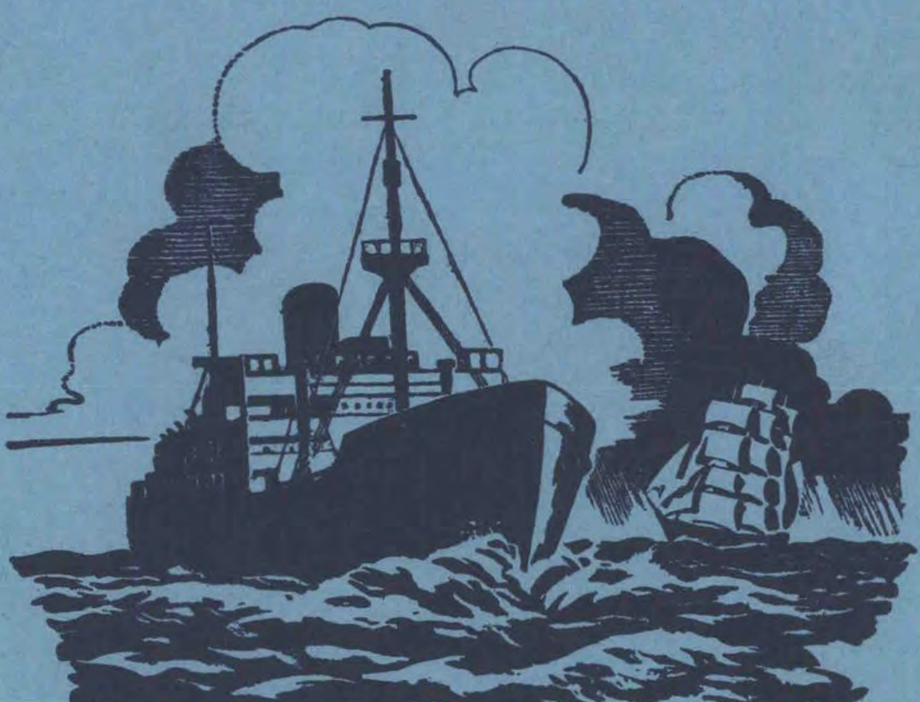
M.O. 656

The Marine Observer

A quarterly journal of Maritime Meteorology



Volume XXIX No. 183

January 1959

SIX SHILLINGS NET

THE
MARINE OBSERVER

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

Vol. XXIX

1959

M.O. 656 AIR MINISTRY

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

VOL. XXIX No. 183 JANUARY, 1959

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Letters to the Editor, and books for review, should be sent to the Editor, "The Marine Observer," Meteorological Office, Headstone Drive, Harrow, Middlesex

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Editorial

The year 1958 was a noteworthy one for scientific exploration. Forming the principal part of the Geophysical Year, it is natural that this should be so, and it seems that those who planned the I.G.Y. will have good reason to feel reasonably satisfied with what has been accomplished (see *The Marine Observer*, January 1957).

There is little doubt that the most spectacular achievements have been the successful launching of artificial satellites by the U.S.S.R. and the U.S.A. The radio messages which these satellites were able to transmit to the earth during the somewhat lengthy period they remained in orbit are expected to provide invaluable data concerning phenomena outside the normal limits of the earth's atmosphere, which would have been unobtainable by other means. There is evidence that the areas explored by these satellites are between about 150 and 2,500 miles from the earth's surface; information about cosmic rays, ozone and temperature in these wide areas may well be of considerable value to meteorologists engaged upon research projects as well as to other scientific workers.

On the surface of the earth, the British Commonwealth Antarctic Expedition successfully traversed that continent, the first time such a feat has been accomplished, and the scientific results of the expedition will be awaited with interest. Throughout the year the various meteorological stations established on the Antarctic mainland—both on the coast and in the interior, and manned by scientists of many nations, including the British station at Halley Bay and the U.S.A. station at the South Pole itself—have continued their regular observational routine of conditions at the surface and the upper atmosphere. Meteorological conditions on the Antarctic continent are of considerable interest to world meteorology and the international effort expended in obtaining these observations from this inhospitable continent are therefore well worth while.

Throughout the year the less spectacular activities of professional meteorologists ashore and aboard weather ships, and of voluntary observers, in the merchant ships of all nations, have played their part in providing information, all of which will eventually be studied on an international basis after it has been extracted from the original records and reproduced by mechanical methods on "micro cards" at the headquarters of the World Meteorological Organization in ,Geneva. Voluntary observers in British ships have contributed a very large amount of data—including a gratifying number of aurora observations—from all oceans.

At the same time, scientists in other fields—oceanographers, seismologists, glaciologists, geologists, etc.—have been carrying out their special studies as part of the I.G.Y. programme, thus playing their part in the greatest international scientific effort which has so far been undertaken. In this troubled political world, it is good to know that scientists and seamen continue to do their best to work together to the common good.

Another outstanding technical achievement during the year, not connected with the I.G.Y. programme, but of particular interest to seamen, was the successful under-water crossing of the Arctic Ocean by the United States nuclear-powered submarine *Nautilus* (2,980 tons). She submerged under the Arctic ice off Point Barrow (Alaska) on 1st August, passed under the exact position of the North Pole on 4th August, and emerged from the ice on 5th August and surfaced near the coast of Greenland in Latitude 79°N. on the Greenwich meridian. The total distance the vessel covered under the ice was about 1,830 miles and the total steaming time was 96 hours. Reports indicate that her submerged speed averaged about 20 knots, and that during her passage of the Arctic Ocean she was at a depth of about 400 feet or more. It appears that sonar devices (similar in principle to the echo-sounding machine) were used not only for depth sounding but also for detecting the ice above; the vessel also had a television camera pointing upwards, and in addition it was possible to observe the ice overhead through the periscope.

This feat was no mere stunt and it seems to open up many interesting commercial possibilities. Certain airlines have already taken the initiative in saving distance by the opening of a regular air service from Europe to the east coast of North America via the North Pole.

The early navigators, Hudson, Franklin, Frobisher and others, have left their name on the map as a reminder of their attempts to find a North-West Passage from Europe to the North Pacific and similarly other pioneers tried to find their way via the somewhat longer route to the east, north of Russia. As mentioned in previous numbers of this journal, the " North-West Passage " has, of recent years, been traversed with icebreaker assistance and the " northern sea route " is similarly exploited with the aid of powerful icebreakers by the U.S.S.R. authorities, the merchant ships following the icebreaker in convoy. But surface navigation through ice is inevitably an expensive and somewhat hazardous business. The *Nautilus* achievement seems to open up the possibility of a submarine cargo service beneath the ice across the Arctic Ocean from ports in the North Pacific to European ports. Such a project is not beyond the bounds of possibility, once the cost of nuclear power has been reduced to a reasonable figure; in fact the President of the United States in an official statement concerning the *Nautilus* said, " This points the way for further exploration and possible use of this route by nuclear-powered cargo submarines as a new commercial sea-way between the major oceans of the world ". The distance from Yokohama to London, for example, by the shortest route (via Suez) is about 11,000 miles; via the North Pole it is only about 6,000 miles.

Quite apart from the saving of distance on this Polar route, submarine navigation for cargo ships has many practical advantages. The vessel is unaffected by wind and waves (and fog), and surface currents; the currents beneath the surface are invariably relatively weak and at a depth of (say) 150 feet a submarine is unaffected by even the largest ocean waves. Thus " heavy weather damage " to ship or cargo would be non-existent and provided she proceeded at a safe depth she could keep to a rigid schedule in the worst weather without excessive fuel expenditure, for it is, after all, wind and waves that delay surface vessels—and fog still plays its part in this respect despite the use of radar and other electronic aids.

The experience of the *Nautilus* showed that with the aid of upward and downward soundings (sonar apparatus) there is no insuperable difficulty in maintaining a safe distance between the ice and the bottom in the Arctic basin. If it became essential for the vessel to surface for safety in the middle of that basin, it seems that it would perhaps be feasible to do so in summer-time because at that season there are usually gaps in the ice. In winter-time the story would certainly be very different in this respect. Ice atlases show that, in the position at which *Nautilus* surfaced, open water could normally be expected in August; on the meridian of 10°E. there is a tongue of open water extending to about 78°N. even in the worst month (April). In the Bering Strait, however, the situation is very different; in August it should normally be fairly clear of ice, but in other summer months there may be quite a lot of ice about, and in the winter the ice extends well south of Bering Strait. Another difficulty is that the water in this area is shallow (as little as 11 fathoms in places), so that a submarine might well find it difficult to navigate with safety under the ice there during certain seasons. A Reuter report quoted the captain of *Nautilus* as saying that, due to the effects of winds and currents, ice in the Arctic basin may form projections downwards of 50 feet or more. The navigation problems of such a voyage are of exceptional interest—but, as more about the bottom topography is known, a safe depth could be maintained fairly easily during the appropriate season and, the currents being so weak, lack of sights while under the ice need not be a major embarrassment. The navigation would depend primarily upon the technical arrangements which are made to overcome the obvious problems associated with a gyro or magnetic compass at the Pole itself. These problems seem to have been satisfactorily dealt with aboard the *Nautilus*.

When clear of the ice a vessel could surface to take celestial observations or fix her position by electronic aids before continuing the voyage beneath the surface. Meteorological considerations must inevitably " come into the picture " because the master would need to know what the weather (particularly visibility) was likely to be where he surfaced, and after all it is the meteorological conditions which govern the amount of ice cover in the Arctic basin itself, and indirectly the direction and force of the under-water currents which the vessel experiences. Surfacing in a very heavy gale is in any case not a particularly pleasant experience and, owing to the violent motion of a submarine when on the surface, solid cargoes would obviously need to be well secured.

These possibilities seem to suggest that the oceanographers (and the meteorologists) may have some fascinating tasks to do in the future in the planning of the submarine cargo routes of the world.

Meteorologically, memories of the summer of 1958 are unlikely to be particularly exhilarating for those who spent it in England and Wales; one of the advantages of going to sea in an ocean-going ship is that one gets some variety of climate (a little taste of " flying fish " weather during a passage if nothing else). But it seems, nevertheless, from available statistics, that despite all the grumbling that occurred, the summer of 1954 was not much drier, and 1956 was rather worse. Rainfall statistics are a reasonable guide. The total amount of general rainfall* which fell over England and Wales during July to September 1958 was 12·5 inches. This amount has been exceeded in 11 years since 1870 and the wettest years, as far as these months are concerned, were as follows:

1956	13·8 inches	1918	14·2 inches
1927	14·9 inches	1879	14·2 inches

The summer of 1958 in Scotland was certainly not abnormal.

* * *

On behalf of the Director-General and staff of the Meteorological Office we send New Year greetings to all the readers of this journal, afloat and ashore.

MARINE SUPERINTENDENT.

THE MARINE OBSERVERS' LOG

January, February, March

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

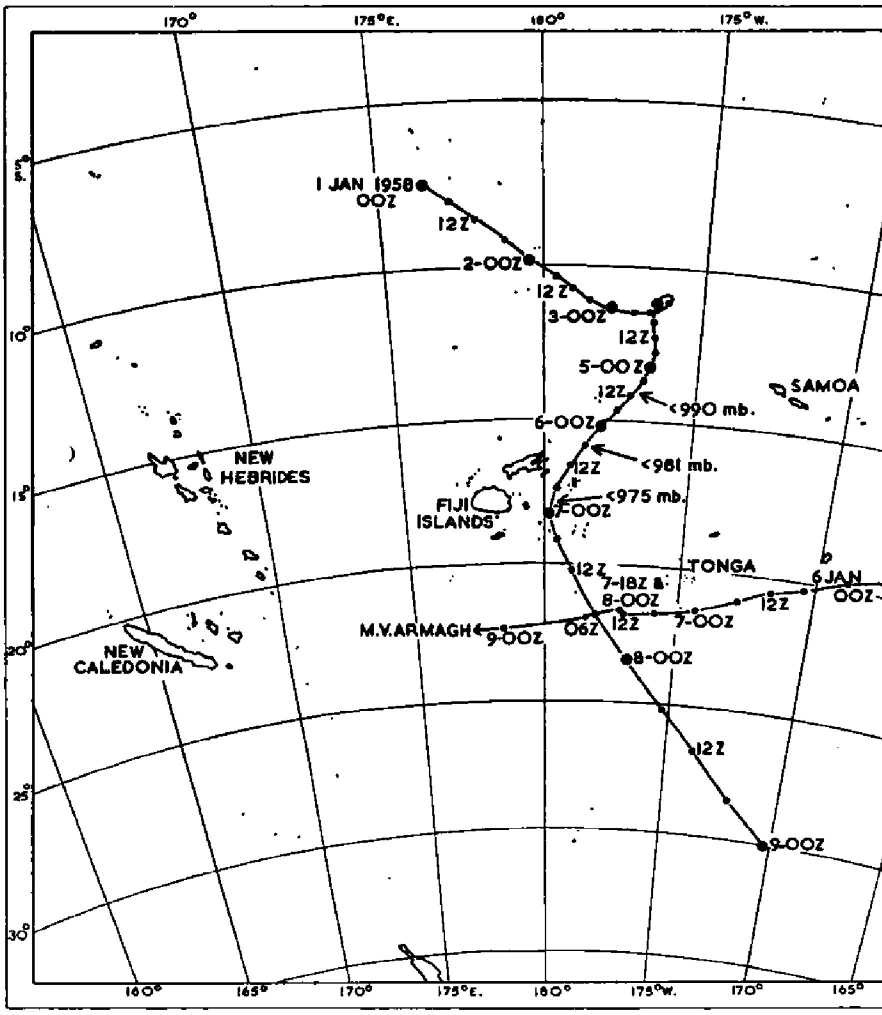
TROPICAL REVOLVING STORM

South Pacific Ocean

M.V. *Armagh*. Captain T. Hastings. Balboa to Brisbane.

5th January, 1958, at 1000 G.M.T. Suva Radio reports: " Hurricane centred 13° 12'S., 176° 40'W. Centre below 990 mb. Moving SSW. at 5 kt."

*Calculated as an average of the rainfall for about 100 stations in the British Isles.



Positions of hurricane and M.V. *Armagh* at six-hourly intervals.

Position of ship: Approximately 19° 00′S., 165° 48′W.

6th January, at 0008. Suva reports: "Centre 14° 18′S., 177° 30′W. Moving SSW. at 5 kt. Gusts to 100 kt 50 miles off centre."

Position of ship: Approximately 19° 48′S., 168° 54′W.

At 0600 Suva reports: "Centre 15° 30′S., 178° 24′W., moving SSW. at 5–10 kt. Below 981 mb."

Position of ship: 20° 18′S., 170° 24′W.

At 2100 Suva reports: "Centre 17° 48′S., 179° 36′W., moving SSW. 8 kt. Below 975 mb. Wind 100 kt within 50 miles."

Position of ship: Approximately 21° 09′S., 173° 33′W.

7th January at 0900. Suva reports: "... moving SSW. to S. at 15 kt." No further bulletins were to be issued.

Position of ship: Approximately 21° 45′S., 176° 27′W.

Up to this point the tracking of the centre had been very good and the master requested Suva Radio to continue forecasts as the vessel would be in the path of the storm if it should recurve.

At 1200 the wind increased to 40 kt from E′N. with continuous heavy rain and visibility of 2 miles. Barometer 1000·2 mb. The height of the waves was about 50 ft. Vessel hove-to.

Position of ship: 21° 48′S., 177° 00′W.

At 1700 the wind was 90 kt and had backed to NNE. Continuous heavy rain. Visibility badly affected by spray and rain. Barometer 995·6 mb. Waves increased to about 75 ft. Hove-to with wind two points on the port bow.

At 1900 the wind slowly backing to N′W. and moderating slightly to force 11. Vessel following round, keeping wind two points on the port bow.

At 2100, wind NNW., force 10–11. Continuous heavy rain. Visibility under 50 yd. Confused sea.

At 2400, wind NW., force 10. Heavy rain continues. Visibility under 50 yd. Barometer 998·5 mb.

Position of ship: Approximately 21° 36′N., 177° 06′W.

From this time onwards the wind slowly moderated until at 0300 on 8th January course was resumed at 8 kt. By 0600 G.M.T. the wind had moderated enough for full speed to be made.

It was later calculated that the ship passed within 70 miles of the centre of the hurricane.

Note. This observation was forwarded to the Director of the New Zealand Meteorological Service, who comments:

"The hurricane was first noticed on the 0000 G.M.T. chart for 1st January, 1958, as a small circulation in the Ellice Group with central pressure 999 mb. The storm moved slowly south-eastward at almost 8 kt and later became even more slow moving (possibly about 5 kt). On 4th January the storm became almost stationary, or perhaps described a small loop, and soon after began to increase in intensity. During 5th January winds of full hurricane strength were reported from Wallis Island as the hurricane began to move south-south-westward towards the Lau Islands and the eastern parts of Fiji. The Lau Islands felt the full effects of the storm and native villages and coconut plantations suffered severe damage.

"The centre passed about 100 miles to the east of Suva, Fiji, about 2000 G.M.T. on 6th January. At that distance the maximum wind recorded was 50 kt in gusts.

"The hurricane then turning south-eastward and increasing its speed of movement away from Fiji. This part of the track lay very close to the *Armagh* which for some time was hove-to about 80 miles WSW. of Nukualofa in the Tonga Group. The observations from the ship illustrate very graphically the effects of a violent hurricane passing about 70 miles westward of the ship's position. The lowest pressure reported by land stations was 970·6 mb. The track of the hurricane is shown in the accompanying figure."

WATERSPOUTS

Mediterranean Sea

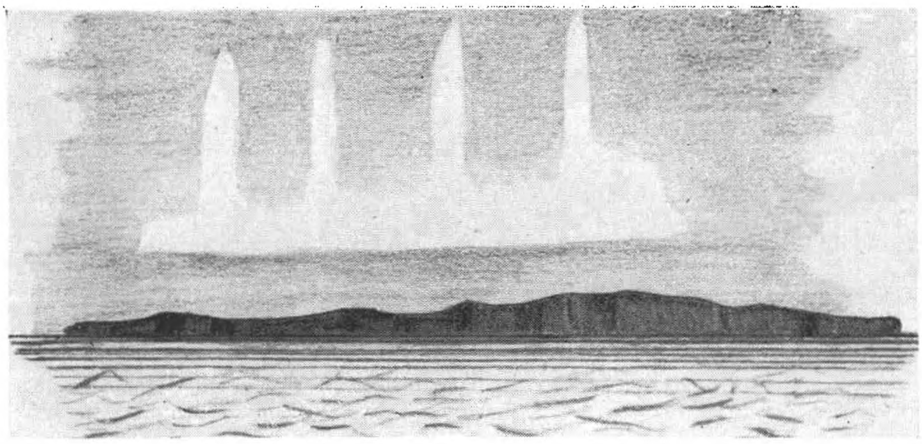
The following report has been received from the Director, Naval Weather Service.

On 3rd March, 1958, various warships were at sea some 30–40 miles SE. of Malta. The synoptic chart showed a complex low over southern Italy and the Adriatic with a trough developing over Tunisia; the wind direction and strength were 290°, 12 kt at the surface, 270°, 27 kt at 5,000 ft, and W'ly winds continued with increasing strength up to 50,000 ft. The night ascents from Malta and Wheelus Field (Tripoli) showed relative humidity 72% and marked instability up to 10,000 ft.

The morning began with bright sunshine, extreme visibility and cloud 1/8 Cu base 1,500 ft. At about 0600 G.M.T. an isolated bank of cloud was observed approaching from the W. It took the form of a long roll of Cb, very dark beneath and with a heavy, congested appearance but comparatively little vertical development. Pilots who flew near reported severe turbulence at 5,000 ft, 1,000 ft below the tops. Both edges of the cloud were very clearly defined, the leading edge in the form of a roll and the trailing edge an almost vertical cut-off, extending N–S. for a distance of about 30 miles.

At 0655, as the ships were drawing near, a thin tornado-like finger was seen descending from the cloud with a rotating spray of water rising to meet it. It was quickly followed by others, and within a minute or two there were four complete waterspouts joining cloud and sea. (Photographs are shown on opposite page.) The disturbance of the water was in each case quite localised, and the diffuse appearance of the lower portions of the spouts made it difficult to estimate their dimensions; 300 ft was judged to be the average height of the spray columns and 50 ft the diameter of the spouts.

None of the ships went sufficiently near to a spout to be able to make a closer examination of the violence accompanying it, and none of the spouts lasted for more than 10 min. No marked change in temperature, dewpoint, or other meteoro-



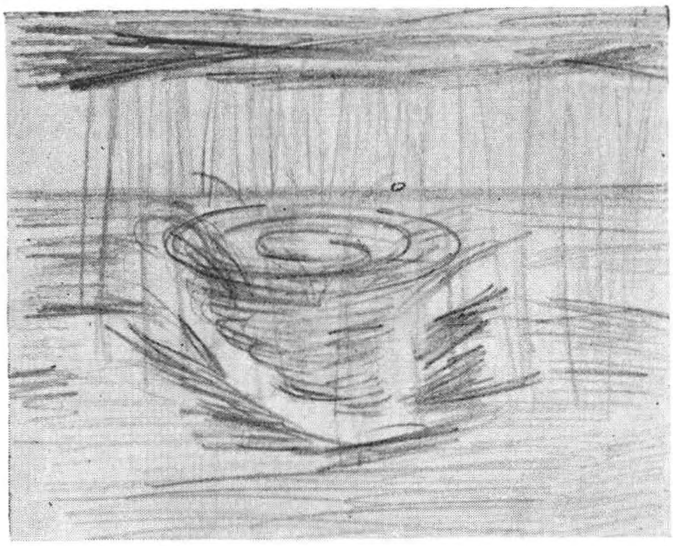
Aurora observed from M.V. *Port Pirie* (see page 17).

Admiralty photograph

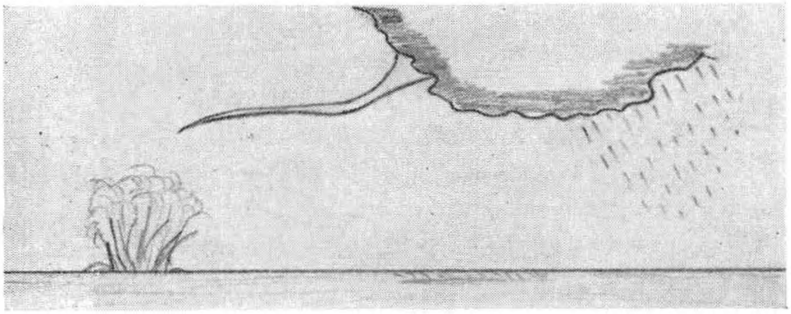
The photograph above is a view from H.M.S. *Birmingham*, showing the cloud formation from which the waterspouts developed (see the report from the Director of the Naval Weather Service on page 8). The photograph below shows three out of the group of four waterspouts observed from H.M.S. *Eagle* at 0700 G.M.T.

Admiralty photograph

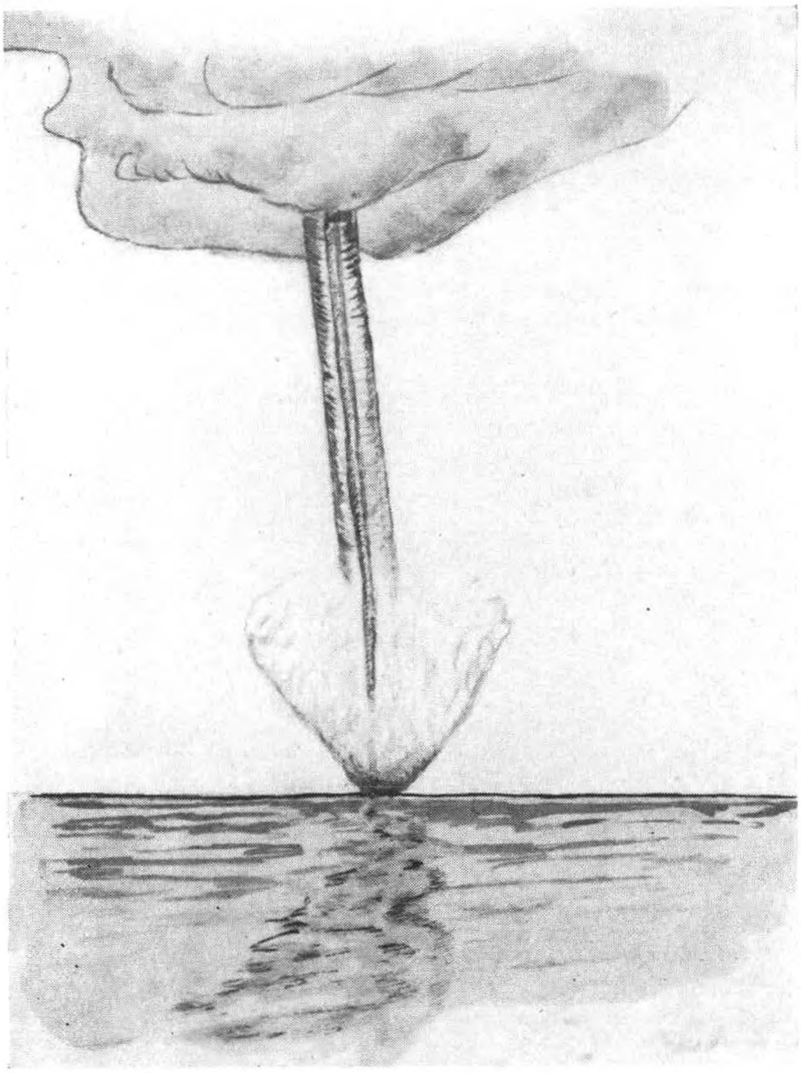
(*Opposite page 9*)



Whirlwind observed from M.V. *San Velino* (see page 9).



Waterspout observed from M.V. *New Zealand Star* (see page 9).



Waterspout observed from S.S. *Clan Chattan* at 0421 G.M.T. on 18th March, 1958 (drawn by Captain Baxter.) See page 9.

logical conditions which might have indicated the presence of a cold front, accompanied the passage of the cloud. By 0715 it was well astern of the ships, the spouts had all gone, and the weather resumed its former brilliance.

Indian Ocean

S.S. *Clan Chattan*. Captain R. R. Baxter. Beira to Cochin. Observers, the Master, Mr. M. D. Cooper, 3rd Officer, and Cadet Cook.

18th March, 1958. While passing Haddummati Atoll at 0421 G.M.T. a waterspout was sighted bearing 059° at 5½ miles (see drawing on opposite page). It had a double funnel, the outer one being the shorter. At 0431 the inner funnel vanished and the outer one shortened. Five minutes later the spout re-formed, the inner one first; when the spout was fully developed, the outer one appeared again. The spout now bore 076° at 4 miles. This pattern of change, 5 min fully established and 5 min hesitating, continued until 0521 when the spout, bearing 180° at 9 miles, ultimately collapsed. The two " tubes " were clearly visible with the naked eye and the spout gave a reasonable echo on the Decca radar screen. Large Cu and Cb were seen all round, from which showers were falling. The sea was glassy calm.

Position of ship: 02° 00′N., 73° 50′E.

Note. Observational evidence indicates that a normal waterspout consists of an apparently hollow tube, the walls of which are formed by cloud particles in spiral motion. The cloud particles are formed by condensation of water vapour due to dynamic cooling, arising from the reduction of atmospheric pressure in the core of the spout. The cloud particles are driven out from the axial area of low pressure by centrifugal force and so form the walls of the tube.

The core of the tube is sometimes seen to be darker than the walls and sometimes lighter. It may not be seen at all, being presumably obscured when the cloud particles around it form a thicker or more concentrated mass.

Double-walled spouts have been recorded at times, and one of the photographs taken on board M.V. *British Consul* clearly shows a double wall in the upper part of the spout, the core being invisible. These photographs were published opposite page 12 of the January 1956 number of this journal. In the the sketch on opposite page it is clearly seen that the axial part of the spout had dark walls with a lighter interior part, thus appearing to form a narrow spout within a wider one.

South Pacific Ocean

M.V. *New Zealand Star*. Captain E. L. Jermyn, M.B.E. Auckland to Panama. Observer, Mr. I. C. Wood, 3rd Officer.

27th March, 1958. The waterspout shown in the sketch (on opposite page) was observed between 0330 and 0340 G.M.T., at a distance of about 4 miles from the ship. It occurred at the rear end of a passing rain cloud. The funnel had a " rat-tail " shape, with a prominent gap between the end of the " tail " and the top of the disturbance on the sea surface.

Position of ship: 37° 11′S., 179° 51′E.

WHIRLWIND

North Atlantic Ocean

M.V. *San Velino*. Captain W. W. Gibb. Gothenburg to Curaçao. Observers, Mr. H. F. Mitchell, 2nd Officer, and Mr. D. Ambler, Radio Officer.

14th January, 1958. At 1750 G.M.T. a small whirlwind was seen about 1 mile away, travelling at an estimated speed of 25–30 kt. It was about 10–15 ft across and rotating in an anticlockwise direction, causing spray to be lifted to a height of approximately 10 ft (see drawing on opposite page). Showers were falling from heavy Cb overhead, estimated to have a height of 2,000 ft.

Position of ship: 28° 48′N., 47° 18′W.

RADAR SCANNER STRUCK BY LIGHTNING

Gulf of Guinea

M.V. *Trelissick.* Captain G. A. McKay. Approaching Takoradi. Observers. Mr. T. Hallett, 3rd Officer, and lookout man.

25th February, 1958, at 2240 G.M.T. During an electrical storm the radar scanner was struck by lightning, causing a partial failure of the installation. The odd point is that the main transmitter aerial down lead is within 4 ft of the scanner and the aerial charge indicator showed no more charge than usual: also, the scanner itself showed no visual signs of having been struck. Another interesting thing is that the compass showed no alteration in error. The radar was in use at the time.

Position of ship: 4° 58'N., 1° 19'W.

Note. A copy of this report has been sent to the Radio Advisory Service.

ST. ELMO'S FIRE

North Atlantic Ocean

M.V. *Tarantia.* Captain A. J. F. Colquhoun, M.B.E. Glasgow to New York.

26th February, 1958. At 0135 G.M.T. three bright white balls of light, due to a discharge of static electricity, were seen on top of the dodger stanchions on the forecastle head bulwark. Sheet lightning was passing over the ship, and at approximately 0030 an exceptionally brilliant flash occurred directly over the bow. No electric discharge was seen at the truck of the mast, jumbo derrick or other high points.

Position of ship at 0001: 42° 00'N., 59° 06'W.

REVOLVING RING OF CLOUD

Gulf of Aden

M.V. *Achilles.* Captain Digby Jones. Belawan to Aden. Observers, Mr. D. M. Wright, 3rd Officer, and Midshipman Howel.

1st February, 1958. At 2300 S.M.T. a cloud, in the form of a circle about 1 mile in diameter, was observed lying above and ahead of the path of the ship. When the vessel came nearer, the cloud was clearly seen in the moonlight to be revolving in a clockwise direction. The centre of the circle was completely cloudless. While passing under the cloud there was a fall in barometric pressure of 3·5 mb and a 3°F drop in temperature. The sea also was noticeably calmer under the clear sky. As the vessel left the area, both pressure and temperature reverted to their former value. The wind which had been NE., force 4, for a long time, veered completely round while the vessel was passing under the cloud, and finally settled again in the NE. quadrant, at force 3. When last seen, the cloud formation was thought to be breaking up. The phenomena observed lasted for a little over 15 min.

Position of ship: 11° 58'N., 52° 09'E.

Note. This appears to be due to a large vortex having formed in a relatively shallow but unstable layer of the atmosphere. The cloud was probably in more stable air above the vortex but was rotated frictionally by the circulation below it.

DUST HAZE

North Atlantic Ocean

M.V. *Drina.* Captain F. J. Swallow. Las Palmas to Buenos Aires.

6th January, 1958. On arrival at Las Palmas at 1545 G.M.T. we experienced thick haze which at times reduced visibility to a mile. By the time of departure at 2200 the same day, the haze had cleared considerably, but there was still a belt of it, approximately 200–300 ft thick, which persisted until 1330 next day and reduced the visibility at times to 2½–3 miles. During the 4–8 p.m. watch on 8th January, visibility became almost normal for a time, but it deteriorated again. The ship during these three days was covered with a very fine red-brown dust, apparently carried from the Sahara Desert by the moderate to fresh E'ly wind.

Position of ship at noon on 8th: 20° 12'N., 19° 06'W.; on 9th: 15° 00'N., 21° 54'W.

SEA SMOKE

Oslo Fjord

S.S. *Regent Hawk*. Captain G. H. Hobson. Pointe à Pierre to Slemmestad. Observers, the Master, Mr. P. W. Cresswell, 2nd Officer, and Mr. N. A. Baird, 3rd Officer.

8th February, 1958. Between 0800 and 1130 G.M.T. extensive sea smoke was seen during the approach to Lille Faerder from SW., to take a pilot. On the way to Slemmestad the sea smoke became more pronounced and at 1115 it became so thick that visibility from the bridge was reduced to 30 yd for several minutes, up to a height of 25 ft above the sea. Air temp. 13°F. Sea at 0700 G.M.T., 38°, at 1100, 32° (by condenser intake).

Boston (Mass.)

M.V. *Windsor*. Captain D. A. Forrester. Belfast to Boston (Mass.).

18th February, 1958. At 1300 G.M.T. the air temperature was —4°F, sea smoke was present and ice was starting to form in the harbour.

CURRENT RIP

Mexican Pacific waters

S.S. *City of Birmingham*. Captain P. C. Arthur. Panama to Long Beach. Observer, Mr. R. F. Jones, 3rd Officer.

7th January, 1958. At 1010 S.M.T. a current rip in the shape of a narrow band of very ruffled water was observed coming from the direction of the land, heading SSW. and curling slightly round to S. This very clearly defined band was about 30–40 ft wide and the vessel sheared sharply 25°–30° to port, on entering it.

Position of vessel: 14° 56'N., 96° 43'W.

LINE OF DEMARCATION

North Atlantic Ocean

M.V. *Interpreter*. Captain W. Weatherall. Liverpool to Barbados. Observer, Mr. R. Potts, 3rd Officer.

16th February, 1958. The vessel passed from a rippled sea, through a demarcation line of weed extending from horizon to horizon, into a smooth, glassy sea. A rise in sea temperature from 70° to 72°F occurred and a light breeze died away, on crossing into smooth water. Air temp. 70°F.

Position of ship: 25° 38'N., 40° 01'W.

DISCOLOURED WATER

South Pacific Ocean

S.S. *Orcades*. Captain A. E. Coles, R.D. Noumea to Suva. Observer, Mr. M. D. Rushan, Junior 3rd Officer.

11th January, 1958. A patch of discoloured water was observed about 0100 G.M.T. lying in an east–west direction. It was about 400 yd long by 100 yd wide, light green in colour, with what appeared to be patches of floating sand in it. The wind was E'S., force 4.

Position of ship: 19° 48'S., 173° 26'E.

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

" *Orcades*, to the east of the Southern New Hebrides, probably encountered a *Trichodesmium* bloom. The mention of the appearance as of floating sand is very characteristic. This observation could suggest uncharted shoal water, the primary cause of the earlier requests for discoloured water reports, but modern echo sounders have practically ruled out this type of deception."

C.S. *Norseman*. Captain J. G. West. San Pedro to Callão.

11th January, 1958. At 1940 G.M.T. the vessel entered discoloured water which in colour was a dark crimson-brown, almost resembling blood. The reddish discoloration persisted for about ½ mile on each side of the vessel, then a definite line of demarcation was met, beyond which there was clear water. Large patches of darkly coloured water were encountered about 1½ miles after entering the clear water. The total length of the area of discoloration was some 2½ miles. An hour previous to meeting the discoloured water, a whale of undetermined species surfaced and blew just once, close to the vessel. It is unfortunate that the pressure of navigational duties prevented the taking of a sample of the water.

Position of ship: 10° 06'S., 79° 06'W.

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

"*Norseman*'s red water bloom in the Peru Current, north of Callão, remains more of a guess in the absence of samples. It might be *Ciliates* as Darwin recorded further south, *Dinoflagellates*, perhaps the most probable, or even *Radiolaria* as found by the *William Scoresby*. A sample would have been particularly interesting from that part of the world."

Indian Ocean

S.S. *British Sailor*. Captain H. G. Jeary. Mena al Ahmadi to Cape Town. Observers, Mr. W. E. L. Stevens, 3rd Officer, and Watch on deck.

21st January, 1958. At 1100 G.M.T. narrow streaks of discoloured sea water were observed, extending along the line of the wind direction from horizon to horizon. The discoloration was most pronounced along the southern side of the streaks, where it resembled sand in the water. On the other side, the colour changed gradually from yellow to greenish-yellow. A sample was taken and found to contain many thousands of small particles, too small to measure, resembling minute grass seeds when examined through a magnifying glass. There appeared to be about 100 to the cubic inch of water. They had no visible motion but were simply suspended in the water. Sea temp. 85°F.

Position of ship: 21° 40'S., 17° 40'E.

Note. Dr. T. J. Hart, of the National Institute of Oceanography, comments that this observation " almost certainly refers to a bloom of the microscopic blue-green alga *Trichodesmium*, but it is impossible to guess which species without higher magnification of a preserved sample".

DEAD FISH

Indian Ocean

S.S. *City of Cape Town*. Captain T. Lovell. Aden to Karachi. Observer, Mr. D. Russell, 2nd Officer.

25th January, 1958. Numerous dead fish were seen between 0900 G.M.T. and dark, but unfortunately a specimen could not be obtained. They were observed carefully with the aid of binoculars during the 4–8 p.m. watch and it was seen that they were about 6–8 in. long with silver sides and belly: the back, dorsal fin and tail were orange and red, though some fish were red all over. All the fish were floating on their sides. Although there were sea birds in the vicinity they were apparently not feeding on the dead fish. No sign of distress or weakness was evident in flying fish which were seen.

Position of ship at 0900: 20° 40'N., 61° 07'E.

Note 1. Mr. N. B. Marshall, of the Natural History Museum, comments:

" While these records of dead fish from the Indian Ocean are interesting and important, the information given about the fish is not enough for their identification. This will not be possible until some are obtained. Failing that, an accurate sketch or photograph would be helpful. The position in which the fish were seen is interesting in view of the upwelling of water along the Arabian coast. This usually leads to a vigorous growth of plankton, including species of plants that may be noxious to fishes."

Note 2. Similar observations, made in 1957, are recorded in the article on page 30 of the present number of this journal.

JELLYFISH

Bahama Islands

M.V. *Runswick*. Captain J. S. Pinkney, O.B.E. Leith to Port Arthur. Observer, Mr. S. Ward, Chief Officer.

23rd February, 1958. At 1200 G.M.T. vast shoals of " Portuguese Men o' War " were seen all round the vessel. Sea temp. 74°F. Sea calm.

Position of ship: 25° 55'N., 78° 00'W.

Note. Dr. W. J. Rees, of the Natural History Museum, comments:

" I was greatly interested in this observation. These *Siphonophores* drift at the will of the wind and under favourable conditions vast numbers of them are driven together."

PHOSPHORESCENCE

Mediterranean Sea

M.V. *Eastern City*. Captain I. Williams. Antwerp to Japan. Observers, the Master, Mr. R. Croft, 3rd Officer, and Mr. R. Griffin, Apprentice.

21st March, 1958. At 2300 G.M.T. numerous patches of brilliant green phosphorescence were observed, varying greatly in size and shape and apparently moving at great speed. Many large fish, giving off a luminous glow, were seen darting in and out of the phosphorescent patches. Air temp. 59°F. Smooth sea and slight swell.

Position of ship: 36° 10'N., 2° 58'W.

North Atlantic Ocean

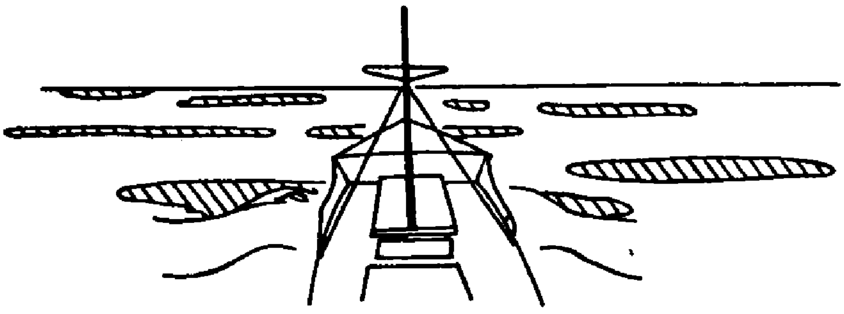
S.S. *Tetela*. Captain F. T. Barber. Dakar to Tiko. Observer, Mr. D. F. Baker, 3rd Officer.

9th February, 1958. From about 2200 G.M.T. considerable phosphorescence was seen in the bow wave and wake, also in the " white horses " raised by a NW'ly wind of force 4. The light was pale blue and quite bright at times; it occurred only in the broken water and no pieces of phosphorescent material were seen, but a number of small shoals of fish caused a glow in the water as they moved. It was more apparent on the lee side of the ship, and diminished considerably after 2330. By 2345 it disappeared. The display was remarkable by reason of the definite blue glow emitted instead of the greenish colour more often associated with phosphorescence. Sea temp. 74°F. Speed of vessel 14 kt.

Position of ship: 12° 40'N., 17° 24'W.

S.S. *City of Manchester*. Commodore E. Scrymgeour. Las Palmas to Cape Town. Observer, Mr. R. B. Meikle, 3rd Officer.

24th March, 1958. At about 2340 G.M.T. several light grey patches were seen



on the water ahead, each approximately 200 ft by 50 ft and lying in an E–W. direction. On the ship's bow entering these patches very bright phosphorescence was seen in the bow waves and down the vessel's side, fading gradually towards the stern. There had been some phosphorescence before this, but that produced in the patches was very much brighter. Air temp. 66°F, sea 66°. Wind NE., force 2. Sea slight with low swell.

Position of ship: 21° 52'N., 17° 45'W.

S.S. *Tweed*. Captain C. Robertson. Buenos Aires to Las Palmas. Observer, Mr. W. Carver, 3rd Officer.

31st March, 1958. Between 2250 and 2315 G.M.T., what appeared to be phosphorescence in the air was observed. Small phosphorescent particles passed upwards from the sea to a height of about 3½ ft all round the ship. At no time before 2250 or after 2315 was any phosphorescence visible either in the sea or in the air above it. Although the moon was high in the sky, it was obscured by cloud at the time the phosphorescence was seen. Air temp. 81°F. Wind ESE., force 2–3. Visibility excellent.

Position of ship: 02° 45′N., 29° 02′W.

Note. This is an observation of the highest interest and Mr. Carver is to be congratulated on having observed such a phenomenon. As far as we know, no such observation has ever been made before.

Eight observations of phosphorescence seen in the air, without any luminosity being seen in the sea at the same time, have previously been put on record. All, with one exception, have been recorded in, and subsequent to, the year 1950. Two of them were observations made by British ships and were published in this journal, S.S. *City of Khios* on page 149 of the July 1955 number and S.S. *Dunkery Beacon* on page 78 of the April 1956 number. The phenomenon appeared to be quite inexplicable. In 1954, however, Dr. Rodewald of Seewetteramt, Hamburg, suggested the possibility that light-producing micro-organisms might be able to leave the sea, in spite of gravity and surface tension, but the *modus operandi* of the transfer, if such could actually occur, was quite unknown. The great value of the present observation lies in the fact that luminous organisms have, for the first time, been seen to leave the sea. It is highly unlikely that any creature larger than a micro-organism could be so transported and the objection that micro-organisms would not be visible with the unaided eye could be met by the consideration that the light emitted by them might well be seen, if strong enough, while the organisms themselves could not be seen.

South Pacific Ocean

S.S. *Gothic*. Captain L. J. Hopkins. Wellington to Balboa. Observer, Mr. J. Bain, Apprentice.

25th January, 1958. At 1300 G.M.T., marked phosphorescence which originated under the stern was seen in the wake. It took the form of countless oval-shaped pieces, approximately 9 in. by 3 in. in size, which moved in an agitated manner. Many of these were caught up in the turbulence of the wake and carried along for about 10 sec, before falling astern. Since the night was dark and overcast, the wake, which had a milky hue, showed up brightly for quite a distance. No phosphorescence was seen elsewhere. Air temp. 65°F, sea 65°.

Position of ship: 36° 11′S., 168° 08′W.

BLUE RAYS AFTER SUNSET

South China Sea

M.V. *Angelina*. Captain P. V. Pattison. Observer, the Master.

28th February, 1958. Just after sunset when off the coast of Viet Nam, a peculiar blue light was observed in the western sky in the form of a fan-shaped shaft of Prussian blue extending from approximately 4° to 40° above the horizon. The base of the shaft bore from between 264° and 269° and it inclined to the N. at an angle of approximately 15°. The sun had set behind the land and there were low layers of brownish-red colouring in the sky, which faded with altitude to a pale pink. Some small low Cu type clouds were also present.

The blue ray was very clearly defined and there were four other pale thin indistinct rays lower down to the N. The phenomenon was visible for some time, the southern edge of the principal ray remaining well defined until the sky darkened.

Position of ship: 12° 18′N., 109° 36′E.

Note. This vessel is one of the voluntary observing ships on the Hong Kong Fleet List and the observation has been sent by the Director of the Royal Observatory, Hong Kong, who remarks that both the 0900 and 1200 G.M.T. charts on 28th February show isolated Cb clouds over Viet Nam which might have caused the phenomenon.

Deep blue fans or rays seen in the sky after sunset are shadow phenomena produced by the obstruction of the sun's rays by some object of relatively high altitude below the observer's horizon. The clearly defined shaft seen may well have been the shadow of a Cb cloud. An alternative explanation is that it was the shadow of a high hill or mountain, as the hinterland in this region rises steeply in height. The indistinct rays seen further to the N. were similar phenomena, where the obstructing objects were further away and also further, angularly, from the line from the observer to the sun's position below the horizon.

GREEN FLASH AT MOONSET

South Pacific Ocean

M.V. *Suffolk*. Captain C. P. Robinson. Balboa to Auckland. Observer, Mr. A. L. R. McNeil, 3rd Officer.

27th March, 1958. As the seven-day old moon was passing behind two banks of cloud low down on the horizon a watch was kept for any flash that might occur. None was observed, however, until the upper tip of the moon disappeared below the horizon at 0712 G.M.T., when a bright green flash was seen. The moon at the time was reddish-orange in colour. Air temp. 79°F, dew point 71°. Wind ENE., force 4.

Position of ship: 18° 32'S., 127° 27'W.

Note. We do not receive many observations of the green flash at moonset. The presumed reasons for this are that it is not so often looked for and is a relatively faint flash compared with that given by the sun, except perhaps on occasions of full moon. The observation of a bright flash with the moon not quite at first quarter is therefore of interest.

ABNORMAL REFRACTION

Florida Strait

S.S. *Tribesman*. Captain W. S. Eustance. Galveston to Land's End. Observers, Mr. J. B. Mitchell, Chief Officer, Mr. J. A. Billington, 2nd Officer, and Mr. M. J. Dolson, 3rd Officer.

25th January, 1958. During the afternoon several examples of abnormal refraction were observed, the most outstanding one being illustrated here. A ship, estimated

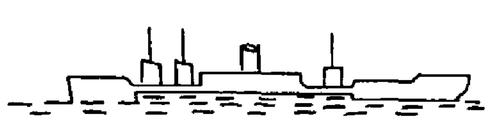


Fig. 1

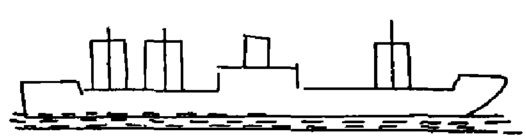


Fig. 2

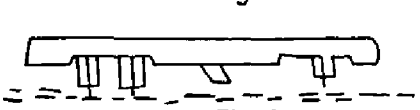


Fig. 3

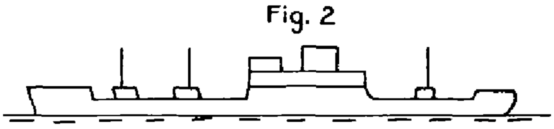


Fig. 4

to be $8\frac{1}{2}$ miles away, appeared to take the successive forms shown in Figs. 1 to 4. The appearance at 1500 S.M.T. shown in Fig. 1 was soon followed by that of Fig. 2. Some 15 min later the image became inverted as in Fig. 3. This persisted for about 10 min before assuming the appearance of Fig. 4. Air temp. 66°F, sea 71°. Wind WNW., force 3–4.

Position of ship: Off Miami.

FOG BOW

Off Cape Race

S.S. *Cairnavon*. Captain G. H. Percy. Newcastle to St. John's, New Brunswick. Observer, Mr. R. M. Somers, 3rd Officer.

17th January, 1958. At 1200 G.M.T. during thick fog, a semicircular bow, of 74° diameter, was seen on the starboard beam. The outside of the arc was tinged with red, otherwise the bow was colourless. At 1330, with the fog clearing slightly, the colour became more distinct. At 1345, when the two ends of the arc joined, the base of the circle appeared to be at the ship's waterline, amidships. Two inner semicircles were now seen, having well-defined colours. They disappeared at 1400, but the circle persisted until about 1600. Air temp. 33·5°F. Wind ESE., force 3.

AURORA

Note. Observations have been received from 17 ships, in addition to those published below. All have been forwarded in full to the Aurora Survey, towards which ships' observations are making a very valuable contribution. During the period January to March 1958 covered by the present Marine Observers' Log, the dates when aurora was most widely observed were the nights of 10th to 11th February and 11th to 12th March.

We have received information that a radio fade-out was experienced by eight ships on the night of 10th to 11th February. Three of these also reported aurora and the observations of two, M.V. *Fresno City* and S.S. *Tenagodus*, are published below. Mr. G. O. Evans, of the Post Office Engineering Department, states that a severe ionospheric disturbance started at 0200 G.M.T. on 11th February and continued to about 1200 on 12th February. All radio, telephone and telegraph circuits incoming to the United Kingdom were affected. The North Atlantic circuits were interrupted for the whole of their scheduled hours of operation on the 11th.

North Atlantic Ocean

S.S. *Loch Avon*. Captain R. C. S. Woolley, R.D. London to Bermuda. Observer, Mr. N. J. D. Smith, 2nd Officer.

11th February, 1958. At 0230 G.M.T. the whole northern sky assumed a rich red glow, particularly in the region of the constellation Cassiopeia, where the clouds stood out darkly against the red background. The red colouring gradually weakened until by 0350 almost all traces had disappeared. At 0500 the aurora was again visible for a few moments.

Position of ship: 41° 27′N., 26° 05′W.

M.V. *Fresno City*. Captain J. M. Cox. Panama to Avonmouth. Observers, Mr. A. G. Bateley, 2nd Officer, and Mr. D. M. Williams, 3rd Officer.

11th February, 1958, at 0400 G.M.T. A bright orange-red glow was observed bearing NNW. and extending 20° in azimuth. It rose to an altitude of 30°, and resembled the glow caused by a large fire at a considerable distance. It was particularly bright between 0400 and 0500. Then it began to fade but extended in azimuth from WNW. to NNE. and in altitude to 60°. The glow, which was now a very pale red, seemed to advance across the sky in patches. The display disappeared at 0515.

At 0545 the aurora reappeared. The brightest area of red colouring bore 340°, extending in azimuth from 300° to 025° and varied in altitude from 10° to 70°. Intensity varied from a fairly deep red to a pale rose pink.

At 0710 the northern sky had a pale pink tinge with three light red pulsating patches, the middle one bearing 360° at an altitude of 15°. The aurora soon began to fade and at 0715 it disappeared.

At 0900 a similar glow was seen.

Position of ship at 0400: 30° 24′N., 64° 00′W.

S.S. *Tenagodus*. Captain L. D. Walker. Boston to Curaçao. Observer, Mr. G. Brown, 2nd Officer.

11th February, 1958, at 0420 G.M.T. A bright red glow started in the N. and within a few minutes reached an altitude of 35°, extending from NW. to NE. Between 0420 and 0500 the display was brilliant, after which it slowly faded and by 0630 only a faint glow was visible. At 0645 the display commenced again, this time with a brilliant red glow and green and white " searchlights ", and lasted for approximately 1 hr. At 0830 a faint glow was still visible.

Position of ship: 27° 15′N., 67° 52′W.

S.S. *Velletia.* Captain J. E. Nettleship. Mena al Ahmadi to Portland (Maine). Observers, the Master, Mr. G. Lough, 3rd Officer, Mr. T. J. Murray, Radio Officer, and Mr. J. Bridges, Apprentice.

11th March, 1958, at 2000 ship's time. Observed aurora between bearings 270° through N. to 030°, at altitude of approximately 44°. At 2200 it had extended between bearings 270° to 090° and to the observer's zenith. The sky was brilliantly illuminated by bands of multi-coloured streamers sweeping across the sky. They originated at an altitude of from 2° to 10° and rose almost to the observer's zenith, varying in breadth between 1°, 2° and 4°. Many colours were observed, mainly amber and green, other colours were a slight variation in shade of the main two. The display gradually weakened in intensity, but at midnight aurora could still be observed on the northern horizon.

Position of ship: 10 miles S. of Sea Island, Nova Scotia.

S.S. *Torr Head.* Captain S. J. Stark. Wilmington to Belfast. Observer, Mr. R. A. Maxwell, 2nd Officer.

11th February, 1958, at 0450 G.M.T. Observed aurora in the form of an arc of pale white light between the bearings 340° and 050°, reaching an altitude of 22°. The arc slowly faded and was replaced by a patch of bright red aurora between bearings 050° and 065°, and altitudes 30° and 37°. The patch maintained altitude and bearing until 0630 G.M.T., when it slowly faded.

Position of ship: 42° 26'N., 51° 42'W.

S.S. *Pacific Northwest.* Captain A. H. Cooke. Panama to London. Observer, Mr. G. M. Pugh, 4th Officer.

12th March, 1958. At 0255 G.M.T. a distinctive red glow, gradually increasing in intensity, appeared behind a bank of Cu bearing N. and reaching an altitude of about 20°. The glow was so definite that the captain was informed and we altered course towards it, and remained on that course for ½ hr to ensure that it was not a distress signal. The glow lasted about 10 min.

Position of ship: 35° 41'N., 46° 58'W.

Gulf of Mexico

S.S. *Forester.* Captain J. Harnden. Maracaibo (Venezuela) to Coatzacoalcos (Mexico). Observers, the Master, Mr. A. K. Jones, Chief Officer, and Mr. G. F. Smith, 2nd Officer.

11th February, 1958, at 0620 G.M.T. A faint pink hue appeared in the sky to NNW. It increased to cover 2/10 of the sky, spreading to NW. and NNE. and gaining a little in brilliance. The display disappeared at 0710. It reappeared at 1030 and persisted until daylight.

Position of ship: 21° 34'N., 86° 26'W.

South Pacific Ocean

M.V. *Port Phillip.* Captain W. B. Craig. Lyttleton to Balboa. Observers, Mr. J. R. King, Chief Officer, and Mr. J. Burtt, Junior 3rd Officer.

11th February, 1958, at 2030 S.M.T. Aurora was sighted extending over an arc of between 130° and 260°. Rays, which were green in colour at the upper end and red or orange at the lower end, at times reached an altitude of 50°. The dark segment varied in height from 5° to 10° and stars could be seen distinctly at all times. The display lasted about 3 hr.

Position of ship: 43° 37'S., 179° 37'E.

Australian waters

M.V. *Port Pirie.* Captain L. J. Skailes. Observers, Mr. J. R. Bell, 3rd Officer, and Mr. H. Channon, Apprentice.

11th February, 1958, between 1645 and 1730 G.M.T. A strong display of aurora was visible (see drawing opposite page 8). It consisted of a horizontal lenticular patch of white light at an elevation of about 10°, more clearly defined at the bottom than at the top, where it gradually merged into the surrounding darkness. Four beams of white light rose up at intervals along its length, to an elevation of about 40°. The aurora was at its brightest about 15 min before it finally died away.

Position of ship: 41° 02′S., 146° 08′E., off Mersey Bluff, Tasmania.

METEORS

Indian Ocean

M.V. *Journalist*. Captain D. Wolstenholme. Mombasa to Aden. Observer, Mr. J. Chambers, 3rd Officer.

24th January, 1958. At 1741 G.M.T. a very bright ball of light (approx. magnitude —2·0) appeared at an altitude of approx. 25° on a bearing of 045°. It fell vertically, and at about 20° altitude broke into four or five separate parts which continued to fall through another 5° before disappearing. The light ranged in colour from orange-white to greenish-white, and illuminated the sea surface and the foredeck. The meteor was visible for about 4 sec.

Position of ship: 00° 39′N., 44° 36′E.

M.V. *Gloucester*. Captain J. E. Budgell. Aden to Adelaide. Observer, Mr. W. D. Doodson, 3rd Officer.

30th March, 1958. At 1945 G.M.T. a meteor of magnitude —0·4 to —0·5, leaving a white trail, was sighted almost overhead, its flight lasting about 3 sec. The trail, which was approximately in a N–S. line, ended before reaching Phecda (γ Ursae Majoris). About 1 sec before disappearing, the meteor and the part of the trail immediately behind it turned bright green.

Position of ship: 05° 45′N., 60° 33′E.

North Atlantic Ocean

M.V. *Regent Royal*. Captain R. Armstrong. Trinidad to London. Observers Mr. R. J. Peters, 2nd Officer, and Lookout Pugh.

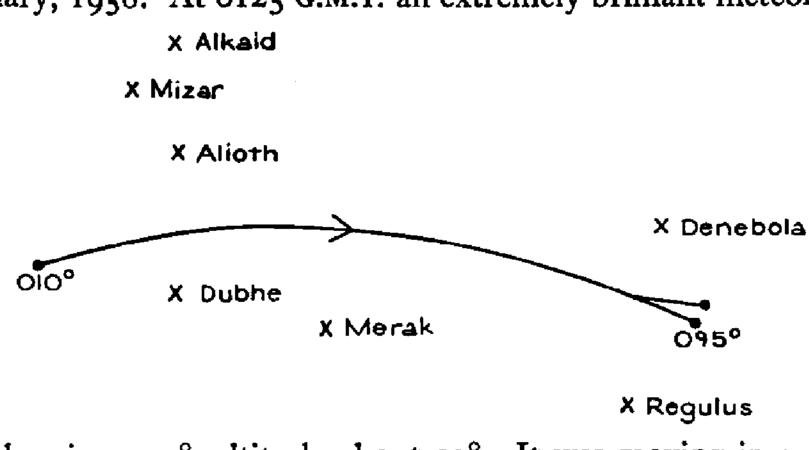
21st February, 1958. At 0614 G.M.T. a meteor was seen at an approximate altitude of 30° and bearing about 070°. It left a very bright, many-hued trail in which the predominating colours were orange, green and purple. It disappeared at about 15° altitude in a multi-coloured explosion. The meteor was estimated to be about three times as large as Venus and about three times as bright.

Position of ship: 25° 54′N., 48° 06′W.

Note. The colours described show that this was an unusually spectacular meteor.

S.S. *Arakaka*. Captain J. A. Carter. Port of Spain to Liverpool. Observer, Mr. J. C. Williams, 3rd Officer.

27th February, 1958. At 0125 G.M.T. an extremely brilliant meteor was observed



near Dubhe, bearing 010°, altitude about 30°. It was moving in an E'ly direction and was visible for about 4 to 5 sec. The head was a brilliant white and emitted a trail 10° in length. When bearing 090°, at approx. 40° altitude, the meteor broke into two pieces which turned red. Both parts disappeared near Denebola on a bearing of 095°, altitude approx. 40°.

Position of ship: 14° 40′N., 58° 48′W.

Cases of Damage to Cargoes, and their Meteorological Significance

By E. Höller

(Marine Weather Bureau of the German Meteorological Service)

This article is an extract from a paper read by Dr. Höller at a conference on "The Meteorology of Cargo Holds", which was held at Hamburg on 20th June, 1956, under the auspices of the Seewetteramt, Deutscher Wetterdienst (the Marine Weather Bureau of the German Meteorological Service). As suggested in the editorial of *The Marine Observer*, October 1956, this article is reproduced here (by the kind permission of Dr. G. Baumann, Director of the Seewetteramt) because it provides such a good illustration of meteorology as applied to a mariner's job. We regret the delay in publication: this has been partly due to the long time taken in getting a good translation of the German text. In our next number we hope to publish extracts from another paper read at this conference.

The study of hold meteorology, a branch of applied maritime meteorology, has arisen out of the need, for economic reasons, to prevent damage, so far as possible, to goods exported overseas. The damage to goods caused by meteorological conditions in the hold is not only that of corrosion of industrial goods, or of mouldiness or rotting of goods of vegetable origin; spontaneous combustion resulting from spontaneous heating may occur in the case of organic goods, and this has at times led to the total loss of ship and crew. According to international statistics, of 190 fires at sea in 1952, 110 were due to fires in the hold, 40 of which were definitely caused by spontaneous combustion, probably more. Of 144 ships on fire in 1954, 91 were cases of fires in the hold.

This report describes a few examples of cargo damage familiar on German and foreign ships in relation to meteorological conditions during the course of the voyage and to ventilation measures taken or not taken.

In 1952 a ship was carrying as part of its cargo chemicals to eastern Asia; there was an explosion on board in the Red Sea, and only one of the crew survived. It was established that hatch 1, in which certain chemicals with a very low flash point were housed, had not been ventilated for some time, so that this may have been the cause of the catastrophe. The temperature of the air in the hold near the ship's sides largely conforms to the course of the temperature of the outside air. Measurements taken with an Assmann psychrometer and thermograph on experimental trips made by the Deutsche Seewarte in 1934–35 and our temperature measurements made in 1955 with remote-reading instruments on M.S. *Steckelhorn*, show that the air temperature of the lower hold barely exceeds 95°F, but that air temperatures of the hold between-decks reach 100°F, and even 108–111°F. In special conditions even higher values are possible. I once measured with an Assmann aspiration psychrometer an outside temperature on deck of 124°F. This was in the neighbourhood of Aden when there was strong insolation and a light following wind, the effects of which were not felt on the ship. With these conditions the iron deck became exceedingly hot. On the voyage last year we measured surface temperatures up to 149°F for the deck cargo. It is possible for 158°F to be reached, i.e. about 65° above the highest possible water temperature. Iron deck-plates heated to such an extent also radiate inwards into the hold, so that the surface of the goods stacked in the hold near the ship's side or deckhead of the hold may reach a temperature of 120°F, particularly in Red Sea ports or similar places where the true air temperature may rise to over 105°F.

Chemicals in sacks were carried from wintry Europe to the tropics. The cargo was well ventilated. At the port of destination it was found that the sacks were eaten away, and corroding of the ship's sides had occurred in the neighbourhood of the area where the goods had been stacked. The damage might, perhaps, have been avoided. When goods, particularly fertilisers, are transported into the tropics, care should be taken to see that the warm air in the tropics with its high content of water vapour should so far as possible be prevented from reaching the cargo; the hold should therefore be kept airtight. Those in control of the ship probably observed this rule in the case of the first example. In both cases chemicals were transported from Europe to the tropics; in the first case non-ventilation was obviously wrong, and in the second, ventilation was equally wrong.

A ship from Vancouver carried foodstuffs in tins, cardboard boxes and sacks via Panama to Central America. The goods, loaded in winter in temperatures of 14–23°F, were extremely cold; fruit juices in the tins were mostly frozen. When the destination was reached, it was found that damage was considerable: labels had fallen away, the tins were rusty, the cardboard boxes had softened and the sacked goods had gone bad. It was obvious that condensation water from the tins which, when unloaded, were in part still cold and dripping wet, had dripped on to the other goods being shipped, so that these too suffered considerable damage. It was established that in spite of the mechanical ventilation facilities available, no ventilation at all was carried out on the first part of the voyage, and that it was not until the vessel reached warm tropical waters that ventilation was carried out on a limited scale. The tins, which were still very cold, were thus surrounded by warm humid air, particularly at the destination, and sweating of the cargo would take place on a large scale. Small quantities of tins, which were loaded in the port of departure directly into the ship from a warehouse regulated to a more moderate temperature, suffered less damage.

As continuous ventilation of the hold introduced at the right time would have of itself raised the temperature of the goods—and so reduced the suddenly occurring unavoidable temperature difference between cargo and ventilation air which takes place on the sudden arrival of the vessel into warm tropical waters, and would thus have lessened the damage—the shipping company, or rather, the ship's executive, was held responsible. In reaching this decision, the court obviously took as a precedent a case which had occurred in the same port a short time previously. Two ships with cargoes of cement arrived there soon after one another from wintry Europe. The cargo on the ship arriving first was still quite cold when unloaded. Condensation water formed on the sacks under the very eyes, so to speak, of those examining the cargo; the cargo had not been ventilated. A message was at once telegraphed to the vessel still at sea and this resulted in ventilation being energetically and successfully carried out, the cargo showing only very slight damage when unloaded.

Now a second example, again concerning the transport of foodstuffs to the tropics. A ship had loaded rice in winter in Korea when the air temperature was 23–28°F. Ventilation channels were provided for the rice. The ship had natural ventilation, which was used to its full extent. The only serious damage found when the vessel reached Europe was that occurring to the sacks in the ventilation channels. On the voyage from Korea to Singapore the temperature at first had risen only very slowly; in the South China Sea, the temperature values of water and air rose suddenly to over 68°F, these values reaching 84°F, with an air humidity of over 80 per cent, at Singapore. There the temperature of the rice cargo was still 50°F. Thus, when the warm humid air came into contact with the cargo, marked sweating of the sacks must have occurred. The damage undoubtedly occurred on this part of the journey to and in Singapore, not on the voyage to Europe. In the case of these two examples, the ventilation measures taken in the first case were certainly unsatisfactory, and in the second, if the course of the temperatures of the cargo had been followed and compared with the trend of the temperatures of the outside air—at that time this was not possible—the ship's officers would probably have carried out ventilation differently, increasing ventilation to begin with, and then, when the outside temperatures suddenly rose, considerably reducing it, particularly as the cargo was to be transported through the tropics to a cooler region again. If ventilation had been increased by mechanical ventilation, the damage might in some circumstances have been much greater.

Now two examples of voyages from the tropics to Europe. Considerable damage to that part of a shipment of cocoa housed in the lower hold was found to have occurred in the case of a ship with mechanical ventilation bound for Europe from the east coast of South America and arriving in winter; the rest of the cargo, mainly vegetable products, arrived in good condition. The ship had already called at other places, where she unloaded part of her cargo of cocoa, before reaching the North Sea ports, these shipments of cocoa arriving undamaged. The damage must therefore have occurred on the last part of the journey.

The sea-route from South America to Europe exposes cargoes to danger, particularly in winter-time in the northern hemisphere. The fall in temperature of air and water in the case of a homeward-bound ship starts at about 5°N. From there to the Heligoland Bight, a distance of 3,600 sea-miles, the temperature of the water drops in midwinter on the average about 43°, that of the air taking almost exactly

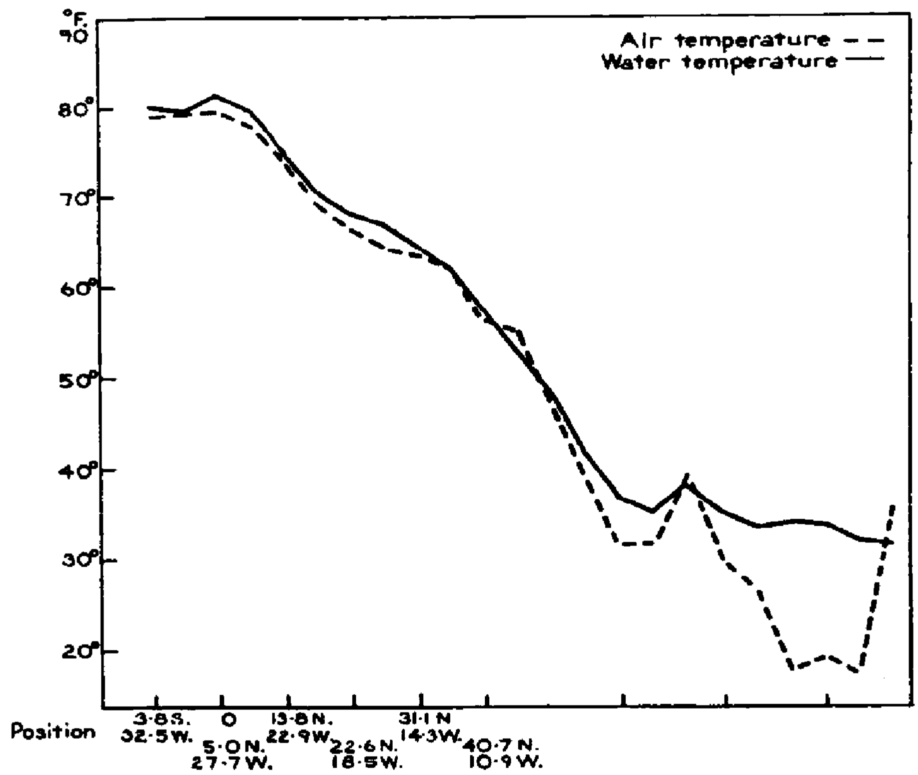


Fig. 1. Course of water and air temperatures of ship homeward bound to Europe from the east coast of South America.

the same course. The temperature diagram (Fig. 1) for this individual voyage from Pernambuco to Europe shows in 5°N. a water temperature of 82°F and an air temperature of 81°F. From there to the Bay of Biscay there is a continuous drop of about 22°, i.e. a drop of 29° for 2,700 sea-miles. For the last part of the journey to the North Sea, a distance of about 900 sea-miles, the diagram shows an unusually marked further drop of the air temperature of about 68°F to 18°F, so that the total fall of air temperature amounted to 63°. High-pressure weather conditions in the region, the centre lying over Scandinavia and the Baltic Sea, gave rise to very cold south-east winds in Central Europe, though they did not extend as far as the Channel. The ship in question thus found on the last part of her voyage particularly unfavourable conditions, so that the statement of the ship's executive that no damage occurred until the vessel was on this part of her voyage is very enlightening.

We have no details of the temperature of the cargo itself. If a cargo stands for some time in a port in the tropics, its temperature on departure may, as the result of solar radiation, be higher than that of the outside air. Assimilation of the temperature of the cargo to outside conditions takes place extremely slowly, especially in the case of the cargo stacked underneath. Part of the cargo had been discharged in the first European port; the lower and inside parts of the cargo with an even higher temperature now formed a new surface. Moisture will therefore have passed steadily from the cocoa to the air in the hold. Ventilation, which was continued, then brought very cold air to the cargo, so that at the surface of the sacks there was a marked temperature boundary layer in which heavy condensation would take place.

Ventilation in winter on this sea-route should be as thorough as possible from 5°N. onward, as far as about the Bay of Biscay, in order to keep the temperature of the cargo low. In European waters, however, ventilation should be reduced and completely suspended when there are influxes of very cold air. But such decisions can be taken with sufficient confidence only when there are available reliable and continuous details of temperature and humidity conditions in the hold, inside the cargo, and, on the other hand, of the outside air. As at the present time such data are not available, opinions differ considerably as to the value and effectiveness of ventilation.

We now come to our second example of a voyage from the tropics to Europe,

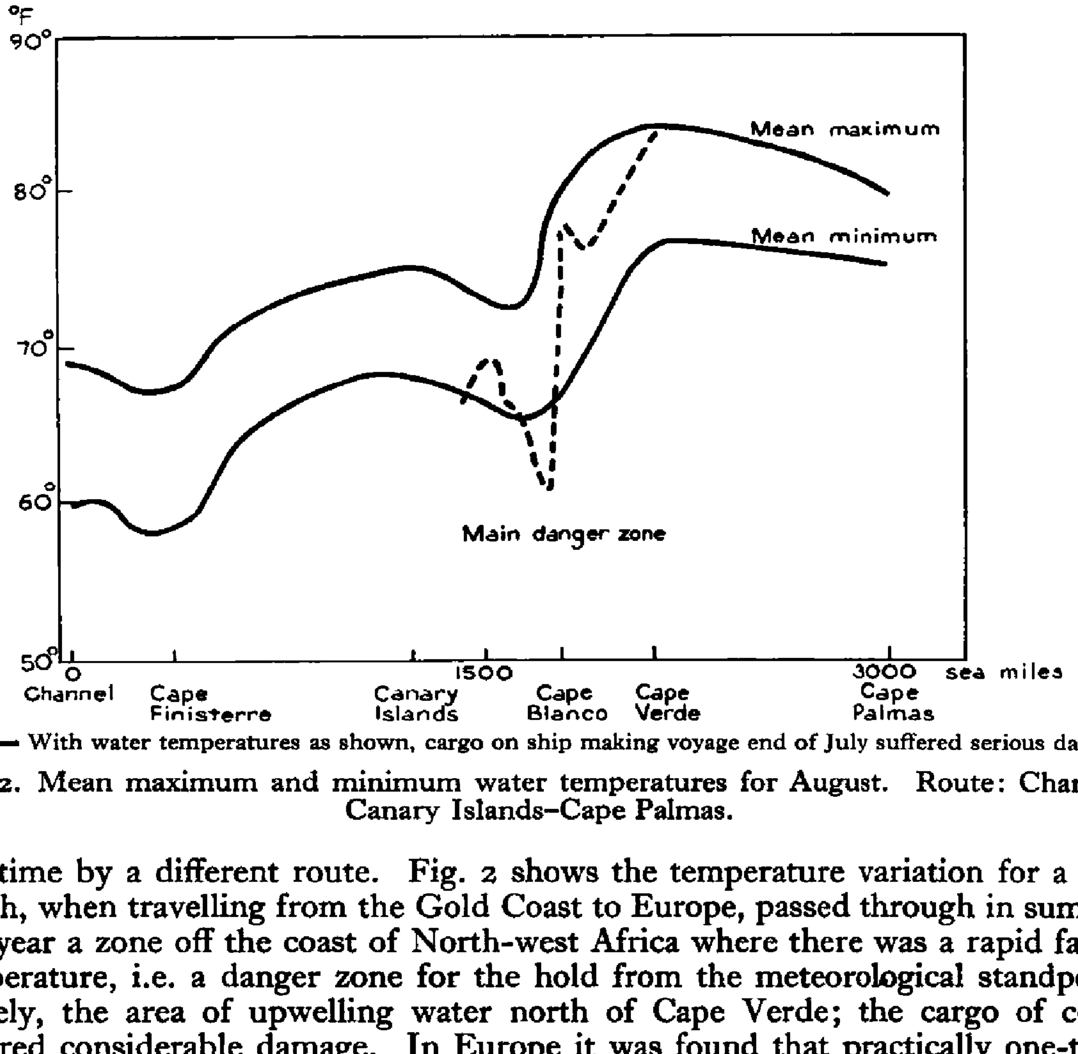


Fig. 2. Mean maximum and minimum water temperatures for August. Route: Channel–Canary Islands–Cape Palmas.

this time by a different route. Fig. 2 shows the temperature variation for a ship which, when travelling from the Gold Coast to Europe, passed through in summer one year a zone off the coast of North-west Africa where there was a rapid fall in temperature, i.e. a danger zone for the hold from the meteorological standpoint, namely, the area of upwelling water north of Cape Verde; the cargo of cocoa suffered considerable damage. In Europe it was found that practically one-third of the entire shipment was completely spoilt and that another third was only suitable for selling at the cheapest rates. The ship's officers were able to prove that they had carried out all the " usual measures " required for the safe transport of the cargo, i.e. regular ventilation of the holds. But an official certificate furnished proof of the fact that the cocoa had left the plantation with 7·5 per cent moisture, i.e. in good condition. Whilst awaiting shipment it had, however, been stored—in June—in roofed but open sheds in the Gold Coast port. But June is in these parts the month with the heaviest rainfall (about 800 mm). Consequently, with an air humidity that was always high, there existed a drop in vapour pressure from the outside air to the well-dried cocoa, which then absorbed moisture again and which, when shipped, must have had a moisture content of well over 7·5 per cent.

The temperature of the cocoa when it left port, about 85°F, was more or less maintained on the first part of the journey until the danger zone north of Cape Verde was reached. The over-moist cocoa gave out moisture steadily to the surrounding air which, in spite of the ventilation carried out, was, with a temperature of almost 86°F, nearly saturated. Only slight changes of the outside temperature had taken place on the first part of the journey, but in the danger zone a marked drop in temperature occurred—17° in four hours, 22° in 24 hours. Ventilation, which was still being carried out, brought the very much cooler air into direct contact with the cocoa, with the result that heavy condensation in the temperature boundary layer, ventilation air/cargo, which was continually being disturbed but which was always restored, took place directly on the sacks of cocoa.

A drop in temperature as marked as this rarely occurs in summer even in this danger zone. Continuation of vigorous ventilation (quite rightly carried out as far as the danger zone) undoubtedly led to the cargo being damaged. Cutting out ventilation as far as possible would have resulted in the displacement of the dangerous boundary layer between the warm and humid cargo air and the cooler outside air at the surface of the cargo to the quickly cooling ship's side. Thus condensation would have taken place there and on the deckhead of the hold; the condensation water would then have dropped on to the cargo. With good dunnage much less damage would then have probably been caused, though it was not altogether avoidable. If there had been a moderate amount of ventilation and it had been possible to control this according, on the one hand, to reliable temperature and humidity measurements of the ventilation air, and, on the other, to the moisture content of the cargo, there would have been even less damage. The fatal error in this case was, however, the too high a content of moisture in the cargo. The combination of an unusually large drop in temperature, a drop which, moreover, had not been experienced before on the route, and an over-moist cargo, set the ship's officers, whose aim it is to hand over merchandise in perfect condition on arrival at the destination, an almost insoluble problem. Ship-to-ship transmission of the details of the actual location and level of the temperature drop in the danger zone, which, according to an English nautical periodical, has already been introduced or at least tried out by English ship-owners, or, perhaps, warnings by the meteorological service, would make it possible for ships' officers to consider whether to run the risk of damage to the cargo or whether to make a small detour —the coldest upwelling water only occurs in coastal waters—so as to avoid the danger area completely. Reliable ways of determining the moisture content of goods to be loaded, which are easy to carry out even in small tropical ports where the means are available, would make refusal possible in the case of goods whose moisture content is too high and not accepted commercially, or would at least relieve the ship's officers of being responsible for the possible occurrence of damage to cargoes.

But often it is not only the conditions on the sea-route which have to be taken into account. A ship sometimes remains in port for a considerable period and, in consequence of the long stay, the meteorological conditions there affect the composition of the hold climate. And then: merchandise comes from the interior of the country to the port, or has to be sent from the port to the interior.

A cement factory with all its structural elements, machinery and interior fittings, was shipped to West Africa. All the component parts, which were packed in boxes and crates, arrived in good condition on the due date, which was in the rainy season. As no sheds were available, everything was left in the open and in the rain for weeks on end. The goods suffered severely from corrosion. It would have been a good thing if the contractor had used his influence to determine when the goods were to be delivered.

Similarly, when, for example, cement is to be unloaded in harbours in the tropics, one should try to fix a suitable delivery date. Fig. 3 shows the monthly amounts of rain for Conakry in French West Africa (9½°N.). The rainfall in July there equals

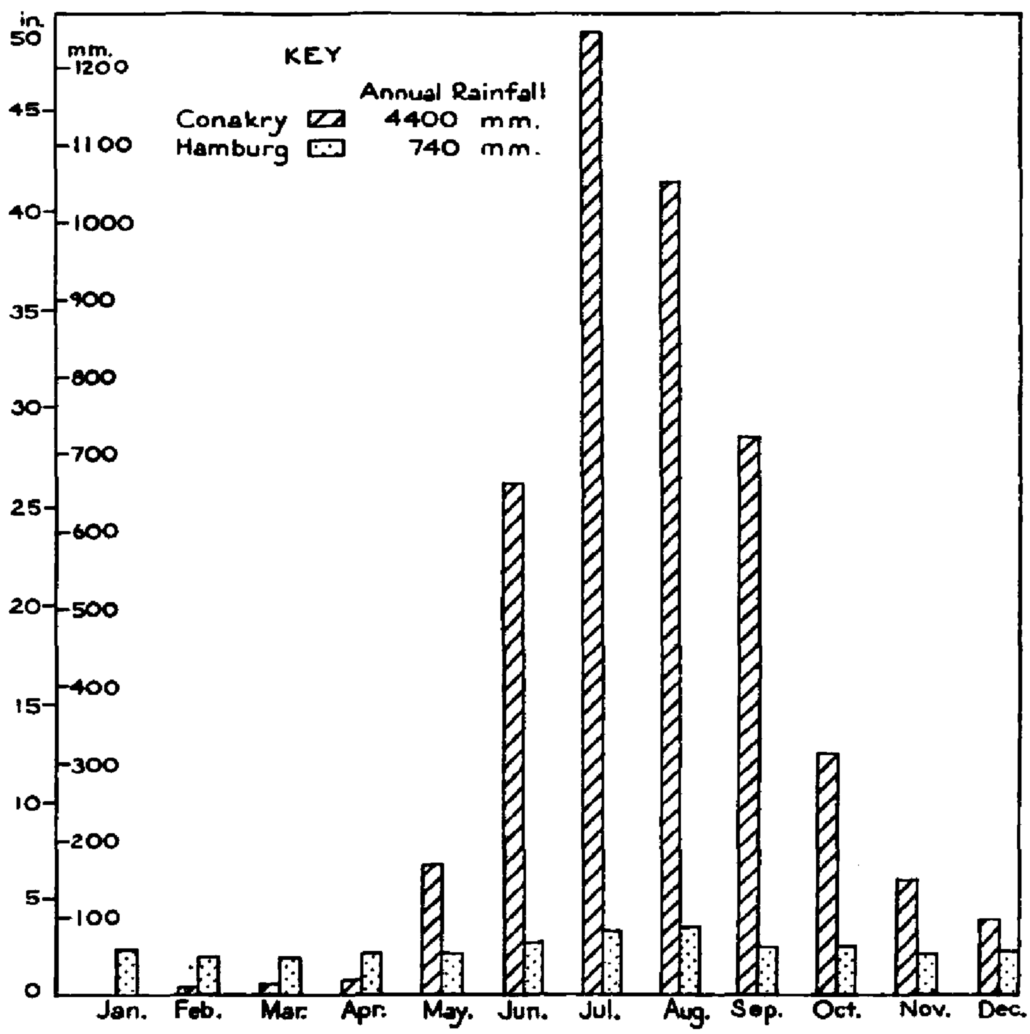


Fig. 3. Annual rainfall.

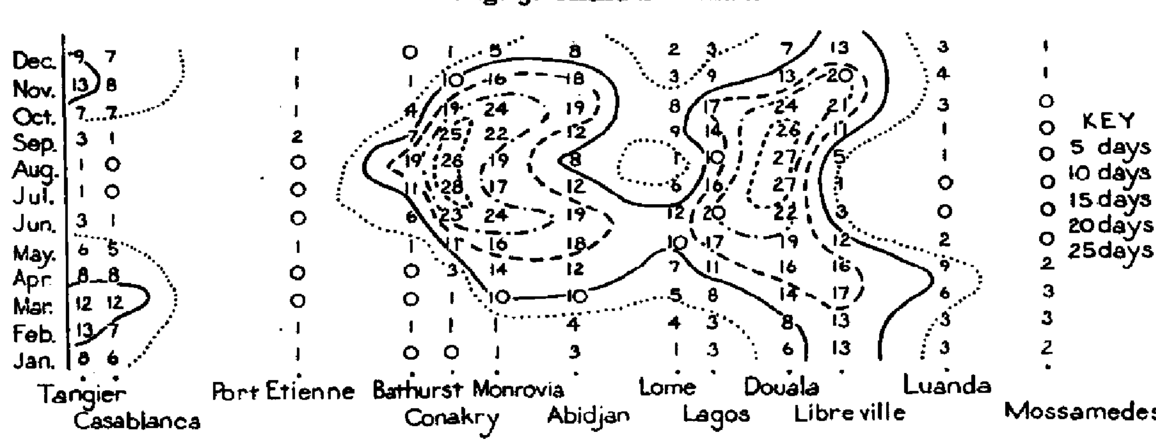


Fig. 4. Number of rain days per month at various West African ports.

Hamburg's rainfall for two years. In July and August it rains practically every day, but there are periods when there is very little rain.

Fig. 4 shows the number of rain days per month for some ports on the West African coast. The rainy regions around Conakry and Douala for the period June to September stand out clearly. The diagram shows too the very rapid decline of rainfall there is sometimes in both directions. He who has to deliver goods in July to a port in the neighbourhood of Conakry or Douala must expect to be held up by rain practically every day. In the case of small ports there may be a wait for weeks if some few predecessors jam the port and their loading and unloading activities have to be repeatedly interrupted on account of continuous rain. When this happens it may be advisable to move on to the nearest harbour where there is

(*Opposite page 24*)

Mr. E. W. Barlow (see page 35).

(*Opposite page 25*)

Admiralty photograph

H.M.S. *Ark Royal* (above); meteorological brief aboard H.M.S. *Illustrious* (below). See article on page 25.

Admiralty photograph

less rain. Those acquainted with conditions in these parts are able to decide whether to do this.

Meteorological Practice in Aircraft Carriers

(The author is the Senior Meteorological Officer of an aircraft carrier)

The operational requirements for any military aircraft are to be able to take-off, accomplish its mission and, preferably, return to base. The weather factors affecting the performance of the task are the same whether the aircraft starts from a runway or a flight deck, but there are complications in launching and recovery at sea which do not affect the forecaster ashore.

The main source of these complications is the capacity of the carrier* to move, often alarmingly, both horizontally and vertically. A carrier must steam into wind to launch or recover aircraft, and allowance for the resulting displacement from the desired track must be made before starting flying operations. A bad forecast of wind direction and strength may result in the carrier being 50 miles upwind of her desired position at the end of the day or, in restricted waters, may cause a halt in flying operations in order to gain sea-room to windward. The effect of a heavy swell on the recovery of aircraft needs no comment, and there is nothing anyone can do about it once the swell waves arrive. But if they can be forecast the day before, it may be possible to choose a calmer or sheltered area for operations.

In order to increase the time on task, military aircraft are usually flown much nearer to their endurance limits than are civil types, and modern jet aircraft must be accepted on deck within minutes of their return. If the carrier is in a heavy shower or fog patch at this time, and as there is unlikely to be a diversion airfield within range, the situation may be far from pleasant for all concerned. Thus, although the reduced time in flight of jet aircraft has cut down the period for which a particular forecast is required, the weather conditions at the end of the flight are much more critical than they were when piston-engined aircraft returned with fuel to spare.

Forecasting in a carrier falls broadly into two main divisions. First there are appreciations, forecasts and gale warnings for the Command which assist in deciding the ship's movements and flying policy. These forecasts are similar to shipping forecasts, covering a 12-hour period with a further 12-hour outlook, but are in greater detail regarding wind, visibility and swell. This type of forecast covers a wide range of users, from the air department—who have to decide how aircraft are to be stowed—to ardent "natives" who want to know if the ship will be able to get into harbour in time to give leave. Then there are the detailed aviation forecasts for aircrew at pre-flight briefings. All aircrew receive training in meteorology, and at briefings are shown the latest chart and are given an account of the weather conditions expected in the next four or five hours (see photograph on opposite page). The information required covers the extent and intensity of the weather, visibility, cloud types and amounts with the heights of bases and tops, winds and temperatures at 5,000-foot intervals up to the aircraft's ceiling, the height of freezing level and the type and severity of icing to be expected. Fighter pilots are also interested in the heights at which condensation trails will form and whether or not they will be persistent.

The aircraft carrier is more concerned with the wind than any type of warship since sails were left ashore. A certain minimum wind down the deck is essential to assist both free and catapult-assisted take-offs, and to reduce the speed of entry into the arrestor gear when landing. This minimum wind speed is usually about, or a little more than, the designed speed of the ship, so that light or variable winds are a bugbear to all concerned, and particularly to the meteorological officer, who is usually held responsible for them! Long periods of steaming at high speeds are

*A photograph of an aircraft carrier is shown on opposite page.

unpopular with the engineers and, since the boilers eat up fuel at speed, greatly reduce the endurance of the ship. They are also unpopular with those who work or live aft as the noise and vibration make work difficult and sleep impossible. A day of glassy or rippled sea can produce more frustration in an aircraft carrier than Freud ever dreamed of. Consider the combination of a 40,000-ton ship careering around the ocean at high speed, occasionally turning a full circle in pursuit of an elusive breath; the Command poring over the anemometer dial which irritatingly will persist in showing two knots less than the log whichever way the ship is pointed; a helicopter hopping around dropping smoke floats in an endeavour to find some wind and its direction; the engineers with one eye on the safety valves, the other on their consumption/speed curves and their minds on feed-water losses; while pilots complain over the radio that they cannot see the deck-landing mirror through the increased funnel haze. On occasions like this the wise meteorological officer retires to his office and locks the door.

There is also the reverse case of having too much wind over the deck. This causes unacceptably severe turbulence in the approach path. This happened recently during the trials of a light-weight aircraft and was only solved by the carrier pointing into wind and going astern at 12 knots!

Not only the speed of the wind but its direction, as pointed out earlier, may vitally concern the carrier. This is particularly the case if she wants to get somewhere in a hurry and there is a light following breeze. Under these conditions she may steam all day at 26 knots and make good only 10. And a light wind across a busy shipping lane is no tranquilliser for the captain.

The forecaster then must try to estimate the surface wind well in advance so that allowance may be made for its effect by choosing the most suitable area of operation or by making ground before flying starts. He must also make a good estimate of the upper winds. Although radar and other homing devices will usually bring a pilot back, there are still such things as radio failure, and pilots like to keep their own reckoning. Moreover, the aircraft controller in the ship needs to know the upper winds. Winds up to 140 knots are not uncommon between 25,000 feet and 35,000 feet, and the controller must take them into account in stationing and recovering the aircraft.

Weather and visibility affect the carrier in much the same way as they do an airfield, always bearing in mind that, for the carrier, there may not be a diversion airfield. However, the carrier forecaster has an advantage over his opposite number ashore when heavy and widespread showers are present. Such showers show up well on the radar screen and it is often possible by manoeuvring the ship in the intervals between launching and recovery to ensure that the ship is in a relatively clear patch for the next flying operation.

The carrier meteorologist quickly learns the value of land effects. In the difficult period immediately after first embarking the carrier squadrons—when it is vital to have a steady deck, a fairly high cloud base and moderate visibility until the pilots have gained confidence on and off the deck—the carrier usually works close to the land within reasonable diversion distance of an airfield. The passage of a moist south-westerly airstream over a few hills, or a tongue of land, will often lift the cloud base 200 or 300 feet or improve the visibility from five cables to a mile and a half. If it is possible to find such a lee, giving in addition protection from swell, the advice of the forecaster may well make possible a day's flying which would otherwise be lost.

The data on which the carrier meteorologist bases his forecasts are almost entirely obtained by wireless telegraphy. There is a world-wide coverage of meteorological broadcasts, each giving collected data for a specific area. Unlike the forecaster ashore who has a bank of teleprinters hammering out fresh data every hour, the carrier forecaster's raw material is subject to all the delays, interference and mutations of wireless communications. There is delay due to the time taken to collect the data ashore and prepare it for retransmission. There is interference or fading—particularly in a year of sun-spot activity—which may cut out most of the observations he wants. And there are mutations, some of human and others of electronic origin, which alter pressures by 10 millibars or wind directions by 100 degrees and which may lead to a completely false analysis. But it is on this broadcast data that he primarily depends and his demands on the ship's communications department are heavy and continuous. It cannot be a pleasant duty to concentrate for hours on receiving streams of apparently meaningless five-figure groups, but the telegraphists do it and do it well. It has been found advantageous to give the telegraphists concerned a few lectures on the use to which their information is put. This, with a sketchy knowledge of the codes, often helps them to make sense of a transmission which would otherwise be hopelessly corrupt.

Increasing use has been made in recent years of automatic transmission and reception equipment. Among these aids radio teleprinter equipment is most useful while facsimile reproduction is outstanding for line charts, and an increasing number of transmitting stations are being set up. By facsimile a picture of the analysed chart or other derived information can be received without the necessity of taking the raw data by wireless and processing it aboard. This still does not excuse the carrier meteorologist from plotting and analysing his own charts, however, since all the data required cannot be shown on the chart, the coverage is not yet worldwide, and some facsimile broadcasts assume that there is weather on only five and a half days a week and shut down at week-ends!

One of the main difficulties in carrier forecasting is the paucity of observations over sea areas. The nearest upwind observation for a carrier may be 300 miles away and the SYNOP may be five hours old by the time he gets it—and there is no opportunity of ringing up a chum a few miles to windward for a spot check. The carrier meteorologist is thus deeply indebted to the men of the ocean weather ships and particularly to those stalwarts of the voluntary observing ships who continue to record and put out their observations year in and year out. Without them he would be even more at sea than he usually is!

There are left three sources of information to the carrier forecaster independent of outside sources: reports from the carrier's aircrew, radar balloon observations of upper winds and his own eye. Aircrew are encouraged to, and usually do, look in at the meteorological office after landing and describe the weather on their sortie. While in flight they always report deteriorations which may affect the ship and in difficult conditions a special weather reconnaissance can usually be arranged.

It is normally possible to obtain the upper winds from broadcast radio-sonde ascents or from contour charts. If this information is not available, the carrier releases a balloon covered with a nylon mesh vest (suitably impregnated with a radar scattering composition) and tracks it by radar. Always provided that the balloon clears the ship's superstructure successfully, that it does not burst at 20,000 feet, that it is not struck by lightning, a playful aviator or act of God, and that the ship's radar manages to pick up and track the minute target, the winds can be found at all operating heights. Radio-sonde ascents from carriers are also increasing. From these, temperatures and humidities in the upper air can be determined—important factors in operating jet aircraft.

Finally, many a carrier forecaster has made, or lost, his reputation by a good look round the sky and adjusting his forecast accordingly. There is a story on record of one meteorologist who was called up on the voice-pipe by his captain with the query: "Hey, Seaweed, when's this fog going to clear?" The poor man raised his eyes from his chart and replied, "What fog, sir?" So, should you ever see a chap with a worried expression on his face wandering about the flight deck of a carrier, looking suspiciously at a patch of altocumulus castellanus on the horizon, you may be sure he is the meteorological officer.

G. V. L.

On Waterspouts—How to Observe and Photograph Them

By Fritz O. Rossmann

(Consultant for Upper Air Physics at White Sands Missile Range, New Mexico, U.S.A.)

From the century of the great discoveries, at first men of practice and later scientists have paid attention to the rare but very strange phenomena of the atmosphere—tornadoes over land and waterspouts over sea. Rather early a close relationship of those phenomena was concluded from the column-like appearance and the whirlwind nature of both. Especially in the respect of tornadoes, the highly concentrated kinetic energy or wind velocity was recognised to cause unusually heavy destruction to every man-made work.

The waterspouts over the ocean, though they occur much more frequently than tornadoes ashore, cause by far less damage. As I showed[1] in another paper, this fact is partly due to the circumspection of the sea captains, who usually attempt to avoid encounters with waterspouts and nearly always succeed. It is also due in part to the fact that waterspouts are much weaker than tornadoes.

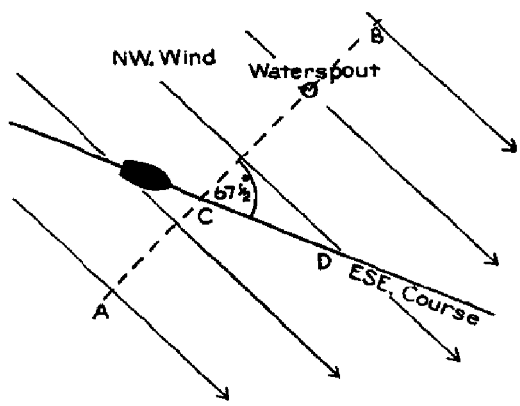
Among the mass of particular problems which are connected with the large variety of tornadoes in strength and appearance, the cardinal question is still unsolved: what is the origin of tornadoes and waterspouts ? As the research up to the present has demonstrated, another problem is closely connected with this question. Are the air masses in the funnels streaming upward, or are they streaming downward—in other words, is the air " boiling up " toward the clouds, or is it falling down from the clouds toward the surface of land and sea ? Studying accounts of observations or photographs, one can clearly discern two structures, the central cloud funnel, and that which is best called the tornado foot or waterspout foot, surrounding the funnel close to the surface only. The foot seems to be a vortex ring around the funnel in which the downdraft motion inside the funnel rebounds from the ground into a strong upward motion. It becomes visible because it is filled with foreign particles, in the case of tornadoes with dust and sand and sometimes debris, in the case of waterspouts with water spray, which is usually blown more vertically upward than the solid particles around the tornadoes. The dust or water-spray clouds are blown up sometimes to heights of several hundred feet, which not rarely are so dense as to cover completely the lower part of the funnel.

For clarifying all these questions, careful observations of waterspouts made without prejudice may contribute much. For the reason of their quite rare occurrence, meteorology depends on the co-operation of everyone who has the opportunity to observe these phenomena. There exist nowhere better conditions for observations of waterspouts than aboard a ship at sea. The ship's officers are constantly watching the sea and sky from the high outlook of the bridge which opens the view to the distant horizon. Binoculars, a camera, a clock and a bearing device are always at hand. By these means it is possible to make accurate and reliable observations of every important detail, as their shape and change of form in time, their direction and distance, and their speed and duration as well as all other weather phenomena around. These details are listed in order of importance for clarifying the problems still open.

The most essential feature is the shape of the waterspout funnel in its orientation to the horizontal wind field outside, which is crossed nearly vertically by the waterspout. The orientation must be determined with respect to the true wind direction. The shape should always be fixed at once, maybe with a few outlines sketching it; much better, of course, would be a photograph, or several photographs at definite intervals of time, say one minute, a whole series of pictures which represents an irrefutable document and can be evaluated later more accurately and reliably than any sketch. The most valuable documents, however, are moving pictures, although a series of photographs is a good substitute if the time lapses between the individual pictures are determined, with an accuracy of a few seconds, by a second observer. The absolute time has to be fixed for only one picture with an accuracy of some minutes. Such takings still pay even if the distance is great and the objects are so small that only the inclination of the funnel against the horizon is shown.

In order to deduce what is going on inside the funnel, it is necessary to take the bearings of the waterspout immediately after the photographs, and also to note the ship's course, speed, the wind direction and the wind speed. From those observations at any time later the horizontal wind field, which was punched by the waterspout, can be derived. If there are means, the upper wind should also be determined, as accurately as possible, either by a pilot balloon observation or at least by wind observation at cloud ceiling, observing the direction and speed of the cloud drift. How much later this observation can be made depends on the steadiness of the weather.

The sketches and photographs of the funnel's shape are more informative and valuable the smaller the distance is from which they are gained and the better they present the profile picture in the wind direction. This profile picture should



be explained as follows: the plane traced in the figure by the straight line AB is vertical to the sea surface and perpendicular to the true wind (NW. wind) and runs also through the location of the waterspout. Then the intersection of AB and the ship's course CD, the point C, where the waterspout bears 67½° ahead on port, is the best position for taking pictures of the waterspout funnel in the correct wind profile view. This point C coincides by no means with the point of the course line of shortest distance between waterspout and ship. When, for instance, the speed of the ship is about twice the drift velocity of the spout, the point of shortest distance is reached much later at about D. Since most waterspouts last only a short while (on the average, 15 minutes), and the duration cannot be determined ahead of time, it is necessary to take pictures as early as possible and to continue at least until the most convenient point, C, is reached.

And now the merits of this method should be explained. The curved shape of the funnel is the result of the combined wind flow inside and outside the funnel, or of two streams independent of each other: the more or less vertical flow in the funnel along its axis, and the almost horizontal wind field around the funnel as it is distributed in direction and speed and altitude. From the curvature of the funnel, and its orientation in the horizontal wind field, definite conclusions can be drawn about the speed of the flow inside the funnel. There is, indeed, only one rare exception. When calm exists outside the funnel, or a flow uniform in speed and direction prevails from the ground up toward the cloud level, the cloud funnel will be vertical. Then it is impossible to find out whether the air flow in the funnel is upward or downward.

For this reason all other observations are important. What weather prevails and what is the type of cloud from which the funnel comes ? Can precipitation—hail or rain—be observed simultaneously somewhere around, visible in the form of more or less vertical dark columns? Or are other waterspouts to be seen, perhaps ending freely in the upper air (" blind spots ")?

If precipitation is also observed farther away, the time difference between the appearance of the waterspout and the beginning of precipitation should be noted. Furthermore, whether there are electrical phenomena, lightning, thunder, corona, and St. Elmo's fire, and whether there is hail, and where these things occur, should be observed; and the situation of the spout in respect to the sides of the thunderstorm cloud or to the squall line should be determined. What kind of noise does the spout make, and does the noise come from the free atmosphere, i.e. from aloft, or from the spot where it touches the sea surface? Not very much is known about the impact spot on the surface, its diameter, appearance and shape, or its vertical cross-section. How is the so-called " cascade ", or the foot of the water spray, created, i.e. where does the surface become droplets, at the rim of the spot, or further inside?

REFERENCE

1 ROSSMANN, F. O. Differences in the physical behaviour of tornadoes and waterspouts. *Weather, London*, 13, 1958, pp. 259–263.

Fish Mortality in the Arabian Sea, 1957

We have received observations from seven ships which make it clear that there was an extensive mortality of fish in the Arabian Sea region during three periods of the year 1957. The observations, arranged in order of date, are given below.

C.S. *Edward Wilshaw*. Captain C. C. Muckleston. Mombasa to Aden.

10th January, 1957, between 0530 G.M.T. in 16° 15′N., 61° 15′E., and 0830 in 16° 08′N., 60° 45′E. During the three hours' steaming between the above positions many dead fish were seen floating on the surface. There was no great concentration of fish, two or three bodies being seen every 5 min. All of them seemed to be intact and of one species, pinkish in colour and measuring 3–4 in. in length.

M.V. *Trelissick*. Captain F. G. Bolton. Mombasa to Kuwait.

20th January, 1957, at 0730 G.M.T. in 17° 10′N., 57° 47′E. Observed numerous scattered dead fish floating on the surface, all of which appear to be of the same species, having flattish bodies, 6–9 in. in length, silver underneath, tinged pink on top with reddish gills, fins and tail. They were similar to an English golden carp. Flying fish were to be seen as usual.

S.S. *Mahseer*. Captain A. Hill, O.B.E. Aden to Colombo. Observers, the Master and Mr. J. Lyle, Chief Officer.

1st June, 1957. Between 1300 and 1430 G.M.T. numbers of dead fish were seen floating on the surface of the sea. They were all reddish brown in colour with white underneath, and measured about 6–8 in. in length. It was unfortunately not possible to obtain a sample. Air temp. 86°F, sea 81°. Wind WSW., force 5.

Position of ship: 10° 34′N., 62° 51′E.

M.V. *Bellerophon*. Captain H. H. Sanderson. Aden to Penang. Observer, Mr. D. D. McDonald, 2nd Officer.

11th June, 1957, at 0900 G.M.T. in 10° 16′N., 64° 20′E. For the next three hours the vessel passed through widely scattered quantities of dead fish floating on the surface. They appeared to be between 5 and 7 in. long. A few were of a reddish colour, but most were grey with white underparts.

S.S. *Albistan*. Captain R. Mace. Bandar Shapur to Durban. Observers, Mr. J. Brown, Chief Officer, and Mr. T. W. Feather, 2nd Officer.

12th June, 1957. From noon until sunset, great numbers of dead fish were observed floating on the surface, singly or in groups, at intervals of about 100 ft apart. They were from 9 in. to 12 in. in length and had bright red backs and white undersides. Some sea birds were in the area but none were seen to be feeding on the fish. Wind SW., force 4. Sea moderate or rough.

Position of ship: 12° 56′N., 60° 03′E.

13th June. During daylight hours, dead fish were again seen floating, but they were less numerous and scattered at greater intervals than those of yesterday. As before, no sea birds were observed feeding on the fish. Wind WSW., force 4–5. Moderate sea and swell.

Position of ship: 9° 15′N., 60° 14′E.

M.V. *Eucadia*. Captain A. J. F. Colquhoun, M.B.E. Aden to Karachi. Observers, the Master, Mr. J. Scrimgeour, 2nd Officer, and Mr. J. Walker, 3rd Officer.

10th October, 1957, 0730 G.M.T. During the last four hours we have been passing thousands of dead fish, which range between 4 in. and 8 in. in length and are about 2 in. in width. The dorsal fin, tail and back are a reddish colour, while the underside is white. Air temp. 80°F, sea 81°. Wind W., force 5. Sea rough.

Position of ship at 0600: 22° 18′N., 63° 42′E.

M.V. *City of Chester*. Captain T. S. Dennis. Aden to Karachi. Observers, Mr. J. Campbell, 2nd Officer, and Mr. R. M. Jones, 3rd Officer.

15th October, 1957. Dead fish about 2–5 in. long, reddish in colour with white undersides, were observed floating, evenly distributed, about 20–30 ft apart, during the whole of the daylight hours. Though many sea birds accompanied the ship, none were interested in the fish. Sea slight, wind light and variable.

Position of ship at noon: 20° 21′N., 60° 39′E.

It will be noted that the latitudes of the positions of observation differ appreciably in the different periods. Giving the latitudes to the nearest degree, they are:

January	16°–17°N.
June	9°–13°N.
October	20°–22°N.

There is less difference in the longitudes, which, with the exception of one at 58°E., all lie between 60°E. and 64°E.

There were reports in the press that an anonymous Russian merchant vessel had encountered large quantities of dead fish while crossing the Arabian Sea in June 1957, and over a considerable area it was estimated that there were 10 fish in each square yard.

The observations have been sent to Mr. N. B. Marshall, of the Natural History Museum, who states that the descriptions of the fish suggest that one specimen is mainly involved, but as there are a number of fishes with red backs and white under-parts identification is not possible in the absence of specimens. He also says it is clear that great quantities of fish, perhaps amounting to several million tons, died in the north-western Indian Ocean in 1957.

M.V. *Eucadia* sent us a sample of sea water taken at the time of the observation and this, together with all the ships' observations, were sent to Dr. T. J. Hart, of the National Institute of Oceanography. He states that fish mortality is fairly frequent along the west coast of India, southward of Bombay, though this mostly occurs close inshore, as far as is known at present. He tested the sample, which apparently had had no preservative added, and found that the organic contents had rotted. He is, however, able to say that the sample contained a far larger amount of organic matter than would normally be expected in such a position in the open ocean, in the absence of visible sea discoloration.

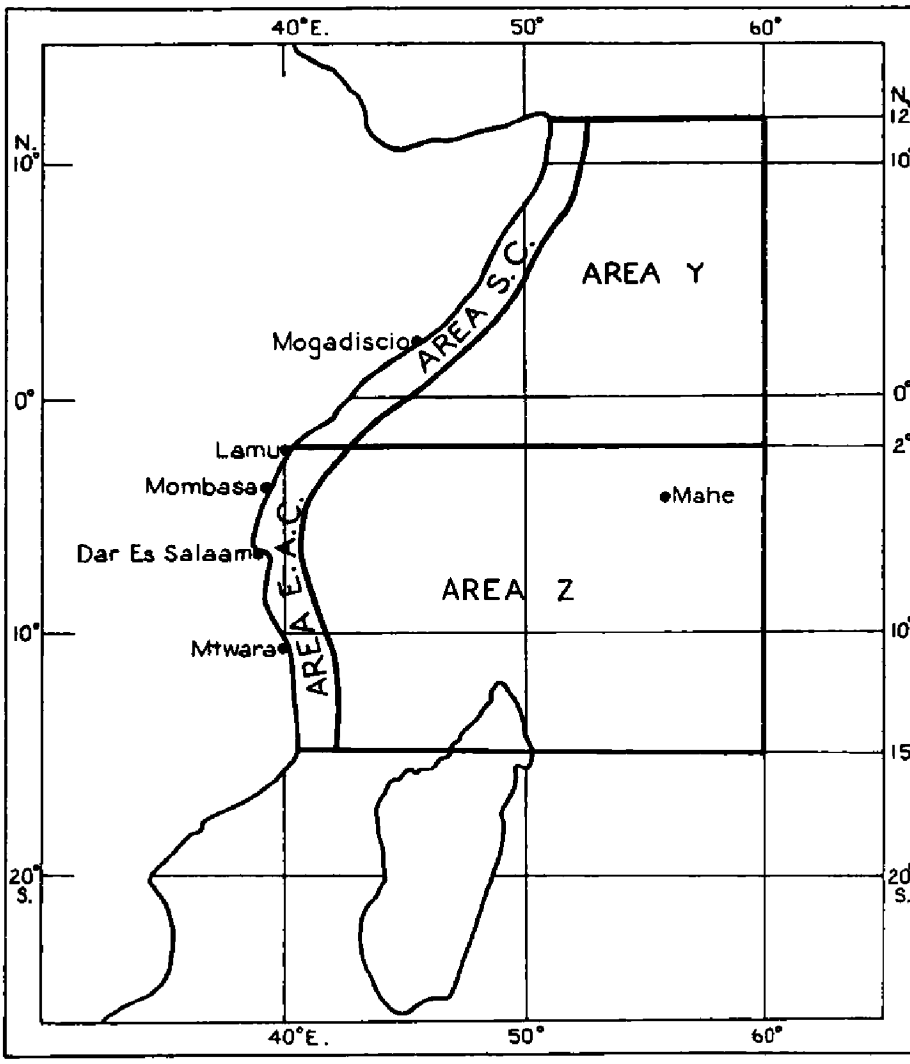
As there is an interval of about four months between the first and second of the observation periods given above, and one of about three months between the second and third periods, it is clear that there cannot have been one actual cause producing all three mortalities, though it is possible that the same type of cause recurred after an interval of time. One cause of the mass destruction of fish, which is known to occur from time to time in certain regions, is a deficiency of oxygen in the water.

Note. A later observation of this nature, made in January 1958, is given on page 12. A previous similar observation, with a note by Dr. Parker, was published on page 74 of the April 1956 number of this journal. E. W. B.

BRITISH EAST AFRICAN WEATHER SERVICES TO SHIPPING IN THE INDIAN OCEAN

Following a recent conference of Meteorological Services in Africa, the Nairobi area of responsibility for the provision of weather forecasts and other meteorological information for shipping has been changed. The area now extends from 12°N. to 15°S. and from the African coast to 60°E.

In an endeavour to improve its forecast service to shipping, this area has been divided into four sub-areas and in future a separate weather forecast will be issued for each of these. The boundaries of these sub-areas are shown on the map below.



Weather forecast areas to be used by British East Africa commencing on 1st January, 1959.

From this it will be seen that the main area is sub-divided into two coastal strips each about 100 miles wide, called the Somalia Coast Area (Area SC) and the East African Coast Area (Area EAC), with the remainder of the main area divided along 2°s. into approximately equal areas Y and Z.

The two coastal strips are the lanes which most shipping in this part of the world frequents. Even so, the normal shipping density is not high and the number of ship weather reports received in Nairobi is often insufficient for the preparation of really satisfactory forecasts within this coastal belt.

According to a survey made in 1952, the majority of Area Y is rarely crossed by ocean ships. In consequence, weather reports are very rarely received and as there are no islands nor air routes traversing the region, little is known from day to day of the weather. Forecasts cannot therefore be very accurate.

Area Z has a few island weather stations in the south and a routine report from Mahe in the north-east. There is not a high density of shipping in the area, though rather more than in Area Y. Frequently many days pass without the forecaster receiving any ship reports from the area. The position is somewhat better than in Area Y but there is much room for improvement, particularly as cyclones at times affect southern parts of the area.

It will be apparent from this brief survey that the East African Meteorological Department is very anxious to receive more ship weather reports from all parts of its area of responsibility in order to be able to improve its general forecasting service. Shipmasters, whether of selected ships or not, are therefore earnestly requested to transmit weather reports to the Department from any part of the area. Messages in code, or in plain language in the case of ships not on the Fleet List, should be transmitted to either OBS Dar-es-Salaam on medium wave or to OBS Mombasa on medium or short wave. These messages will be accepted free of charge. Such co-operation would be very much appreciated.

Shipping Operations in Hudson Bay

We have received the Commonwealth Shipping Committee's 17th Report on the Hudson Bay marine insurance rates. These reports have periodically been reviewed in this journal, the last one in January 1956, when we commented on the 14th Report dealing with the 1954 season. In that issue also we were able to include some historical notes dealing with the development of Port Churchill.

It is interesting to note in the current report, which deals with the 1957 season, the continued steady progress which is being made in the navigability of the Hudson Bay route and the subsequent improvement in trade from Port Churchill.

During the 1957 season of navigation, 46 ships made voyages to Churchill and loaded full cargoes for European destinations. In 1954, the number was 36. Although the 1957 number is two less than the record created in the previous season, many of the ships were larger and the total amount of grain lifted from Port Churchill was approximately one ship-load more than in the previous season. For many years, Messrs. Dalgliesh's *Warkworth*, a selected ship, had always been the first to enter the port, but in 1957 the German M.V. *Nordmeer* beat her by one day.

Abnormally severe ice conditions prevailed at the eastern end of the Hudson Strait at the opening of the 1957 season, and the late clearance of the icefields there caused the first ships to be held up for several days and they mostly got through to Churchill at the same time. The first ships passed Cape Chidley on 23rd July and the last ship cleared outward on 10th October. The latest permissible date for ships to load and sail from Churchill was, however, some 10 days later.

In our last review we referred to the work which was being done on the investigation of ice in the Hudson Bay by the National Research Council of Canada. The Council has now issued its final report on this investigation which has been made possible by the ready co-operation of shipmasters in submitting to them continuous reports of conditions. They have some very informative things to say on the subject of detection of ice by radar. They found that sea clutter in excess of 4,000 yards is not usually encountered on a passage through Hudson Strait, but that it is present a large percentage of the time and frequently of sufficient strength to obscure dangerous ice. Even in strong sea clutter, however, they found that the edge of a floe presents a strong line of demarcation between the ice and the sea clutter. Radar detection of field ice is, therefore, not difficult, since the ice has a tendency to damp any sea clutter that may be present. They considered that under normal conditions with sea clutter less than 2,000 yards, any growler large enough to cause damage to a ship should be detected beyond the clutter region.

The Council stress the importance of operating radar with an appreciation of its limitations and state that it may be dangerous if not wisely employed.

The five-year survey has enabled the general area of ice concentration on the Hudson Bay route to be well defined. This has been materially helped by aerial ice surveys, 16 of which were made between 19th July and 5th September and which covered the shipping lanes from Churchill to Resolution Islands. As a result of these surveys, shipmasters were advised of a safe course to follow.

Ice and the normal risks of navigation in little frequented waters are, of course, the main hazards on the Hudson Bay route, but before the route can be considered as comfortable and safe as the normal trade routes, much has to be learned about the meteorology of the region. It has been our pleasure for a number of years past to put instruments aboard many British ships on the Churchill run and to collect meteorological logbooks from them. We are indebted to them for their willing co-operation. Noteworthy among the observers has been Captain N. Thompson (S.S. *Warkworth*), who has been a regular trader every year since the war.

Perhaps the most pertinent comment on the advances made in making the route safe for shipping is given by a study of the additional premiums required of ships using it. In 1931 this was 50s. per cent of their insured value. In 1956 the figure had fallen to 5s. 6d. per cent for ships fitted with gyro compasses, though for ships not so fitted it had fallen only to 40s. per cent.

L. B. P.

CLIMATOLOGICAL AND SEA-SURFACE CURRENT CHARTS

Previous notices concerning these charts appeared in the July 1957 and January 1958 numbers of this journal. The 12 monthly charts for the North Atlantic are now all on sale at a price of 36s. the set (by post 37s. 2d.). Alternatively, they may be purchased in a folder at a price of 37s. (by post 38s. 2d.). They can be obtained from H.M. Stationery Office at any of the addresses given on the title page of this journal. The charts are largely based on the data contained in *Monthly Meteorological Charts of the Altantic* (M.O. 483) and *Quarterly Surface Current Charts of the Atlantic* (M.O. 466). Printed on a single sheet for each month, the charts show wind-roses, ocean currents, ice limits and main shipping tracks. Other elements—mean air and sea temperatures, barometric pressure, visibility and frequencies of gales and hurricanes—are depicted in small insets. The size of the charts is 40 in. by 25 in., but they are folded to 13 in. by 8 in.

Publication of charts for the South Atlantic, Indian Ocean and North and South Pacific Oceans will be considered in the light of the demand for the North Atlantic charts. It is necessary for H.M. Stationery Office to be assured of a certain minimum figure to justify the considerable expenditure of public funds which would be involved in the production of these charts for other oceans.

A REPLY TO MANY LETTERS

Now that most of last year's Excellent Awards have been safely distributed, we wish to record our appreciation of the many interesting letters received from the recipients of the awards. Unfortunately we are not able to reply to these letters individually, but we are always glad to hear from the large numbers of observers who obviously derive much pleasure from their meteorological work, and assure us of their continued interest in this work for the future.

There is much in these letters that would, no doubt, also be of interest to readers of this journal. For instance, we would mention the captain who wrote to us pointing out that in a fairly recent issue of *The Marine Observer* an observation by his grandfather was published in the " Old Time Marine Observers' Log "; an observation by himself appeared in the " Marine Observers' Log " of the same number. Another case concerns a radio officer, formerly in a selected ship, who writes: " You may be interested to hear that I have been employed ashore in Post Office Radio Stations since April 1958. I am now dealing with meteorological observations ' on the other side of the fence '—taking them from ships and forwarding them to the Meteorological Office via teleprinter."

We must confess to getting a little light-hearted entertainment from some of the letters, and hope that we still have the co-operation of the radio officer who, after saying he was delighted to receive an award, added that: "It makes what is sometimes a confounded nuisance seem worth while."

To close, we are much encouraged by the expressions of appreciation of the work done by the Meteorological Office, and hope that many of our readers will be able to echo the sentiments of the captain who wrote: "Having been an observing officer myself, I endeavour to encourage my officers in their observations, by which they themselves gain valuable information and experience, while contributing to an organisation of great value to mankind in general and seamen in particular."

M. V. R.

PRACTICAL VALUE OF RADIO WEATHER BULLETINS

From time to time letters covering a wide variety of subjects are received in the Marine Division from the masters of ships and ships' officers. One such letter which arrived not long ago described how the master, as the result of plotting the information broadcast in the North Atlantic Weather Bulletin, was able to navigate his ship in such a way as to avoid running into very strong head winds and rough seas. He was enthusiastic about the advantages to be gained by using the bulletin and confessed to regret at not having realised its possibilities a long time ago.

We would be glad to hear from any other masters or deck officers who can recall any particular occasion on which the North Atlantic Bulletin, or indeed the equivalent broadcast of any other country, had proved to be of especial benefit in assisting the navigation of their vessels.

Subject to the consent of the writers, we should be glad to print any suitable accounts in future issues of *The Marine Observer*.

G. M. R.

RETIREMENT OF MR. E. W. BARLOW

In the July 1927 number of *The Marine Observer* there appeared an article entitled "Currents in the North Atlantic Ocean". Edward William Barlow, B.SC., F.R.A.S., who was the author of that article, joined the Marine Division of the Meteorological Office on 1st January, 1927, and retired on 30th November, 1958, thus completing nearly 32 years' service in this Division.

During his long service in the Marine Division, Mr. Barlow's main work has been concerned with ocean currents, ice and the various types of phenomena, meteorological and other, observed at sea. The statistical computation of currents for publication in atlas form was instituted in 1923 by his predecessor, Mr. C. S. Durst. The current atlases previously in use at sea had been compiled from eye estimation of the general flow of current in each area of an ocean. As the new work continued, and atlases for different oceans were published, Mr. Barlow acquired a more exact and detailed knowledge of surface ocean currents than had been possible to anyone before. By examining individual current observations from British ships it was possible to derive information, for local coastal or other areas, of various kinds that the atlases could not show. In the course of the work currents previously unknown, or only partially known, were brought to light and study of the various oceanographical theories of current formation was of assistance in explaining these and other details of the general circulation.

The information about currents given in the Admiralty Pilots used to be based on the older current atlases, on local knowledge and experience, and on the observations made by surveying ships for local coastal areas. The building up of the newer and more accurate information enabled Mr. Barlow to revise the statements about currents which are given in Chapter I of every Pilot. The first Pilot revision he made was for the Eighth Edition of the Red Sea and Gulf of Aden Pilot, which was published in 1932. At the time of his retirement, Mr. Barlow had completely rewritten the general current statements in all but one of the 74 Pilot volumes, the exception being the Ch'ang Chiang Pilot, which deals only with the river formerly known as the Yangtze Kiang. In all, he wrote 111 revisions, which means that a number of the Pilots were revised twice, and a few three times, as a result of increasing knowledge. Much of the information about currents at local places, given in the body of each volume, has also been revised or added to.

In 1953 the Admiralty decided that a short statement about currents should be given on each of their navigational charts as it came up for revision, or on new charts. Since that date, Mr. Barlow, working in co-operation with the Hydrographic Department, has supplied information for 140 charts.

One of Mr. Barlow's duties was the study of sea ice. During his long stay in the Marine Division he acquired considerable knowledge of the subject and completely revised the ice sections of the relevant Admiralty Pilots. In connection with the preparation of the new International Ice Nomenclature, Mr. Barlow was able to give valuable assistance to Mr. (now Sir James) Wordie, who was the British representative on the working group appointed for this purpose by the Commission for Maritime Meteorology in 1947.

Mr. Barlow is not only a keen amateur astronomer (he was elected a Fellow of the Royal Astronomical Society at the early age of 18 and has his own private observatory at home) but he has always been interested in all natural phenomena. The number and variety of observations received from selected and other ships provided him with a ready field of study. Mr. Barlow gave particular attention to the phenomenon of marine bioluminescence (phosphorescence), and he made a classification of its many varied forms in the form of a paper which he read before the Challenger Society (of which he is a member) in 1951. This work was only made possible as a result of observations made aboard voluntary observing ships; Mr. Barlow intends to do some further work on this subject after his retirement. He did a considerable amount of work in association with Mr. Paton and Mr. McInnes of the Aurora Survey in helping to stimulate the interest of marine observers in making auroral observations for the International Geophysical Year.

Mr. Barlow contributed numerous articles concerning ocean currents and various meteorological subjects to *The Marine Observer*. He was responsible for the selection of items for the "Marine Observers' Log", and wrote many of the comments on them. He also prepared the chapters on currents, ice and phenomena in *The Marine Observer's Handbook* and *Meteorology for Mariners*. There is no doubt that the information he has passed on to seamen during the years, especially about ocean currents and ice, has made its contribution towards safety at sea.

He was an admirable colleague with whom to work and we wish him health and happiness in his retirement.

C. E. N. F.

Book Reviews

The Indian Ephemeris and Nautical Almanac for the Year 1959, issued under the authority of the Director General of Observatories, New Delhi. 10 in. × 7½ in. pp. xxiv + 404. Civil Lines, Delhi, 1958. 19s. (Rs.12.00).

This new publication has been produced under the direction of Dr. Basu, Director General of Observatories in India, who is also Director of the Indian Meteorological Department. The introduction gives an interesting summary of the development of Indian astronomy, which dates back as far as 1350 B.C. when a treatise containing elementary astronomical data was compiled. There appears to be no further historical record of astronomical work being done in India until about A.D. 400; considerable observational work on the motion of celestial bodies and on astronomical calculations was carried out between then and about A.D. 1200.

Thereafter it appears that astronomical work in India was largely carried out at five separate observatories but that practical astronomy did not keep pace with that of other sciences.

The publication of this new book marks an important step in plans for the further development of astronomical studies in India. The preface acknowledges assistance provided by the Astronomer Royal and other authorities in the United Kingdom and in the U.S.A. in compiling the Ephemeris.

A comparison with this book and the *Abridged Nautical Almanac* in current use in British ships (jointly produced also as the *American Nautical Almanac* from the year 1958) shows that the *Indian Ephemeris and Nautical Almanac* is probably intended as much for use by astronomers as by seamen. Its general arrangement does not seem to be anything like as convenient for the navigator as that of the *Abridged Nautical Almanac.* The data in the Indian almanac for the sun, moon, planets and stars are all in different sections of the book instead of being grouped together under the day in question, as in the British almanac. Furthermore, the hourly positions of the sun are given in the older form of right ascension, instead of Greenwich hour angle, the change to which was made in the *Abridged Nautical Almanac* in 1952. It should be remembered, however, that the latter was prepared purely for navigational use.

The miscellaneous tables contain information about eclipses, sun-rise and moon-rise, etc. At the end of the book is a detailed Indian calendar which shows, for example, that on 22nd March, 1959, the year 1881 Saka begins. A Moslem calendar is also included, together with interesting information about Hindu, Moslem and Christian feast days and holidays.

The introduction points out that there are in India no less than 30 different kinds of indigenous calendars in use in different parts of the country with different year beginnings, based upon planetary constants calculated by the astronomers of ancient orders. One of the objects of the new Ephemeris is to provide correct constants for this purpose.

C. E. N. F.

The Life-boat Story, by Patrick Howarth. $8\frac{3}{4}$ in. × $5\frac{3}{4}$ in. pp. xi + 203. *Illus.* Routledge & Kegan Paul, Ltd., London, 1957. 21s.

This history of the Life-boat Service of the United Kingdom is largely the history of the Royal National Life-boat Institution which was formed about 125 years ago. The foreword, written by H.R.H. the Duchess of Kent, mentions that during this period over 80,000 lives have been saved by the life-boats. It is inevitable that the history of the Life-boat Service is intimately related to the more violent aspect of the meteorology of these islands. The story which Mr. Howarth tells with much skill and human interest is one of selfless devotion to duty for the benefit of others, of great heroism and almost incredible feats of seamanship on the part of the life-boat crews, mostly in very unpleasant weather conditions, of generosity on the part of voluntary subscribers and of ingenuity on the part of the boat builders.

The story begins, appropriately enough, in the Goodwin Sands area, and here as elsewhere the author's neat and concise style comes out in his description of the idiosyncrasies of these sands and their malevolent history. As early as 1616 there are records of rescue work having been carried out voluntarily in this area by boatmen from Deal; a life-boat station was officially established there in 1865. When in 1703, 13 warships were driven on to the Goodwin Sands "in a hurricane", 1,200 lives were lost but about 250 were saved by the Deal boatmen.

But it was at Bamburgh in Northumberland that an organised Life-boat Service, which can be looked upon as the forerunner of the R.N.L.I., first appears on the scene, thanks to some money which was left in trust by the Crewe family for various charitable services in connection with seamen. Special types of boat were used specifically for life-boat services there as early as 1784. It was in the same vicinity (actually in the Farne Islands) that Grace Darling figured in the rescue of survivors from the *Forfarshire*, on passage from Hull to Dundee, which went ashore in a northerly gale on 7th September, 1838.

The author tells us that the R.N.L.I. was founded at Douglas, in the Isle of Man, in 1824. He mentions that between 1822 and 1845, 142 vessels were wrecked on the coast of the Isle of Man, so it is perhaps not surprising that there was a local interest in life-boats. The founder of the Institute was a man by the name of William Hillary, who had himself been an active member of the crew of the Douglas life-boat, which was operated at the time by a local organisation. Due to Hillary's energy and enthusiasm the National Institution for the Preservation of Life from Shipwreck, as it was then called, had quite an auspicious start in life and was very soon able to provide new life-boats. It assumed the title of Royal National Life-boat Institution in 1854.

The book shows us that the R.N.L.I. has had many vicissitudes and points out that major shipwreck or life-boat tragedies involving loss of life have always tended to increase public interest, and consequently the subscriptions. Proposals have been made from time to time that such an important rescue service should be " nationalised ", but it has wisely been decided that so long as the organisation is operated so efficiently and the men who man the life-boats are so enthusiastic and self-sacrificing in their work, it is far better to remain as it is.

The book mentions the Institution's interest in meteorology in connection with " the preservation of life from shipwreck ", which was shown in a practical way in the 1870s when they made aneroid barometers available to fishing vessels at greatly reduced prices.

The author takes us to various life-boat stations around the coast of the United Kingdom and Ireland, and gives vivid pictures of the men who form the crews of these vessels—many of them fishermen. He describes the evolution of the life-boat from the early pulling boats, some of them being fitted with sails, up to the advent of the steam life-boat and thence to modern vessels of today, fitted with powerful Diesel engines and quite elaborate equipment (including the invaluable radio telephone).

Each chapter is built up round a particular life-boat station; thus Cromer is the setting for " life-boats in time of war "; Aberdeen and Peterhead for " Scottish life-boats "; Stornoway and Cowes for " the design and construction of life-boats ".

Perhaps the most spectacular episode in the book concerns the remarkable job done by the Ballycotton life-boat when, after a battle lasting 76 hours, they rescued the crew of the Daunt Rock Light-vessel in appalling weather conditions which, in February 1936, included a south-easterly gale which blew more or less incessantly for five days, interspersed with a period of fog, " during which the sea scarcely went down at all ". In January 1881 the Whitby life-boat was dragged a distance of six miles over roads frozen by ice and snow by the local men, women and children in order to launch it in Robin Hood Bay to rescue the crew of the brig *Visitor*. In January 1942 a three-day gale " with gusts of 105 miles per hour " involved the Peterhead life-boat in the rescue of 106 lives. A more recent case, which is quoted, is the work of the Donaghadee boat in rescuing survivors from the *Princess Victoria*.

Throughout the book, and particularly in the last chapter, we get glimpses of the more sombre side of the story—the life-boatmen who have given their lives in an endeavour to rescue others.

The appendices at the end of the book list the number of stations of the R.N.L.I., which totals over 150, and show us that the Netherlands is the only other country in which the Life-boat Service is entirely supported by voluntary contribution, but that in most of the primarily " maritime " countries there is a measure of voluntary contribution with assistance from the State.

The book is illustrated with some excellent photographs and is generally well worth reading.

C. E. N. F.

Personalities

RETIREMENT.—At the end of June 1958, COMMODORE E. J. SYVRET, O.B.E., retired from the sea after 47 years with the Port Line. Edward John Syvret received his early training in H.M.S. *Worcester* and commenced his apprenticeship in 1911 in the Tyser Line, one of the constituent companies of the Commonwealth and Dominion Line, later to be known as the Port Line. He was appointed to his first command, the *Port Montreal*, in 1937. This was one of the three ships specially built for the Port Line for the new Montreal–Australia–New Zealand service, jointly operated by three shipping companies. In 1944, Captain Syvret was awarded the King's Commendation for services in the Mediterranean when in command of the *Port Alma*. In April 1945, when outward bound in the *Port Wyndham*, he was torpedoed and brought his ship into Deal Roads listing heavily to port and well down by the head. She was eventually towed, stern first, into Southampton.

In December 1954 he was appointed Commodore of the Port Line and in 1956 was awarded the O.B.E. Commodore Syvret was one of our more senior observers, his first meteorological logbook coming here in 1920 when he was in the *Port Sydney*. In 15 years he sent us 21 logbooks, many of which were assessed Excellent. He received Excellent Awards in 1949, 1951, 1952 and 1953.

We wish him health and happiness in his retirement.

L. B. P.

Letter to the Editor

LABRADOR CURRENT

SIR,—In my experience of nearly 30 years, when using " F " track on approaching Cape Race westbound or leaving Cape Race eastbound, there has been a marked set to the south. This year, however, the set has been to the north on each voyage since " F " track was declared open.

Hitherto, whilst in the current there has been a marked drop in sea temperatures, this year, however, the change has been very slight.

Ice reports have indicated that few or no icebergs have drifted south of the parallel of Cape Race, in fact from reports earlier in the season it would appear that the bergs either dispersed or retreated to the north-east coast of Newfoundland.

It would be interesting to know if other ships have experienced the foregoing.

J. CROSBIE DAWSON,
Master.

R.M.S. *Parthia*.
6th September, 1958.

Note. Captain Dawson's experience certainly indicates that there was some weakening of the Labrador Current this summer. The Atlantic Current Atlas shows that some variability in this current, with sets having northerly components, may always be expected, but from the comparatively small number of current observations that we have for this region, these sets appear to be least frequent in summer. We have had no other specific reports of northerly currents in this region during this year and we should be interested to hear of the experiences of other shipmasters.

IN LIGHTER VEIN

My bloomer

Oh dear, I am in a horrible fix,
I've sent nought nought instead of three six,
FGA I hope has seen
In column eleven I've put sixteen,
In group eleven nought nought once more,
Though I follow this up with a two and a four.
In future, dear sir, I'll take more care,
On my next observation more time I'll spare.

D. HATTON,
2nd Officer.

The above poem was written by an observer who had made the not uncommon mistake of coding the direction North as 00, which, as most ships' officers will know, means calm, both for wind and waves.

The numbers following the two 00s mentioned by the author would of course indicate to the meteorological centre that a mistake had been made. If, however, for any reason these could not have been entered, then the mistake might be very misleading.

METEOROLOGICAL OFFICE LEAFLET No. 3

The familiar leaflet which gives details of weather bulletins and gale warnings for coastwise shipping and fishing vessels has recently been revised, reprinted and given a new reference number. It is now known as M.O. Leaflet No. 3 instead of Form 2451.

Fleet Lists

The need for economy due to rising costs has made a curtailment of the publication of the Fleet List necessary, and in future it will appear only in the July number. The January number will, however, contain an amendment to the list of the previous July, setting out particulars of additions to and deletions from that list.

We wish to emphasise that the deletion of a ship from the Fleet List implies no discredit on her master or officers but may be due to a variety of reasons, such as a long refit, lay-up or sale or a change of national registry. We have thought it necessary to publicise the deletions, however, in order to give our readers a true picture of the voluntary observing fleet.

Knowing that the Fleet List has always been, and is, a very popular part of the journal, we have reduced the frequency of its publication with real regret. We hope it will not cause inconvenience to our readers afloat.

BRITISH COMMONWEALTH

AUSTRALIA (Information dated 30.6.58)

The following have been recruited as selected ships:

Carpentaria (British India Steam Navigation Co., Ltd.)
*Koojarra** (Western Australian State Steamships)
Malay (Austasia Line, Ltd.)
Mandama (Austasia Line, Ltd.)
Montoro (Burns, Philp & Co., Ltd.)
Sibigo (Royal Interocean Lines)
Sigli (Royal Interocean Lines)
Surabang (Royal Interocean Lines)

The following has been recruited as a supplementary ship:
Delamere (Western Australian State Steamships)

The following ships have been deleted:
Daylesford, Delos, Koolinda, Kybra, Romanic.

* Formerly a supplementary ship.

HONG KONG (Information dated 1.10.58)

The following have been recruited as selected ships:

Name of Vessel	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Chefoo	C. N. Stewart, D.S.C.	J. M. Parker, R. A. Taylor, H. S. Briant	Chan Man Kit	China Navigation Co., Ltd.
Hallvard ..	T. Strange Olsen	O. Saltvold, L. O. Nordli, I. Vikse	H. V. Leong..	China Siam Line

The following ship has been deleted: *Tai Poo Sek.*

INDIA (Information dated 11.10.58)

The following have been recruited as selected ships:
Amra (British India Steam Navigation Co., Ltd.)
Indian Shipper (India Steamship Co., Ltd.)
Pradeep (Department of Lighthouses and Lightships, Government of India)

The following have been recruited as supplementary ships:
Jagjanani (Great Eastern Shipping Co., Ltd.)
Raja (Asiatic Steam Navigation Co., Ltd.)
Ranee (Asiatic Steam Navigation Co., Ltd.)
State of Orissa (Eastern Shipping Corporation)

The following ships have been deleted: *Itaura, Risaldar.*

MALAYA (Information dated 2.10.58)

The list of ships is the same as that published in the July 1958 number of *The Marine Observer.*

NEW ZEALAND (Information dated 2.9.58)

The following has been recruited as a selected ship:
*Kaituna** (Union Steam Ship Company of New Zealand, Ltd.)

The following have been recruited as supplementary ships:
Holmglen (Holm & Co., Ltd.)
Holmlea (Holm & Co., Ltd.)
Kaimai† (Union Steam Ship Company of New Zealand, Ltd.)
Koraki (Union Steam Ship Company of New Zealand, Ltd.)
Navua† (Union Steam Ship Company of New Zealand, Ltd.)

The following ships have been deleted: *Kairanga, Kaponga, Piri, Waitaki.*

PAKISTAN (Information dated 1.10.58)

The list of selected and supplementary ships is the same as that published in the July 1958 number of *The Marine Observer.*

The following have been recruited as auxiliary ships:

Name of Vessel	Call Sign	Owners
Fakirji Cowasjee ..	AQBQ	East and West Steam Navigation Co., Ltd.
Fausta	AQBH	East and West Steam Navigation Co., Ltd.
Firdausa	AQAL	East and West Steam Navigation Co., Ltd.
Firoza	AQBE	East and West Steam Navigation Co., Ltd.
Ocean Endeavour ..	AQBD	Trans-Oceanic S.S. Co., Ltd.
Ocean Enterprise ..	AQAY	Trans-Oceanic S.S. Co., Ltd.
Ocean Envoy ..	AQBT	Trans-Oceanic S.S. Co., Ltd.

SOUTH AFRICA (Information dated 20.10.58)

The following ship has been recruited: *South African Transporter* (S. A. Marine Corporation, Cape Town.)

* Formerly a supplementary ship.
† Formerly a selected ship.

GREAT BRITAIN (Information dated 18.10.58)

The following have been recruited as selected ships:

Name of Vessel	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Aramaic	6.10.58	G. Conolly	N. J. Case-Green, D. Aberdeen, C. Downes, D. Bridger	F. Laurence	Shaw Savill Line, Ltd.
Ayrshire		P. MacMillan	N. McCarthie, M. N. Ure	M. Collins	Cayzer Irvine & Co., Ltd.
Baron Ardrossan	8.9.58	J. Reid	H. A. Whitfield, W. H. Davis, J. Johnstone	J. D. Connor	H. Hogarth & Sons, Ltd.
Beecher Island	7.10.58	A. J. Lawson	A. S. Flint, R. G. Holmes, S. V. Garratt, J. C. Daws	T. N. Guina	B.P. Tanker Co., Ltd.
Brazilian Prince		L. J. Kew	R. C. Jackman, K. Slapp, M. S. Smith	J. R. Proffitt	Prince Line, Ltd.
British Purpose		T. R. L. Tanner	M. F. Mathison, B. Wharrie, M. Cleghorne		B.P. Tanker Co., Ltd.
City of Portsmouth		E. Fawcett	P. Petts, J. L. Kinley, J. Blackie		Ellerman & Bucknall S.S. Co.
City of Winchester		J. W. Wotherspoon, M.B.E.	P. G. Evans, T. Innes, G. Barden		Ellerman & Bucknall S.S. Co.
Clan Macdougall	19.9.58	T. N. Soane	C. F. Knott, I. Dalziel, J. Markie	C. F. Knott	Cayzer Irvine & Co., Ltd.
Clan Macleod		W. W. Simpson	P. G. M. Gurnell, D. Richards, J. Curwen	J. Carey	Cayzer Irvine & Co., Ltd.
Cornwall		F. C. Taylor	B. Wood, P. A. Plumley, P. Lay, J. Knight	B. Nutt	Federal Steam Navigation Co., Ltd.
Crystal Bell		E. Owen	M. Houchen, T. Burke, W. Hunt	N. A. P. Grice	Sugar Line, Ltd.
Cymric		H. C. Smith	K. C. Newton, R. L. Reid, —. Pitt	W. Charlton	Shaw Savill Line, Ltd.
Hemiglypta	10.10.58	S. A. Greenaway	J. M. Conolly, M. T. John, W. R. Smith	J. P. Conolly	Shell Tankers, Ltd.
Houston City		G. Harvey	J. Williams, D. S. Sapp, V. Cartwright	J. London	Sir William Reardon Smith & Sons, Ltd.
Innesmoor		F. B. Lamb	I. McLeod		Walter Runciman & Co., Ltd.
Loch Loyal		G. M. Fletcher	J. C. Jardine, G. Varney, J. Niblock	J. Barter	Royal Mail Lines, Ltd.
Logna		L. B. Andersen	D. I. Polson, —. Harkness		Chr. Salvesen & Co.
Northumberland		T. F. Alderman	I. W. Stirling, G. Pool, G. S. Lott	R. Waters	Federal Steam Navigation Co., Ltd.
Otaio	9.9.58	A. Hocken	A. Carver, R. Cooke, E. Jones, R. Ford	P. Broome	New Zealand Shipping Co., Ltd.
Otra		W. Scott	H. Mackay, R. Hare		Chr. Salvesen & Co.
Pacific Envoy		P. Owens	B. Roberts, —. Dyason, K. Milliken, J. Heathcote		Furness Withy Co., Ltd.
Pacific Stronghold		H. A. Shaw, O.B.E.	J. Phillips, S. N. Coe, R. Weekes, E. Dempster	T. W. Elliot	Furness Withy Co., Ltd.
Perseus		H. C. Large			China Mutual Steam Nav. Co., Ltd.
Port Auckland	2.10.58	C. R. Townshend	L. G. Williamson, D. J. North, G. Collison	H. Horricks	Port Line, Ltd.
Port Invercargill		A. Brown	D. S. Taylor, M. Twomey, G. Shearn	J. P. Goddard	Port Line, Ltd.
Ribblehead	12.9.58	A. Mathison	P. R. Owen, A. Azols, J. Parsloe	K. A. MacKenzie	Bolton S.S. Co., Ltd.
Richard de Larrinaga	12.8.58	J. Meade	F. J. Waring, L. G. Daniel, J. Reid	J. Hunter	Larrinaga S.S. Co., Ltd.
Scottish Star		E. Laidlaw	R. K. Bilton, J. Merrills, R. Parker, T. Milne	D. Clarke	Blue Star Line, Ltd.
Silverbrook	5.9.58	P. L. Hopkins	D. C. Dunn, M. R. Duke, J. Corbett, D. J. Metcalf	S. H. Ebel	Silver Line, Ltd.
Silversand	24.9.58	D. B. Edgar	K. Lewis, A. A. Walker, J. P. Daniel, G. Metcalf, J. Moore	H. G. Percival	Silver Line, Ltd.
Tabaristan		R. Mack	W. MacKendril, D. Garden, F. Fiori		Strick Line, Ltd.
Taranaki		W. J. Stanger	F. W. Miller, J. D. Haberfield, B. N. Hinderwell, M. F. Hughes	G. Cavaye	Shaw Savill Line, Ltd.
Tidecrest		A. Miller	J. G. B. Hughes, J. Main, R. Todorovich	A. Patterson	Ivanovic & Co., Ltd.
Toronto City		E. Irish	P. Doble, P. Wright, N. Childs	T. M. Jenkins	Charles Hill & Sons
Tremorvah		H. Care	P. Sandercock, C. D. Abbott, S. Vass	A. Watt	Hain S.S. Co., Ltd.
Trochurus		W. Broughton	A. W. Leyland, —. Karlson, A. P. I. McGuigan	D. Spooner	Shell Tankers, Ltd.
Welsh Trader		E. Atkinson	E. Lightowler, C. G. Foot, B. Hall		Trader Navigation Co., Ltd.
Wokingham	6.10.58	F. W. Grist	A. D. Sugden, J. Collister, A. J. Hutchings	A. Maclean	Watts Watts & Co., Ltd.

The following have been recruited as supplementary ships:

Name of Vessel	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Bellerby		E. Dunn	A. O'Hara, D. Cherry		Ropner Shipping Co., Ltd.
*Cato**		M. G. Mowatt	T. Phillips, E. Powell		Bristol Steam Navigation Co., Ltd.
Greathope		R. Cook	A. McGrath, W. Craig, L. Dobson	K. Blackmore	Newbigin S.S. Co., Ltd.
*Hadrian Coast**		W. Wyness	J. Cowie, P. Bowie		Coast Lines, Ltd.
Kenya		D. W. Speirs, G.M., R.D.	T. Bogie, A. J. Hughes, J. L. Smith	J. D. Masterman	British India Steam Nav. Co., Ltd.
*Kirkham Abbey**	17.9.58	H. H. Fox, M.B.E.	D. C. Thomas, T. Walker, R. E. Bielby		Associated Humber Lines, Ltd.
Lord Codrington		W. R. H. Lewis	J. C. Fowler, C. A. J. Skey, A. Kamdron	J. L. McDade	Norships Ocean Carriers Co., Ltd.
Tremayne	19.8.58	L. J. White	P. R. Donlin, S. Mallory, R. Cartwright	J. Dustan	Hain S.S. Co., Ltd.
Trevean		S. Watkins	K. W. Davidson, W. T. W. Price, —. Saddler		Hain, S.S. Co., Ltd.

* Formerly a Marid ship.

The following have been recruited as Marid ships:

Name of Vessel	Captain	Owner/Managers
Bolton Abbey ..	H. Aron	Associated Humber Lines
Heron	E. C. Painter, D.S.C. ..	General Steam Navigation Co., Ltd.
Scotia	A. M. Finlayson ..	Scottish Home Department
Zena	L. W. Loose	Glen & Co., Ltd.

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

Skipper	Trawler Owners/Managers
G. E. Beech ..	J. Marr & Son, Ltd.
C. Burt	Kingston Steam Trawlers Co., Ltd.
T. Christy	J. Marr & Son, Ltd.
F. R. Cornish ..	Kingston Steam Trawlers Co., Ltd.
A. E. Crewdson ..	J. Marr & Son, Ltd.
E. Hogg	Kingston Steam Trawlers Co., Ltd.
A. Jackson	Kingston Steam Trawlers Co., Ltd.
W. Jinks	Iago Steam Trawler Co., Ltd.
J. Moran	J. Marr & Son, Ltd.
R. Nash	Iago Steam Trawler Co., Ltd.
T. H. Spall ..	Atlas Steam Fishing Co., Ltd.

The following ships have been deleted: ***Alcantara, Alva Star, Balantia, Bransfield, British Loyalty, British Piper, British Union, Bury, Cambridge, Captain Hobson, City of Barcelona, City of Sydney, Darro, Echo, Geelong Star, Gothland, Halindene, Harrogate, Hororata, Maidstone, Martagon, Martita, Monarch, Ocean Layer, Orari, Orcades, Orchy, Planter, Reina del Pacifico, Ringdove, Rivercrest, Romanic, Tagelus, Tekoa, Tenagodus, Thaumastus, Tongariro, Tottan, Tregenna, Trelissick, Tribesman, Twickenham, Volvula.***

Meteorological Office (Marine Division) Atlases

The following are published by the Marine Division of the Meteorological Office and may be purchased from the bookshops of Her Majesty's Stationery Office at any of the addresses on the title page. Copies are available for reference by shipmasters and shipowners in the offices of Port Meteorological Officers.

Meteorological Atlases

Monthly Meteorological Charts of the Atlantic Ocean. M.O.483, 1948. (60°S–70°N, 80°W–40°E) *Reprinting*

Monthly Meteorological Charts of the Western Pacific. M.O.484, 1956. (60°S–60°N, 100°E–155°W) (16¾″ × 23¾″) 105*s*. (post 2*s*. 9*d*.)

Monthly Meteorological Charts of the Eastern Pacific. M.O.518, 1956. (60°S–60°N, 160°W–60°W) (17½″ × 24½″) 147*s*. (post 3*s*. 3*d*.)

Monthly Meteorological Charts of the Indian Ocean. M.O.519, 1952. (50°S–30°N, 20°W–120°W) (16½″ × 22½″) *Reprinting*

The above four atlases contain monthly charts of wind, barometric pressure, air and sea temperature, and all meteorological elements including some typical tracks of tropical revolving storms.

Monthly Sea Surface Temperatures and Surface Current Circulation of the Japan Sea and Adjacent Waters. M.O.M.447, 1944. (20°N–47°N, 110°E–150°E) (20″ × 17″) 7*s*. 6*d*. (post 9*d*.)

Monthly Sea Surface Temperatures of Australian and New Zealand Waters. M.O. 516, 1949. (50°S–10°S, 100°E–180°) (19¾″ × 12¼″) 10*s*. (post 7*d*.)

Monthly Sea Surface Temperature of the North Atlantic. M.O.527, 1949. (30°N–68°N, 80°W–15°E) (19¾″ × 12¼″) 10*s*. (post 7*d*.)

Monthly Meteorological Charts and Sea Surface Current Chart of the Greenland and Barents Seas. M.O.575. (60°N–80°N, 30°W–120°E) *Reprinting*

This atlas contains a generalised surface current chart for the area and monthly charts of wind, barometric pressure, air and sea temperature, and all meteorological elements.

Current Atlases

Currents of the Indian Ocean. M.O.392, 1939. (50°S–30°N, 20°E–140°E) (30″ × 20″) 10*s*. (post 7*d*.)

South Pacific Ocean Currents. M.O.435, 1938. (60°S–0°, 140°E–70°W) (22″ × 34″) 10*s*. (post 1*s*. 1*d*.)

The above two atlases contain quarterly " current arrow " and " current rose " charts.

Quarterly Surface Current Charts of the Atlantic Ocean. M.O.466, 1957. (60°S–70°N, 80°W–20°E) (22½″ × 18″) 32*s*. 6*d*. (post 1*s*. 6*d*.)

Quarterly Surface Current Charts of the Western North Pacific Ocean with monthly chartlets of the China Seas. M.O.485, 1949. (0°–60°N, 98°E–160°W) (21″ × 16″) 25*s*. (post 11*d*.)

The above two atlases contain current rose charts, predominant current charts, and vector mean current charts.

Ice Atlases

Monthly Ice Charts of the Arctic Seas. M.O.M.390a, 1944. (60°N–80°N, 80°W–110°E) (12″ × 7″) 3*s*. 6*d*. (post 5*d*.)

Polar ice, mean limits of sea ice, extreme limits of sea ice, extreme limits of bergs.

Monthly Ice Charts of Western North Atlantic. M.O.478, 1944. (37°N–53°N, 72°W–35°W) (12″ × 7½″) 4*s*. (post 7*d*.)

Mean limits of pack, extreme limits of pack, mean limits of bergs, extreme limits of bergs.

Her Majesty's Stationery Office

Printed in Great Britain under the authority of Her Majesty's Stationery Office by The Campfield Press, St. Albans, Herts.

888. Wt. 0003. K14. 12/58. S.P. & S. G.9.8.8. S.O. Code No. 40-38-1-59