higher at J (18·3 knots) than at I (17·7 knots). At both stations January is the windiest month, but the quietest months are July at station J and August at station I.

The windiness of these ocean weather stations is clearly shown by referring to Table 2. Over the year, mean wind speed at station I is nearly 25% greater than the value at Lerwick, the nearest land station lying in the same latitude. Similarly the value for station J is three-quarters as large again as the mean wind speed recorded at Valentia. Both ocean weather stations I and J appear to have rather higher mean wind speeds than Macquarie, Heard and Deception Islands which lie near the most frequented storm tracks of the southern ocean, although they are still far less windy than the coast of Antarctica at Adélie Land as found by the Mawson expedition in 1912–13.

Percentage frequencies of certain ranges of wind force related to direction were determined and these showed that winds of force 8–12 were more frequent at station I than at station J in all months except May-August, October and December. Table 7 shows that the number of gale days per annum was 92 at station I and 117 at station J; the smaller number at I being due to a marked falling off in the frequency of gale days in the summer months at I as compared with J. A gale day was defined as a day (0–24 G.M.T.) when wind force 8 and above occurred, at one or more of the eight synoptic hours of observation.

Table 3 gives the number of occasions on which winds of force 8–12 occurred from different directions. Storm force winds of force 10 have occurred from all

Table 4. Means and Extremes of Pressure at Mean Sea Level (1948-52)

Station I

Month	Mean	No. of Obs.	Max.	Min.	Difference of Values (Table 4–MO. 483)	Extremes of Pressure over British Isles Highest mb.	Lowest mb.
Jan.	*(1008·0)	878	1036·5	954·7	+ 5·5	1055	925
Feb.	1000·6	1054	**1041·9**	**945·3**	−1·4	1050	951
Mar.	1006·1	1210	1033·0	971·2	−0·9	1045	948
Apr.	1004·8	1204	1035·0	970·3	−5·4	1045	953
May	1016·6	1171	1036·4	981·6	+5·3	1042	968
June	1012·1	1164	1032·5	981·3	+0·5	1034	977
July	1011·7	1159	1032·7	980·1	+2·7	1038	976
Aug.	1007·1	1152	1027·3	980·6	−1·9	1032	968
Sept.	*1007·4	1004	1035·1	963·6	−0·7	1039	971
Oct.	998·4	1057	1027·8	952·3	−8·2	1039	947
Nov.	1004·6	1175	1029·5	963·6	+5·6	1044	940
Dec.	(998·7)	1086	1035·6	948·9	−2·3	1050	927
Year	1005·0	13276			−0·1		

Station J

Month	Mean	No. of Obs.	Max.	Min.	Difference of Values
Jan.	1007·1	1242	**1046·4**	968·4	−0·2
Feb.	1008·7	1091	1037·8	951·8	+3·2
Mar.	1009·2	1236	1037·4	957·6	−0·4
Apr.	1012·5	1209	1039·5	971·7	+0·8
May	1014·8	1236	1036·6	974·7	+1·4
June	1013·7	1200	1035·4	981·5	−2·4
July	1017·1	1128	1035·5	981·3	+2·7
Aug.	1010·8	1191	1029·1	977·3	−2·6
Sept.	1011·0	1171	1032·9	972·0	−1·4
Oct.	1009·7	1200	1033·9	**941·0**	0·0
Nov.	1006·9	1184	1038·4	965·6	−0·8
Dec.	1008·3	1155	1036·5	945·1	+1·5
Year	1010·9	14243			+0·1

* Less than half possible observations in any one month.
( ) One monthly mean obtained by interpolation from a " NACLI " Chart.

Table 3. Number of occasions* on which winds of Beaufort forces 8 to 12 occurred for different directions during five years 1948-1952

Force	Station I						Station J					
	8	9	10	11	12	8–12	8	9	10	11	12	8–12
Direction (Points)												
1–4	82	20	4	10	0	116	24	5	1	0	0	30
5–8	68	15	5	0	0	88	23	3	1	0	0	27
9–12	75	22	10	1	1	109	51	16	1	0	0	68
13–16	69	27	8	5	0	109	62	18	7	1	2	90
17–20	131	34	19	3	1	188	149	33	10	2	0	194
21–24	241	90	42	13	3	389	202	58	16	3	0	279
25–28	118	18	10	1	0	147	213	67	22	3	2	307
29–32	66	8	5	0	0	79	45	10	4	0	0	59
All (1–32)	850	234	103	33	5	1225	769	210	62	9	4	1054

During 5 years 1948–52 there were two months when there were no reports for Station I.

Mean Number of occasions* on which winds of forces 8 to 12 occurred each month for five years 1948-52

Force / Month	Station I						Station J					
	8	9	10	11	12	8–12	8	9	10	11	12	8–12
Jan.	(21)	(12)	(7)	(3)	(1)	(44)	30	12	3	0	0	45
Feb.	22	7	3	0+	0	32	15	6	1	1	0	23
Mar.	29	8	2	2	0	41	19	5	1	0	0+	25
Apr.	21	4	1	0	0	26	12	3	0+	0	0	15
May	2	1	0+	0	0	3	4	0+	0	0	0	4
June	2	0	0	0	0	2	2	2	0	0	0	4
July	2	0	0	0	0	2	0+	0	0	0	0	0+
Aug.	2	1	0	0	0	3	5	5	1	0	0	7
Sept.	11	4	0+	0+	0	15	7	1	1	0+	0	9
Oct.	17	2	1	0+	0+	20	8	2	1	0+	0	11
Nov.	24	7	5	0+	0	36	26	5	1	0	0	32
Dec.	(24)	(5)	(3)	(1)	(1)	(34)	24	6	3	1	1	35
Year	177	51	22	6	2	258	152	43	12	2	1	210

( ) 4 years observations only. * Based on 8 observations per day.

directions at both stations, and force 11 has occurred with winds between East and South as well as from all directions with a westerly component. The second part of the table shows that force 10 has occurred in all months at I except in June, July and August, and at J except in May, June and July.

Pressure

The mean monthly values of pressure, together with the absolute extreme values reported through the five years in each month, are given in Table 4. In this table are also shown the differences between these values and the corresponding values taken from the *Monthly Meteorological Charts of the Atlantic Ocean* (M.O.483) expressed as the differences (Table 4–M.O. 483) in each case. The large value of the differences in some months is hardly surprising, in view of the shortness of the period used for determining the means for I and J.

Interesting features of these tables are the fact that the normal pressure gradient between J and I was reversed in May (1948–52), and that at J pressure reached its highest mean monthly value in July, but at I in May. The highest pressure so far observed at these stations (1046·4 mb at J in January) is not far short of the absolute extreme recorded for a land station in the British Isles (1054·7 mb at Aberdeen on 31st January, 1902). Although the lowest values of pressure so far observed at either station have not been lower than the extreme lowest value of 925·5 mb recorded on land in the British Isles, (at Aberdeen on 26th January 1884,) the monthly absolute extremes for February at I and for October at J during these five years were lower than the corresponding long period figures for the British Isles for these months. Lower extreme values of pressure have so far been reported at J than at I in the months of March, May, August, October and December. The range between the absolute extremes of pressure so far recorded at I is 96·6 mb and at J 105·4 mb.

Temperature

Monthly means of dry bulb temperature and dewpoint are given in Tables 5 and 6 for the two stations. Mean ranges of average monthly temperatures (11·5°F at I, 11·2°F at J) compare with values of 15°F on the western seaboard of the United Kingdom and 23°F in East Anglia*. As would be expected the ranges of extremes (33·3°F at I and 30·5°F at J) are far lower than at land stations in the British Isles. Air temperature has never fallen below freezing point at J, and only on 18 days in five years at I. These days were distributed as follows, December and January 5 each, February 4, March 2, April and November 1 each.

Table 5. Mean Air and Sea Temperatures (1948-52)

Station I (Mean Position = 59° 29′N, 19° 29′W)

Month	Air Temp.	Dew Point	Sea Temp.	Air-Sea Temp. difference	Mean Daily max.	Mean Daily min.	Difference of Values (Table 5–M.O. 483) Air	Sea
Jan.	42·2	36·3	47·2	−5·0	45·2	40·1	+1·2	−0·3
Feb.	42·5	37·5	47·2	−4·7	44·6	40·4	+1·9	+0·5
Mar.	43·3	38·6	47·1	−3·8	45·6	41·6	+0·9	+0·5
Apr.	43·3	36·9	47·6	−4·3	45·5	41·2	−2·3	0·0
May	47·2	42·2	48·9	−1·7	49·1	45·6	−0·3	+0·1
June	50·4	45·9	51·5	−1·1	51·6	49·0	+0·1	+0·4
July	52·9	48·8	53·7	−0·8	54·4	51·6	−0·8	−0·3
Aug.	53·7	49·1	54·8	−1·1	55·2	52·3	+0·4	+0·4
Sept.	52·0	46·8	54·3	−2·3	53·8	50·6	0·0	+1·1
Oct.	48·9	44·0	52·0	−3·1	50·7	47·1	+0·5	+1·3
Nov.	46·6	41·7	49·7	−3·1	48·4	44·9	+0·2	+0·6
Dec.	43·6	38·4	48·5	−4·9	45·4	41·0	+1·9	+0·3
Year	47·3	42·3	50·3	−3·0	49·0	45·5		

Number of days on station at 60°N., 20°W. 777 Total 1,601
at 59°N., 19°W. 824

* Values taken from M.O. 488 *Climatological Atlas of the British Isles.*

Table 6. Mean Air and Sea Temperatures (1948-52)

Station J (Mean Position = 53° 06′N 19° 25′W)

Month	Air Temp.	Dew Point	Sea Temp.	Air-Sea Temp. difference	Mean Daily max.	Mean Daily min.	Difference of Values (Table 6–M.O. 483) Air	Sea
Jan.	46·7	41·1	50·3	−3·6	49·1	43·8	−1·7	−0·7
Feb.	46·3	40·3	50·2	−3·9	48·4	43·7	−1·4	−0·5
Mar.	48·5	43·5	50·2	−1·7	50·1	46·8	+0·3	−0·2
Apr.	48·1	42·0	49·9	−1·8	49·9	46·1	−2·1	−1·1
May	51·2	45·8	52·1	−0·9	52·8	49·6	−1·1	−0·6
June	54·4	50·0	54·6	−0·2	55·7	53·0	−1·1	−0·9
July	57·5	53·2	57·9	−0·4	58·7	55·8	−0·5	−0·3
Aug.	57·5	52·6	59·1	−1·6	59·0	56·1	−1·4	+0·6
Sept.	56·4	51·5	57·9	−1·5	58·0	54·9	−1·0	+0·2
Oct.	53·7	48·0	55·8	−2·1	55·5	52·1	−0·8	+0·2
Nov.	50·5	45·1	53·3	−2·8	52·3	48·8	−1·7	−0·3
Dec.	47·8	42·9	51·5	−3·7	49·9	45·6	−1·2	−0·5
Year	51·5	46·3	53·4	−1·9	53·3	49·7		

Number of days on station at 53° 50′N., 18° 40′W. 789 Total 1,774
at 52° 30′N., 20°W. 985

Table 7. Weather

Station I

Month	Mean number of days per month: Precipitation	Rain	Snow Sleet	Hail	TLR†	Fog	Gale*	No. of days
Jan.	28	24	14	13	1	0	15	31
Feb.	27	21	11	11	>0	1	11	28
Mar.	26	24	8	8	>0	0	14	31
Apr.	28	26	7	9	0	1	10	30
May	24	23	2	3	>0	3	1	31
June	24	24	>0	0	0	4	1	30
July	27	27	0	0	0	4	1	31
Aug.	27	27	0	0	0	3	1	31
Sept.	25	25	0	1	0	3	6	30
Oct.	29	29	1	3	>0	1	9	31
Nov.	28	28	2	3	0	>0	10	30
Dec.	30	27	9	13	>0	1	13	31
Year	323	305	54	64	2	22	92	365

Station J

Month	Mean number of days per month: Precipitation	Rain	Snow Sleet	Hail	TLR†	Fog	Gale*	No. of days
Jan.	30	29	2	9	1	>0	18	31
Feb.	25	24	4	8	1	1	13	28
Mar.	27	27	1	3	>0	2	12	31
Apr.	27	26	1	4	0	1	8	30
May	22	22	>0	2	0	3	5	31
June	25	25	0	0	0	7	3	30
July	27	27	0	0	>0	8	2	31
Aug.	28	28	0	>0	>0	3	7	31
Sept.	26	26	0	1	>0	4	7	30
Oct.	29	29	>0	2	1	2	13	31
Nov.	26	26	>0	2	0	2	13	30
Dec.	29	28	1	7	1	>0	16	31
Year	321	317	10	38	5	33	117	365

Precipitation includes rain, hail or snow; drizzle is included under rain.
† Includes T or L in addition to TLR (thunderstorm).
* Force 8 and above.
The symbol >0 denotes a value of 0·1 to 0·4.

Number of days per month denotes the number of days (0–24 GMT) on which the particular type of weather was entered in the "present weather" and/or "past weather" on at least one synoptic hour or occasion.

The figures obtained for the original number of days available for the different months have been converted to the equivalent number of days per month which would have been observed if the observations had been made on every day of the month.

Monthly mean sea temperatures are included in the same table, also mean monthly values of air-minus-sea temperature difference, which are of greater scientific interest. The latter show a fairly regular seasonal variation; at station I they vary between −5·0°F in January to −0·8°F in July, and at station J from −3·9°F in February to −0·2°F in June. Thus on the average the air is colder than the sea at all seasons through the year. However the mean air-minus-sea temperature difference has a very small negative value during the spring and early summer. In individual years air temperatures exceed sea temperatures at both stations for periods of 2 or 3 weeks in the spring and early summer and very occasionally for a few days in the autumn and winter.

Weather

Table 7 brings out clearly the notably high annual frequency of precipitation at both stations, 323 days at station I and 321 days at station J, although no precise comparison can be made between amounts of rainfall at the ocean weather stations and those at adjacent land stations until a raingauge can be devised which will make accurate measurements of precipitation amounts aboard the weather ships.

The frequency of snow and sleet at station I (54 days per annum) compares with about 35 and 40 days in the Orkneys and Shetlands respectively, similarly at station J the figure of 10 days compares with 5 days at Falmouth and 3 at Scilly. A rather similar parallelism can be found in the hail frequencies (64 days at I and 20 at Orkney, 38 at J and 16 at Falmouth). The high frequency of hail in the winter months is probably related to the large number of occasions when the air is much colder than the sea at that season. Thunder was heard on 5 days a year at J (average 5 at Falmouth) but on 2 days a year at Station I, which compares with 7 at Deerness (Orkney) and 3 at Stornoway.

Visibility

Table 8 shows the percentage frequency of fog (defined as all occasions when visibility was <1,000 yd). At station I the greatest frequency was in July when it rose to 3·2%. Fog was very infrequent there from October to April; in this particular period there was no fog recorded in November. At station J the frequency of fog was higher, up to 5·4% in June and 3·6% in July; fog was infrequent from October to April and was not observed in January. At both stations there was a high frequency of visibilities above 10 miles (60–70%) which was noteworthy at J in most winter months and at I between July and January.

Comparison with the Monthly Meteorological Charts for the Atlantic Ocean

On the assumption that the mean positions of the stations were 59½°N., 19½°W. and 53°N., 19½°W. the monthly and annual means of pressure and air and sea temperatures given in Tables 4, 5 and 6 were compared with values obtained by interpolation from the charts given in M.O. 483 (*Monthly Meteorological Charts for the Atlantic Ocean*). These charts were based upon readings of air and sea temperatures made by British observing ships and selected ships during the periods 1887–99 and 1921–38 respectively, and upon pressure readings for the latter period only. The results are shown in the last column but one on the right of Table 4 and in the two right-hand columns of Tables 5 and 6. The annual values of the differences between Tables 4, 5 and 6 and M.O. 483 were:

	Pressure mb	Air temp. °F	Sea temp. °F
Station I	−0·1	+0·3	+0·4
Station J	+0·1	−1·1	−0·3

The results for station I agree with the conclusion that the sea and overlying air in this region have been warming up in recent years, but suggest that slight cooling has occurred at station J.

Table 8. Percentage Frequency Visibility (1948-52)

Station I

Vis. / Month	0–50 yds.	50–200 yds.	200–500 yds.	500–1000 yds.	1000 yds. –1 n. mile	1–2 n. miles	2–5 n. miles	5–10 n. miles	10–25 n. miles	>25 n. miles	No. of Obs.
Jan.				0·3	0·5	2·3	10·5	24·2	56·7	5·5	705
Feb.				0·2	2·0	4·0	10·2	27·8	43·4	12·4	1063
Mar.					0·4	3·8	17·2	22·2	49·2	7·2	1181
Apr.				0·2	0·8	3·2	10·0	25·8	56·6	3·4	1202
May			0·2	0·6	0·8	3·6	11·8	23·4	48·0	11·6	1170
June		1·0	0·8	1·0	2·8	6·2	12·4	23·0	40·6	12·2	1166
July		0·2	1·4	1·6	2·8	2·8	9·0	22·8	49·2	10·2	1158
Aug.			0·6	1·0	0·4	2·0	7·4	18·0	55·2	15·4	1150
Sept.		0·2	0·2	0·8	1·8	2·0	9·6	20·2	59·2	6·0	1004
Oct.				0·8	1·2	2·6	9·2	21·8	59·0	5·4	1052
Nov.					0·8	2·8	10·8	24·8	46·0	14·8	1174
Dec.				1·3	1·7	2·7	8·5	28·3	55·0	2·5	838
Year	<0·1	0·1	0·3	0·6	1·3	3·3	10·8	23·8	50·1	9·1	12863
No. of Obs.	1	16	38	80	166	423	1385	3062	6524	1168	12863

Station J

Vis. / Month	0–50 yds.	50–200 yds.	200–500 yds.	500–1000 yds.	1000 yds. –1 n. mile	1–2 n. miles	2–5 n. miles	5–10 n. miles	10–25 n. miles	>25 n. miles	No. of Obs.
Jan.					0·4	2·6	13·0	28·0	44·6	11·4	1233
Feb.			0·2	0·6	0·8	1·6	9·8	32·4	50·2	4·4	1091
Mar.		0·2	0·2	1·2	1·0	3·2	13·0	29·8	49·2	2·2	1238
Apr.		0·2	0·2	0·4	1·0	2·6	11·8	32·4	47·6	3·8	1210
May		0·6	0·6	1·0	0·6	3·2	11·0	26·8	50·0	6·2	1238
June		0·6	2·4	2·4	1·8	3·8	12·0	29·2	40·2	7·6	1190
July		0·2	2·0	1·4	1·8	4·4	9·4	30·0	45·4	5·4	1119
Aug.		1·2	0·8	0·4	2·0	5·8	12·8	26·0	45·4	5·6	1074
Sept.			1·4	1·0	2·4	4·2	9·4	27·0	46·2	8·4	1159
Oct.	0·2	0·2		1·2	1·8	5·2	14·0	32·0	41·4	4·0	1124
Nov.			0·6	0·4	1·0	3·4	9·2	23·0	55·8	6·6	1154
Dec.		0·2		0·6	0·8	4·6	9·4	23·8	48·6	12·0	1098
Year	<0·1	0·3	0·7	0·9	1·2	3·5	11·0	28·2	47·7	6·5	13928
No. of Obs.	1	41	103	126	173	487	1534	3930	6642	889	13928

Diurnal Variation of surface barometric pressure, wind velocity air and sea temperature and cloud amount

A few of the results of an investigation into diurnal variations of certain meteorological elements at the Ocean Weather Stations in which surface data for the ocean weather stations I and J for the four years 1948–51 were used are included here.

Treatment of the data

As results obtained previously for the two years 1948–49 showed that the magnitudes of the diurnal variations in both elements were in close agreement at the two stations I and J, in using the data for the four-year period 1948—51 it was therefore decided to ignore the changes which were made in the positions of I and J in March 1950 as described earlier.

As previously, data was used for those days only when the ships were within a square grid whose sides at their nearest were 105 miles distant from the station positions given earlier, when the ship was considered to be " on station ". In addition only days were used on which observations were available at all eight synoptic hours from a ship " on station "; any days on which one or more observations at synoptic hours were missed were rejected. When one ship relieved another " on station " and both ships were making observations within the grid at the same time the observations of the ship nearer to the grid centre were used.

Accuracy of the observations available

In obtaining results for surface barometric pressure, wind and total cloud amounts data was taken from Hollerith cards. For air and sea temperatures Hollerith card data were not considered sufficiently accurate for this part of the analysis, and therefore all temperatures used were taken direct from the ocean weather ship logbooks. For the greater part of the period air and sea temperatures have been read to 0·1°F and entered to this degree of accuracy in the log-books. Pressure was read to 0·1 mb and punched on Hollerith cards to the same degree of accuracy. Wind velocity was measured from the cup anemometer exposed on the mainmast about 55 feet above the sea surface, the wind velocity being recorded in the logbook and punched on Hollerith cards in Beaufort Force. The punched data has been reconverted to knots in this analysis using the appropriate mean values of Beaufort Force on the international scale.

All observations of cloud amount used in this analysis have been converted to amounts in tenths.

Air temperatures were read to the nearest 0·1°F from a thermometer in a Stevenson Screen exposed on the weather side of the ship. Data from the original logbooks were used.

Sea temperatures were read to the nearest 0·1°F using a canvas bucket which aims to catch a sample from the top six inches of the sea. Data from the original logbooks were used. Most of the entries were made to the nearest 0·1°F but a few were entered to the nearest 0·5°F or 1·0°F, and had to be used in this form.

Number of observations available

In the first instance the diurnal variations of the elements were determined for all days which were available after applying the procedure already described. The numbers of days for each station, element and season, which were available at the time when this investigation was begun, are shown below.

Station I	*Winter*	*Spring*	*Summer*	*Autumn*
Season	Dec.–Feb.	Mar.–May	June–Aug.	Sept.–Nov.
Pressure	257	328	319	296
Wind	268	328	318	296
Total Cloud	269	327	319	296
Air Temp.	269	328	318	295
Sea Temp.	257	324	316	283
Station J				
Pressure	318	359	353	348
Wind	331	360	353	349
Total Cloud	331	360	353	349
Air Temp.	331	360	349	349
Sea Temp.	301	359	351	347

Diurnal variations of Sea and Air Temperatures (All days)

Values of the ranges of the diurnal variation of certain elements obtained from this data are given in Table 9.

There is good agreement between the magnitudes of the yearly diurnal ranges of the two stations and also between most of the seasonal values. There is little difference between the diurnal ranges of sea temperature in autumn and winter and also between spring and summer.

For air temperature the ranges at both stations are largest in spring and summer and smallest in winter, the largest value for I is 1·36°F in spring, for J 1·41°F in summer.

For sea temperature the ranges at both stations are largest in spring and summer (0·36°F at J in spring 0·32°F at I in summer); in autumn and winter the range is very small, being near 0·1°F at both stations.

In all seasons, but particularly in summer, the range of diurnal variation of air temperature appears greatly to exceed that of sea temperature.

Radiation errors are discussed later.

Table 9. Diurnal Variation of Pressure, Wind, and Total Cloud

Element	*Season* / *Station*	*Winter* Dec.–Feb.	*Spring* Mar.–May	*Summer* June–Aug.	*Autumn* Sept.–Nov.	*Year*
Pressure (mb)	I	1·03	·68	·79	·94	·70
	J	·76	·98	·72	·74	·70
Wind (kt)	I	·92	1·45	·65	·27	·83
	J	·74	·92	·71	1·28	·69
Total Cloud (tenths)	I	1·30	·90	·42	1·02	·76
	J	1·35	·95	·72	·96	·88

The ranges given here were obtained by taking the difference between the highest and lowest among the mean values found for all eight synoptic hours for each of the elements.

Diurnal Variations of Sea and Air Temperature (Classified days)

The reality of these diurnal variations of air temperature is open to doubt since they are subject to errors due to heating of the air as it passes across the ship. Possibly the sea temperatures also are affected by the presence of the ship.

Sufficient data were available to make it worth while to determine separately the magnitude of diurnal variations on days when the heating effect of the ship could be expected to be (a) at a minimum, and (b) at a maximum. The smallest heating from the ship would clearly occur on days with strong winds and overcast skies, while the greatest heating would similarly be anticipated on calm, sunny days.

A classification of days which are both " windy " and " cloudy " was readily devised for the ocean weather ship stations, but it proved much harder to select a definition for days which were both " quiet " and " fair " which could be used with the data, since periods as long as twenty-four hours with winds of less than force 4 at all eight synoptic hours, and also with cloud amounts less than 4 oktas (5 tenths) at all eight synoptic hours are uncommon in the North-east Atlantic. After some consideration days were classified as follows:—

Day (0–24 G.M.T.)	*Description*
" Quiet "	Five observations or more with wind force 0–4
" Windy "	Five observations or more with wind force 6–12
" Cloudy "	All eight observations in code figures 4–9 (Applied for both old and new International Codes)
" Fair "	Four observations or more in code figures 0–5 (Applied for both old and new International Codes)

The inclusion of any observation of force 4 on " quiet " days was open to objection, but was found to be unavoidable, as otherwise, the number of " quiet " days would have been too small for satisfactory analysis.

A few days which, according to the definitions above, could have been classified as both " cloudy " and " fair ", were excluded from the analysis. Afterwards values of the diurnal variation were computed for days thus classified. Henceforward the terms quiet fair days and windy cloudy days are used with the meaning given above. Values of the ranges of the diurnal variation as defined earlier are given in Table 10.

Reality of the diurnal variation

The results for both stations I and J for the windy cloudy days in winter afford strong proof of the existence of a small diurnal variation of air and sea temperature. The low elevation of the sun in winter, together with the rigid classification of the windy cloudy days, imply that heating of the ship by insolation would be negligible, and similarly cooling of the ship by nocturnal radiation in these circumstances would be at a minimum.

At both stations the diurnal variation of air temperature is markedly greater on quiet fair than on windy cloudy days for all seasons, except in winter, when the

Table 10. Diurnal Variation of Air and Sea temperature

All days

	Season	*Winter* Dec.-Feb.	*Spring* Mar.-May	*Summer* June-Aug.	*Autumn* Sept.-Nov.	*Year*
Air °F	I	·43	1·36	1·31	·68	·90
	J	·56	1·30	1·41	·88	1·03
Sea °F	I	·12	·24	·32	·10	·20
	J	·05	·36	·35	·08	·20

Windy cloudy days

	Season	*Winter* Dec.-Feb.	*Spring* Mar.-May	*Summer* June-Aug.	*Autumn* Sept.-Nov.	*Year*
Air °F	I	·91 (57)	1·05 (72)	·71 (29)	·70 (60)	·63 (218)
	J	1·18 (69)	·88 (48)	·91 (37)	·60 (55)	·61 (209)
Sea °F	I	·09 (54)	·17 (71)	·26 (27)	·13 (60)	·05 (212)
	J	·20 (66)	·19 (48)	·17 (36)	·22 (55)	·10 (205)

		Spring and Summer Mar.-Aug.	*Autumn and Winter* Sept.-Feb.
Wind (kt)	I	3·17 (101)	4·13 (117)
	J	2·64 (85)	3·43 (123)

Quiet fair days

	Season	*Winter* Dec.-Feb.	*Spring* Mar.-May	*Summer* June-Aug.	*Autumn* Sept.-Nov.	*Year*
Air °F	I	·62 (19)	1·99 (17)	2·09 (38)	1·55 (30)	1·57 (104)
	J	·97 (15)	2·12 (42)	2·43 (35)	1·77 (25)	1·93 (117)
Sea °F	I	·19 (19)	·26 (17)	·70 (38)	·13 (30)	·33 (104)
	J	·11 (15)	·76 (42)	1·02 (35)	·17 (25)	·55 (117)

		Spring and Summer Mar.-Aug.	*Autumn and Winter* Sept.-Feb.
Wind (kt)	I	2·37 (55)	3·08 (49)
	J	1·63 (77)	4·25 (40)

Figures in brackets denote the number of days used in computing each gauge.

reverse is true. For sea temperature the diurnal variation similarly is greater on quiet fair than on windy cloudy days for all seasons, the exceptions being winter and autumn both at station J when the reverse is true.

The magnitude of the diurnal variations of the elements found here show good agreement with those found by earlier workers as the table below shows:—

Element whose diurnal variation is shown		*Magnitude* °F	*Location*	*Authority and date*
Air		0·5–0·8		Geiger
Air		0·95	Station I	Gordon 1948–49
		0·85	,, J	,, ,,
Air	All days	0·90	Station I	Hay 1948–51
		1·03	,, J	,, ,,
Air	Windy cloudy days	0·63	Station I	,, ,,
		0·61	,, J	
Air	Quiet fair days	1·57	Station I	,, ,,
		1·93	,, J	
Sea		0·5	Tropics	Geiger
Sea		0·0–3·5	Tropics	Schott
Sea		0·4–0·6	Trades	Sverdrup
Sea		0·4	30°–40°N.	Challenger
Sea		0·22	Station I	Gordon 1948–49
		0·12	,, J	
Sea	All days	0·20	Station I	Hay 1948–51
		0·20	,, J	
Sea	Windy cloudy days	0·05	Station I	,, ,,
		0·10	,, J	
Sea	Quiet fair days	0·33	Station I	,, ,,
		0·55	,, J	

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Five-year Current Means at Ocean Weather Stations I and J

By E. W. Barlow, b.sc.
(Marine Division, Meteorological Office)

Both these stations are situated within the region of the North Atlantic Current, on the eastern side of the ocean. Immediately eastward of the Great Bank of Newfoundland the Gulf Stream widens by fanning out. In its subsequent course across the ocean the current is known as the North Atlantic Current, the resultant flow of which is in a general north-easterly direction. This current is mainly produced by the tractive force of the wind, and as the winds of this part of the ocean are very variable, the direction and rates of individual current observations observed will also be very variable. The current in the long run, as part of the general circulation of the North Atlantic, is therefore the residual flow of water produced by the excess of the predominating wind over other winds.

The variability of the North Atlantic Current is well shown by the roses given for each quarter of the year in M.O. 466, *Quarterly Surface Current Charts of the Atlantic Ocean.* The observations used in making this atlas are almost wholly those of merchant ships, which while fairly numerous south of latitude 52°N. are very scanty in all higher latitudes. As the current observations of ocean weather ships accumulate they will obviously provide most valuable data for the analysis of ocean current conditions in regions for which we have hitherto had very little information. Furthermore, as the observations of each of the two ships are made within a restricted area, the information will be more detailed since it represents conditions at what is practically a fixed place, while in the case of the current atlases the information given, for example, in any one current rose is derived from observations made over a relatively wide extent of the ocean.

A summary is given below of the current observations for the first five years of ocean weather ships' observations, 1948–1952. In making the investigation only the currents computed from astronomically derived positions have been used, since individual Loran positions in overcast conditions cannot be checked. We thus have 199 observations made at I in the 10 months February to November inclusive, none being available for December and January, and 244 observations made at J covering the whole year.

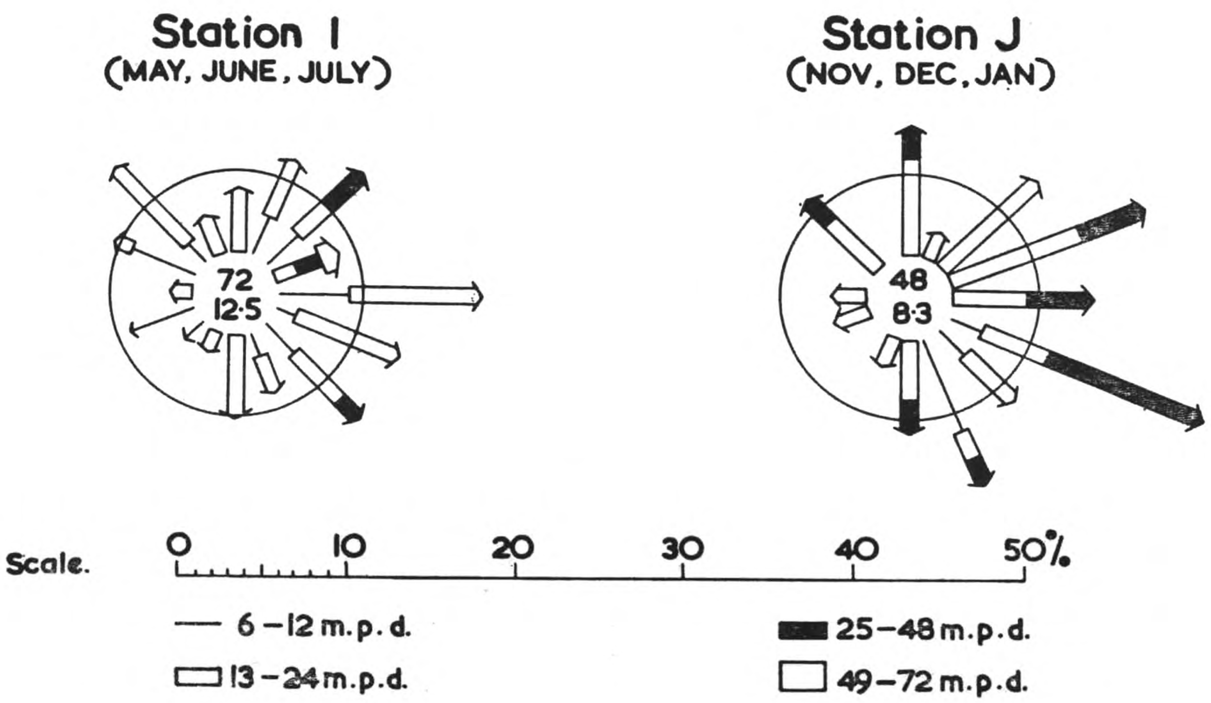
Current roses have been drawn for each quarter of the year for both stations, except the quarter November to February at I, and also annual roses for each station. The roses for the summer quarter (May to July) at I and the winter quarter (November to January) at J are reproduced. The main characteristic, variability of direction at any time of the year, is well exemplified in these two roses, nearly every direction being included; the annual roses for each station contain every direction.

Few of the currents observed had a rate greater than 1¼ knots and only nine currents exceeded the rate of 1½ knots, three of these being recorded at I and six at J. Of the three strongest currents at I, two exceeded the rate of 2 knots, but no current at J was found to exceed this rate.

The relative strength of currents at the two stations is shown by the following table, which indicates no consistent difference throughout the year. The figures are the percentages of current exceeding the rate of one knot, the number of observations on which each is based being added in brackets.

	Nov.–Jan.	Feb.–Apr.	May–July	Aug.–Oct.
I	—	15½ (58)	7 (72)	11 (63)
J	29 (48)	10 (31)	12 (89)	9 (76)

The resultant water movement, the vector mean flow, is to northward of east during most months at both stations and to southward of east in the remaining



months. When combined into quarters, the southerly movement disappears in all except the quarter August to October at J, for which the vector mean is S.26°E., 5·6 miles per day. For the remaining three quarters at J, the vector mean direction lies between the limits of N.71°E. and N.86°E., with rates between the limits of 5·2 and 8·5 miles per day. For the three available quarters at I the limits of direction are N.70°E. and N.84°E. and those of rate 5·4 and 7·7 miles per day.

These figures indicate a considerable constancy of resultant flow, both in direction and rate. When, however, the vector mean direction and rate is computed for the whole year at each station, actually for ten months in the case of I, the remarkable fact emerges that at these two widely separated stations the resultant flow is almost the same, being at I N.80°E., 6·2 miles per day and at J N.88°E., 6·4 miles per day. The percentage ot weak currents, those of less than one-quarter of a knot, is 13 at both stations.

Somewhere south of Iceland a branch of the North Atlantic Current turns northward, forming the Irminger Current, which carries relatively warm water up the west coast of Iceland and also westward towards the Greenland coast. The existence of this current is beyond dispute and it keeps most of the west coast of Iceland ice-free. From the indications available in the Atlantic current atlas it appears that station I should be within the region where water branches northward to form the Irminger current, but the figures given above show no indication whatever of such a northerly flow. The region of origin of the Irminger Current is therefore at present unknown.

Presentation of Barographs

On 7th November, 1955, Sir Graham Sutton, Director of the Meteorological Office, presented barographs to the masters of three selected ships who had done consistently good meteorological work at sea during a large number of years. As this year was the Centenary of the Meteorological Office, the occasion called for a little celebration so the ceremony was held in the elegant and attractive Air Council Room of the Air Ministry at Whitehall and the guests partook of the Air Ministry's hospitality afterwards. It was hoped that the Under-Secretary of State for Air could have made the presentation, but at the last minute he was called to a Cabinet meeting and so was unable to be present.

As stated in the October 1955 number of *The Marine Observer*, barographs were awarded that year to Captain Fasting (Cunard Company); Captain Horwood (New Zealand Shipping Company); Captain Keay (Canadian Pacific Company); and Captain Trayner (Union Castle Company). Captains Fasting, Horwood and Trayner had stated that they would be able to attend in person, but it transpired that Captain Horwood was unable to attend owing to a severe illness and Captain Fasting was unavoidably detained in Liverpool on duty. Captain Keay was at sea.

Among those who accepted invitations to attend the ceremony were representatives of the Management and the Marine Superintendents of the three Companies concerned, the Deputy Master of Trinity House and representatives of M.M.S.A., Navigators' and Engineers' Officers Union and the Radio Officers' Union, and of the Ministry of Transport and Civil Aviation. Senior officers of the Meteorological Office were also present.

In making the presentations Sir Graham Sutton recalled that when the Meteorological Office was born in 1855, under the direction of Admiral FitzRoy, its primary function was to collect meteorological and ocean current observations over the oceans from British ships. At the end of 1855, over 100 observing ships had been recruited and this voluntary work by the masters and officers of merchant ships on behalf of the Meteorological Office had gone on continuously—apart from the gaps during the two world wars—throughout this 100 years. At the same time these British voluntary observing ships play a major part in a wider international scheme in which the merchant ships of most maritime countries take part. Out of a world total of about 2,650 observing ships of all types, 570 are British. Sir Graham suggested that this is a unique example of real international co-operation, which is in keeping with the traditions of the sea and of the shipping industry.

Sir Graham went on to say that the value of these observations from ships is very great; it is the only practical way in which information can be obtained about the meteorology of the oceans. The devastation caused in 1955 by hurricanes on the American coast and typhoons in the China Sea emphasizes the value of ships' observations for safety of life at sea. Similarly they are of value to most meteorological services not only for day to day forecasting, for the benefit of shipping, aviation, industry, agriculture and the general public, and also for research and climatological purposes on behalf of many interests.

Sir Graham mentioned the part that meteorology would play in the activities of the International Geophysical Year of 1957/1958 and referred in particular to the work being done in Antarctica during that year. Here again observations from ships at sea will form an important part of the programme.

In presenting the barographs Sir Graham congratulated the recipients and thanked them for their good work, but at the same time he mentioned that these awards are a token of recognition of the voluntary meteorological work done at sea by hundreds of ships' masters, deck officers and radio officers. He was glad to have the opportunity of thus publicly thanking all voluntary observers aboard British ships, as well as the owners of the ships and their Marine Superintendents for the work they do on behalf of world meteorology.

Captain Trayner, who has been a voluntary observer since 1921 and is the first master of the Union Castle Company to gain one of these awards, received it in person.

Captain Youngs, Marine Superintendent, accepted the barograph on behalf of Captain Horwood, who has been a voluntary observer since 1923, and who is the eighth master of the New Zealand Shipping Co. to receive an award.

Captain Wood, Marine Superintendent, accepted the barograph on behalf of Captain Fasting, who has been a voluntary observer since 1924 and is the fifth master of the Cunard Company to receive such an award.

The presentation to Captain Keay was made aboard his ship *Empress of France* at Liverpool on 22nd November, 1955, by Mr. S. P. Peters, Deputy Director of Forecasting in the Meteorological Office. Mr. Peters is in charge of the Central Forecasting Office at Dunstable and of the Marine, Climatological and Public Services Divisions of the Office.

Mr. Peters was entertained to luncheon aboard the ship and was accompanied by Captain Burns, the General Superintendent of the Canadian Pacific Steamships and Commander Cresswell, Port Meteorological Officer in Liverpool.

In making the presentation Mr. Peters mentioned that the Canadian Pacific Co. had been associated with this voluntary meteorological work since 1900 and that Captain Keay who had been a voluntary observer since 1923, was the third master of this Company to receive one of these special awards. C. E. N. F.

NEW ZEALAND METEOROLOGICAL SERVICE

The following is an extract from the report of the Director of the New Zealand Meteorological Service for the year ending 31st March 1955.

" *Services for Shipping.* Forecasts for the waters within three hundred miles of New Zealand, storm warnings covering a wider area, and suitable selections of weather reports from key stations continue to be broadcast by radio telegraphy for ships on the high seas and by radio telephony for the particular benefit of coastal ships. Many of the larger ships also use the map analyses broadcast for general information.

" In the summer months special forecasts are provided for yachtsmen in the Hauraki Gulf, Cook Strait, and Marlborough Sounds.

" *Weather Reporting—Shipping.* The Service maintained its close liaison with shipping through its Port Meteorological Officers at Wellington and Auckland, offering assistance in meteorological matters and enlisting co-operation in the sending of weather reports. During the year 134 additional ocean-going vessels agreed to co-operate while in the south-west Pacific. Over 23,000 weather reports were received from ships during the year, exceeding the previous year's total by 14 per cent.

" *Acknowledgement.* The Meteorological Service is greatly indebted to the many voluntary observers and part-time assistants, ashore, afloat, and in the air, whose conscientious efforts, day after day, provide the basic information needed for the preparation of weather forecasts and climatic studies."

BRITISH EAST AFRICAN WEATHER SERVICES TO SHIPPING IN THE INDIAN OCEAN

The following has been received from the Director of the East African Meteorological Department.

" The East African Meteorological Department of the East Africa High Commission is responsible for the provision of meteorological services for all purposes in Kenya, Tanganyika, Uganda, Zanzibar and the Seychelles Islands. In so far as its marine activities are concerned the Department is charged with responsibility for the issue of radio weather bulletins for shipping on the high seas, for the collection and broadcast of weather reports from ships at sea, and for the provision of advice and assistance to shipping in East African ports.

" The area of the Indian Ocean for which the Department issues radio weather bulletins extends from the African coast to 65°E and from 12°N to 30°S. The Marine Weather Bulletin is prepared and broadcast from the Central Forecast Office of the East African Territories at Nairobi. The broadcast is made daily at 1220 G.M.T. under the call sign ZGV on frequencies 9043 kc/s and 17365 kc/s (a third frequency 12000 kc/s is also utilised but is temporarily in abeyance). It comprises five parts:—

(*a*) A plain language statement of storm warnings for the area,
(*b*) A plain language summary of weather conditions in the area,
(*c*) Forecasts, also in plain language, of the weather expected in the area during the next 24 hours,
(*d*) All available weather reports in code from ships within the area,
(*e*) A selection of weather reports from coast and island stations.

" Unfortunately, the majority of Nairobi's area of responsibility is outside the main shipping lanes and there are few islands (none at all in the north) from which weather reports can be received. In consequence very little meteorological information is normally forthcoming and considerable difficulties are experienced in determining the actual location and extent of weather over much of the region. Even more difficult is the task of preparing weather forecasts. To assist the forecasters, and to improve the quality and extend the usefulness of the Nairobi Weather Bulletin all possible ship weather reports are thus essential. The East African Meteorological Department is particularly grateful to the captains of all ships off the coast of eastern Africa (within the African area of responsibility for the collection of weather reports) which transmit observations regularly to the appropriate shore stations.

" In order to assist shipping of different nationalities it was decided at the Meeting of the World Meteorological Organisation Regional Association for Africa in 1953, that within the African area of responsibility ships could transmit their weather reports to the coastal station of their choice, provided of course that the station in question is listed in Fascicule IV of W.M.O. Publication No. 9* as a ' Shore Radio Station Accepting Ships Weather Observation Messages '. In East Africa there are two such stations, both of which accept ships' weather messages free of charge. One is the Cable and Wireless Station at Mombasa which maintains a listening watch for ships' weather reports on 8 megacycles at each main synoptic hour (0000, 0600, 1200, 1800 G.M.T.) and for half an hour afterwards. A watch is also maintained on 12 megacycles between 1215 and 1230 G.M.T. in case of reception difficulties on 8 megacycles. In addition, messages will be accepted at any time on 500 kc/s. Dar-es-Salaam will also accept messages at any time on 500 kc/s but unfortunately has no high frequency listening watch. Weather reports routed through Mombasa should be addressed " Met Nairobi " and those transmitted through Dar-es-Salaam should be addressed " Met Dar-es-Salaam ".

" It has not yet been possible to nominate an officer specifically for Port Meteorological duties at either Mombasa or Dar-es-Salaam. In consequence the Department has no direct contact with shipping at Mombasa. The Headquarters of the Meteorological Department's Tanganyika division is, however, situated at Dar-es-Salaam new airport and the Meteorologist-in-Charge there is always prepared to visit ships and discuss matters of mutual interest. On receipt of a telephone call he is always only too ready to show ships' officers the work of his office, to discuss questions of tropical meteorology, and to assist with any instrumental troubles which may have developed whilst the ship was at sea."

FALKLAND ISLANDS DEPENDENCIES METEOROLOGICAL SERVICE

The following is an extract from the annual report of the Chief Meteorological Officer of the Falkland Islands Dependencies Meteorological Service for the year 1954:—

(*a*) FORECASTING SERVICE.

(i) *Stanley*. The advertised forecast bulletins for whaling ships operating south of 50°S in the sector 70°W to 40°W were maintained until March 25th (one week after the 1953/54 Pelagic whaling season officially ended).

* See also *Admiralty List of Radio Signals*, Vol. III and *The Marine Observer's Guide*.

(ii) *South Georgia.* The advertised bulletins for whaling ships south of 50°S were issued until March 25th. In the 1954/55 season, the bulletins for whaling ships commenced issue on December 11th.

(*b*) SHIP REPORTS.

(i) *Whaling vessels* 1953/54 *season.* Cape Town transmitted collective messages of whaling ship reports throughout the season at 0500 G.M.T. and 1415 G.M.T., the reports being in cypher in a special code which was only available to the Meteorological Service concerned. A total of 2,450 reports was received between January 1st and March 26th.

(ii) 1954/55 *season.* The 1415 G.M.T. transmission was advanced to 1230 G.M.T. 650 reports were received on this service.

REASONS IN WRITING

It has often been stated in this Journal, and in other of our publications, that the blank space is preferable to the doubtful observation.

As seamen ourselves we realize that there must inevitably be occasional blank spaces in a ship's observations even on a deep sea run, but it is always helpful to the assessing officer if the reason can be given in the Remarks Column for he is thus better able to appreciate the difficulties which a particular ship is up against. The following remarks against missing observations from the meteorological logs of five different ships, received in the Marine Division in the past 18 months, may be interesting to our readers.

2nd June, 1953. Too busy listening to Coronation broadcast.

20th November, 1954. The weather changed, it came in thick;
I had to keep a look-out
And so I didn't have a chance
To get the weather book out.

25th December, 1954. Not recorded owing to escape of mental patient.

25th December, 1954. Apology. No current observation on Christmas Day owing to distention, distortion and possible explosion in region of personal bread basket.

6th May, 1955. Temperatures unreliable. The Second Mate was afterwards 'hanged' to windward.

Although not given to explain the absence of an observation we would have been quite willing to accept the following lines as such if the Master's mood had led him to skip an observation on New Year's Day. They are taken from the meteorological logbook of the full-rigged ship *Quito* of Liverpool (Captain I. C. Gales) Areca to Liverpool and are dated January 1st, 1867.

Gone. 1866 is gone!
One more drop in the ocean of time, gone!
One more click in the clock of eternity, gone!
One more unit to swell the aeons of years in the unfathomable past, gone!
One more seventieth part of an old man's life, gone!
With all its sunshine and shade gone!
With all its calms and storms gone!
With all its heat and cold gone!

L. B. P.

SAILING OF M.V. *TOTTAN*

As was mentioned in the January number of *The Marine Observer* a number of expeditions to the Antarctic are taking place about this time, for the purpose of scientific investigations.

On 22nd November, 1955 the Norwegian vessel *Tottan* sailed from Southampton for the Antarctic, carrying the advance party of the Royal Society's International Geophysical Year Expedition (I.G.Y.E.).

The *Tottan* has been chartered by the Royal Society to carry all the necessary equipment to set up a base in Vahsel Bay, in the Weddell Sea. This includes base hut, all stores, fuel, tractors, sledges and extensive instrumental equipment, in fact all that will be required for the party of 10 men, under their leader, Surgeon Lt.-Cdr. Dalgleish, R.N., to live and operate for a period of from 12 to 18 months.

The plan was to manoeuvre the *Tottan* as far as possible into the ice, after which all equipment must be landed onto the ice and manhandled to the position selected to erect the hut. On completion of the discharging the *Tottan* would sail north again to carry on her normal duties of sealing, off Labrador.

For the duration of the voyage the *Tottan* was equipped as a selected ship and meteorological observations will be taken on the outward passage under direction of Mr. D. W. S. Limbert, formerly of the Marine Division of the Meteorological Office, with the assistance of Captain Lief Jacobsen and the ship's officers. Mr. Limbert is remaining at Vahsel Bay as meteorologist to the expedition.

On the day prior to sailing a ceremony was held on board, when Lord Adrian, President of the Royal Society, bade farewell to the party.

The sailing of the *Tottan* was scheduled for 3 p.m., but the usual climax of departure, when a ship draws away into a murky November mist, was rather spoilt by a last minute delay, when inclination tests to establish the stability had to be carried out and a certain amount of re-stowage of cargo had to be done. Thus, the many friends and relations that had come to speed the members of the expedition on their way had to leave before the *Tottan* actually departed at 8.30 p.m.

The latest news of the *Tottan* is that she reached the mainland of the Antarctic continent at Coats Land (75° 37′s., 26° 45′w.) at the beginning of January, being unable to reach Vahsel Bay because of ice. She left the Royal Society's party there and arrived in Halifax N.S. towards the end of February 1956.

The *Theron*, carrying the British Trans-Antarctic Expedition led by Dr. Fuchs, sailed from London on 14th November, 1955. She was also recruited as a selected ship. After spending several anxious weeks trapped in the ice near the middle of the Weddell Sea, she eventually got clear and re-entered the ice close to the coast, following a similar route to that used by the *Tottan*. She landed her expedition at Vahsel Bay (77° 40′s., 34° 40′w.) and cleared the ice on her homeward voyage on 10th February, 1956.

J. R. R.

Book Reviews

The Edge of the Sea by Rachel Carson. $8\frac{3}{4}$ in. × $5\frac{3}{4}$ in. pp. 276. *Illus.* Staples Press Ltd., 1955. 18s.

In *The Sea around us* Rachel Carson showed that she could not only write a book of absorbing general and scientific interest but that she had a delightful descriptive style and a fine command of the English language. In her latest book, *The Edge of the Sea* she does not fail to keep up her reputation.

As its title suggests, this book concerns " that area of unrest where all through the long history of Earth, waves have broken heavily against the land, where the tides have pressed forward over the continents, receded and then returned ". The book is divided into six chapters entitled respectively The Marginal World, Patterns of Shore Life, The Rocky Shores, The Rim of Sand, The Coral Coast and The Enduring Sea.

In each chapter the author gives us an entrancing and almost frightening picture of the vast and unbelievable population of the various shallow water areas which she discusses. On almost every page is a delightful drawing by Robert W. Hines of one or more inhabitants of the surprisingly thickly populated area of this part of the oceans.

The first chapter is by way of an introduction to the subject and chapter 2 discusses in general terms the geological aspect of the shore-line and the general effect of ocean currents and tides upon the various forms of life that are found there.

Chapters 3, 4 and 5 give a detailed description of the various inhabitants (shell-fish, barnacles, seaweeds, jelly-fish, star-fish, anemones, worms, snails, etc.) which inhabit the waters of the rocky, sandy and coral shores respectively. Chapter 6 is in the form of a soliloquy about the history and beauty of the sea itself and the purpose behind the vast and incredibly varied life that it contains.

The impression one has from reading this book is of the vast number of aggressive and unfriendly creatures there are at the edge of the sea and to wonder if it is ever really safe to go bathing. Rachel Carson, having described the stinging tentacles and pincers and other unpleasant appendages which so many of the creatures of the sea have, seems to have spent an extraordinary large amount of time wading in the water and around the beaches studying the various creatures which she describes. Everything she talks about she seems to know from first-hand study and she must be a very observant person.

Some of her descriptions are very vivid even about such an apparently uninspiring subject as a barnacle. "At low tide the barnacle-covered rocks seem a mineral landscape carved and sculptured into millions of little sharply pointed cones. There is no movement, no sign or suggestion of life. . . . Each cone-shaped shell consists of six neatly fitted plates forming an encircling ring. A covering door of four plates closes to protect the barnacle from drying when the tide has ebbed, or swings open to allow it to feed. The first ripples of incoming tide bring the petrified fields to life. . . . Over each individual cone, a feathered plume is regularly thrust out and drawn back within the slightly opened portals of the central door—the rhythmic motions by which the barnacle sweeps in diatoms and other microscopic life of the returning sea."

In a description of a sandy beach, she says:—

" Sand is a substance that is beautiful, mysterious, and infinitely variable; each grain on a beach is the result of processes that go back into the shadowy beginnings of life, or of the earth itself. . . . No individual sand grain remains long in any one place. The smaller it is, the more it is subject to long transport—the larger grains by water, the smaller by wind."

On the subject of the coral seas, she tells us:—

" By day life is in retreat; life is buried and hidden in crevices and corners of ledge and rock. . . . In the shallow waters of the shore, many creatures must avoid the penetrating sunlight that irritates sensitive tissues and reveals prey to predator. But that which seems quiescent—a dream world inhabited by creatures that move sluggishly or not at all—comes swiftly to life when the day ends. . . . a strange new world, full of tensions and alarms has replaced the peaceful languor of the day. For then hunter and hunted are abroad. The spiny lobster steals out from under the sheltering bulk of the big sponge and flashes away. . . . Crabs emerge from hidden caverns; sea snails of varied shape and size creep out from under rocks. . . . I sense the ancient drama of the strong against the weak."

It is a book which can be recommended without hesitation to anybody who is interested in Nature.

C. E. N. F.

Brown's Nautical Star Chart. Designed by P. Clissold and A. J. Tweddell, Master Mariners. Brown, Son and Ferguson. 5s.

The best method for a young officer to learn to find his way round the heavens will always be a moot point amongst navigators, but we feel that a star chart constructed on the Mercator principle would not give him a good start. The cover of this chart states that it is a " Substitute for the Star Globe " but if the novice attempts to use the main chart as such and endeavours to get a visual impression of the relative position of the stars, which is what he would get from a Star Globe, then he will be confounded. For instance, a line drawn from Megrez and produced through Dubhe, will in actual fact take him to Capella; but on the Mercator chart the line takes him very far from that star. The reverse of the main chart gives a cautionary note regarding its use in high latitudes but the distortion of the heavens when laid out on the Mercator principle is not easily grasped by the inexperienced navigator and we would hesitate to recommend this chart to anyone who has not previously consulted a Star Globe or planisphere, or who has not had some appreciable experience of star identification.

Some criticism of the chart must be made on astronomical grounds. It is clear from observations received in the Marine Division that many ships' officers confuse the nominative and genitive forms of the constellation names and this chart will add to the confusion, since some of the names are given in the nominative and some in the genitive indiscriminately. It is always customary in star charts and atlases to give the names in the nominative case as is done, for example, in the small charts given in the Nautical Almanac. In the present chart every one is given in the genitive with one exception, Orion, which appears in the nominative. The genitive form only should be used when a star is referred to by the letter assigned to it in the constellation, thus the star γ in the constellation Gemini is called " γ Geminorum ".

To add to the inconsistency, all the constellations on the subsidiary identification charts are given in the nominative case while in the list of pronunciations about half are given in one form and the rest in the other.

The omission from the main chart of the most westerly star of the three which form the well-known Belt of Orion is unfortunate, as it makes the identification of the two that are shown impossible; this can only be done by reference to the third of the subsidiary charts, where all three are shown. It is recognised, however, that the omission, together with that of the name Alnilam on the main chart, is probably due to lack of space.

In the subsidiary charts the names of the important constellations Orion and Leo are omitted, while the name of the constellation Cygnus is put so near the star γ Cygni as to make it appear that it is an individual name for this star. There are two stars shown in these charts without names, although the names (Algol and Alhena) are given on the main chart.

The list of pronunciations is open to a number of criticisms. It is wrongly headed, since it includes some of the constellations and a constellation is not a star. About half of the constellation names shown on the main chart are included, the rest being omitted for no apparent reason. The name Ankaa is given without any pronunciation. " Diphda " is misprinted as " Diphaa ". The name "Alphacca " has a more usual form, "Alphecca ", as given in the Nautical Almanac. The pronunciations given have not been compared with a standard authority; most of them appear to be correct, but the " au " in both words of the name " Kaus Australis " should be pronounced as in "Australia ".

L. B. P., E. W. B.

Personalities

OBITUARY. It is with regret that we learn from the Canadian Meteorological Division of the death on 16th November 1955 of MR. EUSTACE B. SHEARMAN, B.E.M., formerly Port Meteorological Officer at Vancouver. Mr. Shearman was appointed officially as Port Meteorological Officer and Weather Observer at Vancouver in 1933 although he had done considerable work in the above capacity since 1921. He was born in Belleville, Ontario in 1873. During his years of service he was weather observer, port meteorological officer, publicity agent and general diplomatic representative of the Canadian Meteorological Service at Vancouver. He did much to inaugurate instrumental observations of sea temperature in the Pacific by voluntary observers and later to collect and abstract this information. In 1947 he was awarded the British Empire Medal for his long and faithful service. He never failed to establish the Meteorological Service in a favourable light.

Mr. Shearman retired in 1948 at the age of seventy-four. He will be well remembered by his many friends in the Meteorological Service and in the Voluntary Observing Fleet.

Notices to Marine Observers

Changes in forecast areas in North Sea and Iceland areas and in times and frequencies for B.B.C. Bulletins for Shipping.

On 1st November, 1955, two new areas were added to those contained in the North Atlantic Weather Bulletin broadcast to shipping by the G.P.O. from Portishead Radio. They cover the vicinity east and north of Iceland up to 100 miles from the coast and are as follows:

(*a*) DENMARK STRAIT extending from 65°N., 35°W. to 68°N., 19°W.

(*b*) NORTH ICELAND extending from 68°N., 19°W. to 64°N., 10°W.

Forecasts for these two areas give surface wind force and direction, with the addition of air temperature when this is expected to be below freezing. This information is broadcast for the benefit of British trawlers operating in this area. The loss of two British trawlers in January 1955, north of Iceland, due to their capsizing because of heavy accumulation of ice on their superstructures, emphasises the value of this information.

From 22nd April, 1956, certain areas included in radio weather bulletins for coastal shipping issued by the G.P.O. and B.B.C. have been amended as follows:

(*a*) The area formerly called Iceland will now be called SOUTH-EAST ICELAND. Thus with the addition of the two new areas Denmark Strait and North Iceland in the Atlantic bulletin, all the coastal waters around Iceland are now covered.

(*b*) Two new areas have been added in the North Sea:

- (i) The area to the eastward of Fair Isle between 59°N. and 61°N. is to be named VIKING.
- (ii) The eastern half of the area Dogger is to be renamed FISHER.

(*c*) The area Heligoland is to be replaced by a new area named GERMAN BIGHT. There are a few minor consequent changes in the limits of some existing North Sea areas.

For definite limits of all these areas see the chart contained in Admiralty Notices to Mariners in the *Radio Times* and in a recent amendment to the *Marine Observer's Guide*, which has been issued to all British voluntary observing ships.

Also, with effect from 22nd April, 1956, the radio weather bulletins broadcast for shipping by the B.B.C. will be included in the Light Programme on 1500 metres (200 kc/s) instead of on the Home Service as at present. The times of these new bulletins will be as follows:

Monday to Saturday	0645 to 0650 G.M.T.
	1340 to 1345 clock time
	1758 to 1800 clock time
	2400 to 0005 clock time
Sunday	0645 to 0650 G.M.T.
	1200 to 1205 clock time
	1928 to 1930 clock time
	2400 to 0005 clock time

The five-minute shipping bulletins will consist of:

(*a*) a statement of gale warnings in force; a general synopsis;

(*b*) forecast for the next 24 hours for each coastal sea area, giving wind direction and Beaufort force, weather and visibility;

(*c*) a selection of *actual* reports from certain coastal stations containing wind direction and Beaufort force, present weather, visibility, barometric pressure and tendency.

The two-minute bulletins will consist of the forecast for coastal sea areas only.

Twenty-four-hour forecasts for the East Anglian herring fishing fleet will be added to all shipping forecasts issued by the B.B.C. during the fishing season (about two months from the beginning of October). The area involved will be entitled SMITH'S KNOLL.

Twenty-four-hour forecasts will also be issued for Scottish fisheries in the area MINCH during the 1340 and 2400 hour broadcasts from Monday to Friday inclusive.

Gale warnings issued by the B.B.C. will be broadcast as near to the hour as possible.

The contents of the bulletins issued by G.P.O. coast stations will remain unaltered, except for the changes in names of areas. W/T transmissions will include South-East Iceland and Viking from Wick, and German Bight from Cullercoats. R/T transmissions will include South-East Iceland and Viking from Wick, Fisher from Cullercoats and German Bight from Humber.

Observations in the North Sea

As stated in the April and July, 1955, numbers of *The Marine Observer*, the Meteorological Office is making a special effort to encourage ships to send radio weather messages when in the North Sea area. Although messages in the full code form FM21A are preferable, messages in the shortened form of codes FM22A or FM23A will be extremely useful and the message can be sent either by W/T or R/T as convenient.

It is desirable, as a general rule, that such messages should only be sent when the ship is outside of 20 miles from shore.

If any British ship in the North Sea area is unable to clear such a message direct to a British coast station she can send the message free of charge as follows:

(*a*) Scheveningen Radio: the message being addressed " KNMI De Bilt ".

(*b*) Blavand Radio, or Skagen Radio: the message being prefixed " OBS " and addressed to " Vejrtjenesten, Kobenhavns lufthavn ".

(*c*) Bergen Radio: the message being addressed " Met Bergen ".

In all cases it is desirable that the message should include the preamble " OBS ".

Meteorological Charts for Ships leaving the River Thames

Since 21st November, 1955, the Meteorological Office has arranged for the masters of merchant ships leaving the River Thames to be supplied with a forecast chart. These charts, prepared at the Meteorological Office in Kingsway, and a sufficient number of them dispatched by rail each day from Charing Cross to Gravesend are delivered to the Pilotage Office. Each pilot who boards an outward bound steamer at Gravesend takes one of these forecast charts aboard for the information of the master of the ship.

At the top of the chart is a general statement about the existing weather situation based upon the 0600 G.M.T. chart that morning. The chart itself is a " prebaratic "; in other words it is a forecast chart, portraying what the general meteorological situation around the British coasts and in the Atlantic will look like at 0600 the next day. Facing the chart is a detailed forecast based upon the 0600 chart that morning.

These arrangements have been made possible thanks to the kind co-operation of the Elder Brethren of Trinity House and British Railways.

Thames Fog Warnings

A recent Admiralty Notice to Mariners draws attention to a scheme whereby warnings are issued by radio from North Foreland (GNF) when visibility is less than ½ mile in the vicinity of Gravesend Reach. Another warning is issued when visibility is restored. The warnings are scheduled and provision is also made for the convenience of hours of watch of ships carrying only one radio officer.

A similar arrangement has recently been introduced by the Netherlands authorities in the New Waterway for ships bound for Rotterdam, see *Admiralty List of Radio Signals*, Vol. V.

Radio Weather Messages

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

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

Radio Weather Messages in African Areas

If the radio officer aboard any ship in African waters has difficulty in contacting a specific coast radio station in a certain area, weather messages may be transmitted to any convenient station in any other African area. (See map in *Marine Observers' Guide*, Part IV.) In each case the message should be addressed to the meteorological authority in that area. For example, if a ship in the area allotted to British West Africa cannot raise any station in that area she could transmit to, say, Dakar addressed Meteo Dakar. The French authorities would then retransmit to all African areas in a collective message.

Inspection of Instruments

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

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SOME ATLASES PREPARED IN THE MARINE DIVISION OF THE METEOROLOGICAL OFFICE AND PUBLISHED BY HER MAJESTY'S STATIONERY OFFICE

Atlantic Ocean

Monthly Meteorological Charts of the Atlantic Ocean (M.O. 483, 1948). 19¾ in. × 24 in. £2 15*s.* (1*s.* 1*d.*).

Monthly Sea Surface Temperatures of the North Atlantic Ocean (M.O. 527, 1949). 19¾ in. × 12¼ in. 10*s.* (3*d.*).

Quarterly Surface Current Charts of the Atlantic Ocean (M.O. 466, 1945). 22½ in. × 17¾ in. 12*s.* (6*d.*)

Monthly Ice Charts of Western North Atlantic (M.O. 478, 1944). 12 in. × 7½ in. 4*s.* (2*d.*).

Indian Ocean

Monthly Meteorological Charts of the Indian Ocean (M.O. 519, 1949). 15¼ in. × 22 in. £3 3*s.* (11*d.*).

Indian Ocean Currents (M.O. 392, Second Edition 1939, reprinted 1950). 30 in. × 20 in. 10*s.* (3*d.*).

Pacific Ocean

Monthly Meteorological Charts of the Eastern Pacific (M.O. 518, 1950). 17 in. × 23½ in. £4 4*s.* (1*s.* 4*d.*)

Monthly Meteorological Charts of the Western Pacific (M.O. 484, 1947). 16¾ in. × 24 in. £2 2*s.* (1*s.*).

Monthly Sea Surface Temperatures of Australian and New Zealand Waters (M.O. 516, 1949). 19¾ in. × 12¼ in. 10*s.* (3*d.*).

Quarterly Surface Current Charts of the Western North Pacific Ocean, westward of long. 160°W., with Monthly Chartlets of the China Seas (M.O. 485, 1949). 21 in. × 16 in. £1 5*s.* (5*d.*).

South Pacific Ocean Currents (M.O. 435, 1938, reprinted 1944). 34½ in. × 24 in. 7*s.* 6*d.* (6*d.*).

Arctic Ocean

Monthly Ice Charts of the Arctic Seas (M.O.M. 390A, revised 1944). 12 in. × 7 in. 3*s.* 6*d.* (2*d.*).

Prices in parentheses give postage (inland)

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