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The Marine Observer

A quarterly journal of Maritime Meteorology

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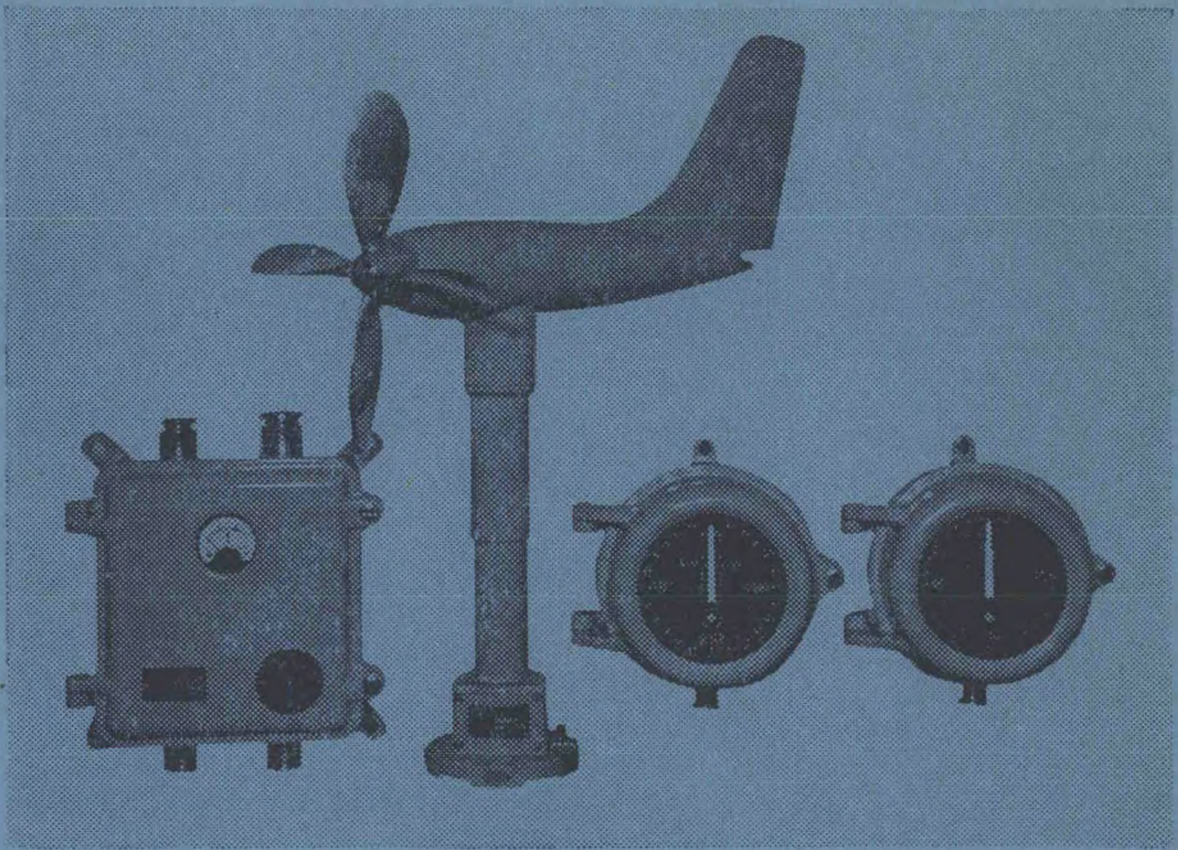

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A Quarterly Journal of Maritime Meteorology
prepared by the Marine Division of the
Meteorological Office

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

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Letters to the Editor, and books for review, should be sent to the Editor, "The Marine Observer," Meteorological Office, Eastern Road, Bracknell, Berkshire RG12 2UR

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Editorial

"I have ever been of opinion that revolutions are not to be evaded". More than a century ago when he wrote those words, Benjamin Disraeli was possibly thinking of political revolutions but they have recently found an echo in the board room of a shipping company, "Gentlemen, there is now no running away. The container era is upon you".

Nothing since the passing of sail has wrought such changes in the world of shipping as are now promised under the all-embracing, though somewhat ugly term 'containerization'. The shape of ships is changing; the shape of docks and wharves is changing; the shape of cargo-handling gear is changing and one has to wonder whether the men who operate them will not change also.

It seems probable that the genesis of the container system lies with the Great Western Railway which, shortly after World War I, instituted a system of door-to-door deliveries in a 'package to contain packages', using containers built in mahogany on a steel framework in their Swindon wagon works.

The idea caught on quickly and soon other railway companies and various private coach-builders were building containers. Between the wars large pre-packed containers carried on lorries or in railway trucks became not uncommon sights on the roads and railways of Great Britain.

It was left to America, however, to take the road haulage principles of door-to-door transport to sea. In 1955 an experimental cargo of containers was carried on a platform in a tanker voyaging between New York and Houston, Texas. They were loaded and discharged by conventional dock cranes but, even so, cargo-handling costs had been drastically reduced.

That experiment was followed by a regular container-ship service between New York and Puerto Rico on which it was claimed that port-handling costs worked out at about one-twentieth of the normal and port turn-round times were cut from 7 days to 15 hours.

There soon followed a longer container-ship service, instituted by an established American shipping company well known in the Pacific, between Hawaii and the United States west coast ports. About three years ago the pioneering company crossed the Atlantic with their containers and what has come to be known now as the 'container revolution' could be said to have started then. Quite suddenly it seemed as if a challenge had been issued; it was accepted and soon several British and European shipping companies were carrying cargoes pre-packed into containers, across the Atlantic, most of them using their conventional ships for the purpose. But the move towards specially built ships to carry standardized containers all over the world had begun.

It was not long before some British shipowners had combined to form two large container groups; currently with the writing of this Editorial they are building 9 container ships to operate a weekly container service between the United Kingdom and Australia starting in February 1969 whilst a U.K. to New Zealand container trade is being planned for the early 1970s. We understand that there are now 50 container ships in service in various trades; by 1970 the number will probably be at least 300 and in 1980 it has been estimated that at least 630 million tons of cargo will be moving in container ships on the deep-sea trade routes of the world.

An average purpose-built container ship of the 1970s will be of about 27,000 tons deadweight with a carrying capacity of 1,300 containers. By using the straddle carrier now being built at many ports, it will be possible to off load one container every minute and, where it is possible to move two at a time, the rate of discharge could be as high as 1,000 tons per hour! And of this type of ship it has been said that nine of them could replace 80 conventional cargo ships. This demonstrates the dramatic reduction in the size of the world's cargo fleets which, at least in some trades, is likely to take place within the next few years.

And what is to be the future of the Voluntary Observing Fleet in such circumstances? The picture is not encouraging; already some of our oldest and most trusted 'customers' on the Western Ocean run have left us to be replaced by larger, faster and more modern ships, one ship often replacing two or more and we visualize, with no little apprehension, that this shrinkage will soon take place in other trades also. Many new ships will undoubtedly be designed with a view to ready adaptation to container traffic when the time comes but it is probable that for many years the requirements of some trades will be adequately met by the employment of conventional dry-cargo ships, bulk carriers and tankers. Although these all tend to get bigger and faster (between 1949 and 1967 the number of U.K.-registered ships fell from 6,077 to 4,156 though their total gross tonnage rose from 18 million to nearly 22 million) and thus contribute to the present-day requirement of more work done by fewer ships, it does seem that the run-down of shipping engaged here will be much slower than in 'containerized' trades.

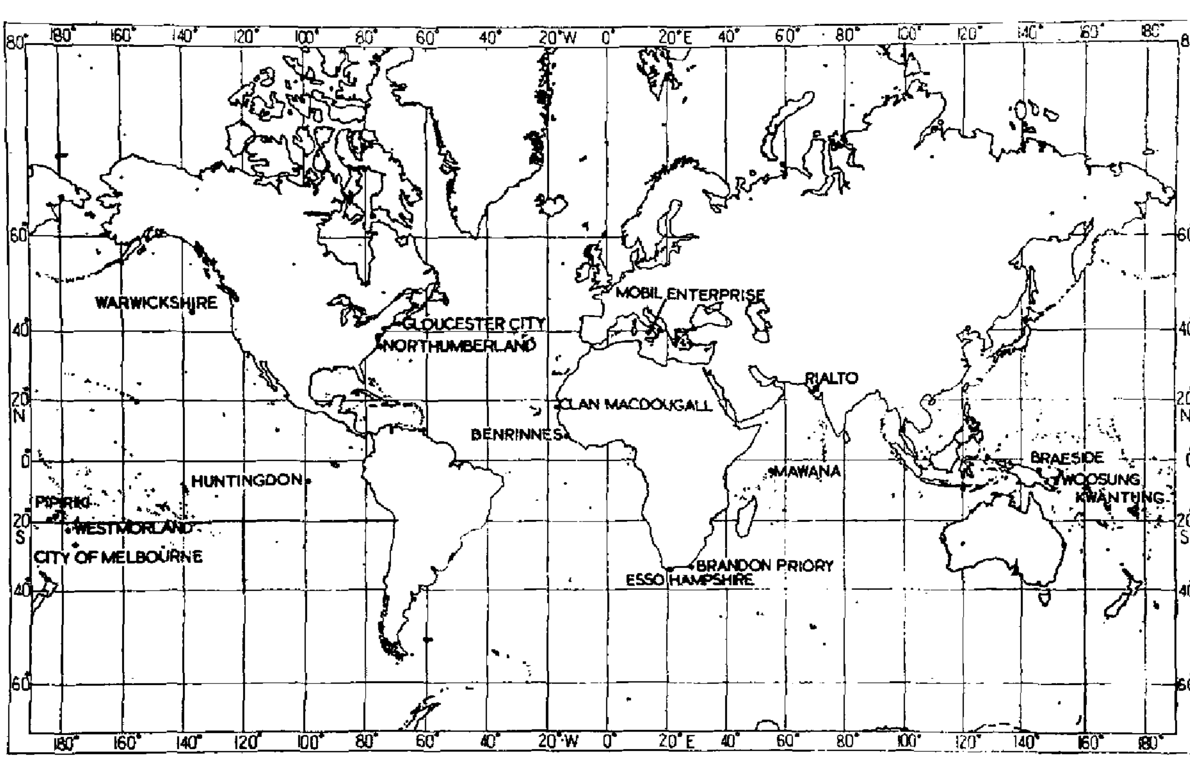
To the Meteorological Office one large ship will never be as useful as two smaller ones and certainly, meteorologically speaking, no lesser number will ever be able to do the work of 500; and the faster that ships get, the wider will be the space between the observations. A 25-knot ship, for instance, will cover 150 miles between two observations whereas a 10-knot ship will cover only 60. A reduction in the strength of the Voluntary Observing Fleet would be an anathema at any time but is especially so now while the United Kingdom, as part of her contribution to World Weather Watch, is endeavouring to increase her number of observing ships. Expressed as a percentage of the number of U.K.-registered ships, about 14 per cent are voluntary observers but this percentage will have to be vastly increased in the face of a numerically smaller merchant fleet if actual numbers are even to be maintained, let alone increased.

The problem then is to find more observing ships, possibly ships that have never observed before. The tide is temporarily being stemmed by a number of Auxiliary (SHRED) ships whose meteorological appetites, having been whetted by observing and sending radio weather messages in the sparse areas, are coming forward as volunteers for 'full membership'. Our hopes are that this will continue but undoubtedly something more is needed. Perhaps we may put forward to our readers a suggestion so often offered by retailers ashore, "If you like us, please tell your friends". For it is quite certain that any significant reduction in the size of the Voluntary Observing Fleet will only result in a reduction in the quality of the services which we are able to provide for shipping. The provision of meteorological services is our solemn commitment under the International Convention for the Safety of Life at Sea and shipmasters and officers who have visited us here in Bracknell and seen the work going on will, better than anyone, understand how difficult and inadequate our efforts would be if there were no ships' observations on the forecasters' charts or in the library of punched cards.

A leading British exporter has accused one of the recently-formed container consortia of "taking all the fun out of shipping cargoes to Australia". Pondering on these words one cannot but recall the occasional feeling of pride which attended the successful out-turn of a difficult cargo, or the zest with which one tackled the problem of loading beef, lamb, pigs' livers and sheep's hearts all in one small cargo space, or the steps which one took to prevent sweat damage or cargo theft, or the hours spent striving for neatness and accuracy in one's cargo plans or even the interminable rows with some recalcitrant stevedore foreman; they were all 'fun' in their way and gave scope for initiative. But now they are all to die and it may not be long before even the stevedore's hand hook will become a museum piece. The prophet Isaiah said "They shall beat their swords into plowshares, and their spears into pruninghooks"; what future would he have visualized for the humble hook when it also had served its turn? To be beaten into a computer part, perhaps. For computers are a vital part of the container age if only to keep track of the position and state (loaded or empty) of thousands of containers stretched out across oceans and continents.

But one thing, at least, remains constant in this changing world. It would be arrogant and heretical even to dream that Man, for all his ingenuity, will ever be able to regulate the passage of the earth around the sun, no matter how he may regulate the passage of his cargoes across the world's surface and it is oddly comforting and reassuring to the writer of the Editorial in the January number of *The Marine Observer* each year to be able to send New Year greetings to all members of the Corps of Voluntary Marine Observers wherever they may be. May 1969 be for all a year of health, happiness, prosperity and good landfalls.

L. B. P.



Positions of ships whose reports appear in "*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.

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

TROPICAL STORM

S.W. Pacific Ocean

m.v. *City of Melbourne*. Captain R. Frame. Panama to Brisbane. Observers, the Master and Mr. M. J. M. Stewart, 3rd Officer.

23rd–24th January 1968. At 2030 GMT on the 23rd a warning was received from Wellington of a tropical storm centred at 25°S, 180°, practically on the ship's course, about 350 miles ahead. The vessel was making 18½ kt on a course of 267°. On the basis of this information and the fact that the barometer had dropped from 1008·5 mb at 2000 to 1002 mb at 2230, the ship's course was altered to 235°, hoping to pass south of the worst part of the storm which was reported to have an E'ly movement of 5–10 knots. The wind was then blowing steadily from NE'E, force 5. At 0001 on the 24th the barometer had fallen to 999·6 mb, the wind still the same with a moderate sea and two swell systems. The vessel's observed position at that time was 24° 59'S, 174° 40'W and the storm centre was reported to lie at 25°S, 178°W. The course was maintained and by 1400 the wind had become N'ly, rising to force 6–7, but at 1415 it veered to the SE and for a short while was variable in force and direction. The barometer read 999·6, seas had increased and a heavy confused swell was running.

At 0400 the wind was ESE, force 7 and continued from then to veer slowly. The barometer, 997·1 at 0400, reached its lowest at 0515 when the centre of the storm was estimated to be 70 miles to the NNW. Barometer at 0600 was 997·8, wind ESE, force 8 and by 0800 had veered to SE'S, force 8. Wind force remained steady until 1200 when it dropped to force 6, still SE'S, and then SSE, force 4 at 1800. The barometer continued to rise slowly, 1000·5 at 1500 and 1005·8 at 2200.

Rain fell intermittently throughout from 1800 on the 23rd to 1200 on the 24th, slight at first, becoming moderate and latterly sometimes heavy.

Note. The following comments have been received from the New Zealand Meteorological Service:

"During the tropical storm encountered by the *City of Melbourne* between Tonga and the

Kermadec Islands the additional observations she sent at 0200, 0400 and 1000 on the 24th were received at the National Weather Forecasting Centre in Wellington and were of considerable value to the forecasters. She was the only vessel sending observations from the vicinity of the storm and these enabled much better pin-pointing of the storm centre than would otherwise have been the case."

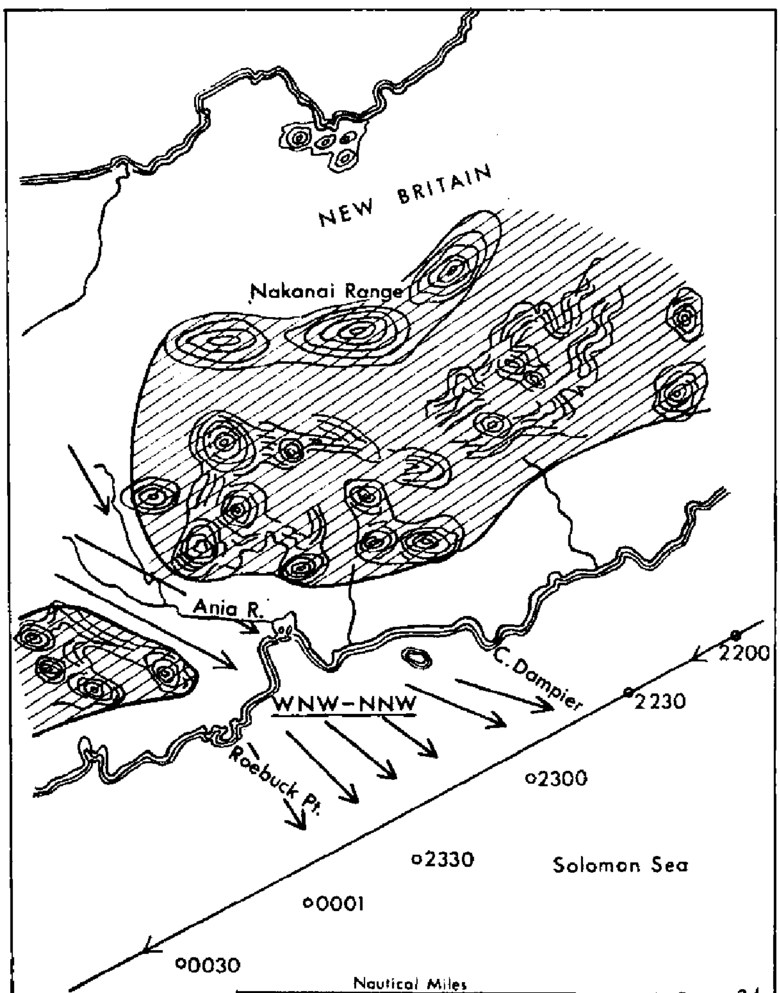
WIND FUNNEL

Solomon Sea

m.v. *Woosung*. Captain J. F. Follett. Rabaul to Lae (New Guinea). Observer, Mr. T. P. Cox, 3rd Officer.

4th February 1968. At 2230 GMT the vessel was 9 miles off Cape Dampier, bearing 289°, on a course of 241° at 15 kt. The wind was light and variable, with rippled sea and no swell. On coming abeam of Cape Dampier the wind increased to force 5–6 from the NW and the sea waves increased to about 5 ft in height. These conditions remained until the vessel was abeam of Roebuck Point where the wind dropped to variable light airs and the sea became rippled once more. During this time the vessel was blown off course a distance of about 3½ miles in an hour. At one stage the ship was steering 246° but making 230°. On consulting the chart of the area it appeared that the wind was being funnelled down the narrow Ania River valley which cuts NW/SE through the New Britain mountain range. The enclosed sketch was reproduced from Chart No. 3830, Bismark Archipelago, Sheet 1.

Position of ship at 2230: 06° 20′S, 150° 30′E.



Note. This is an interesting account of this local phenomena and the explanation given is certainly the most likely reason for this local strong wind.

WATERSPOUT

Seychelles

s.s. *Mawana*. Captain D. Campbell. Dakar to Seychelles. Observers, the Master, Mr. A. R. Anderson, 2nd Officer, Mr. R. Beane, 3rd Officer, Mr. B. Tinton, Chief Radio Officer and Officer Cadet P. More.

23rd March 1968. At 0730 GMT, as the vessel was approaching Mahé Island, three funnel clouds from Cu cloud were observed at a height of 2,500 ft. One faded out very quickly, one reached the island and then faded out while the third was seen to cross the mountain and, on reaching the sea, became a waterspout. Air temp. 85°F, wet bulb 79°, sea 77°.

Position of ship at 0600: 4° 30′S, 55° 00′E.

Note. Showers from large Cu or Cb clouds occur fairly frequently in that area at that time of year. Funnel clouds are formed at the core of a waterspout, sometimes extending down to the surface, and are attributed to the reduction of pressure at the centre of the vortex. Waterspouts can persist for up to half an hour.

ST. ELMO'S FIRE

off Cape Agulhas

s.s. *Esso Hampshire*. Captain L. H. Grey. Ras Tanura to Fawley. Observers, Mr. W. A. Bernard, 1st Officer and Mr. C. Turrell, Able Seaman.

29th March 1968. At 0001 GMT during a severe electrical storm, cloud base less than 100 ft, it was seen that the aerials appeared to be strung with beads of light, vertical pipes on the bridge wings had blue sparks about ½ inch long at their ends and the look-out, when he held up his wet hand, had blue sparks at the ends of his fingers. These conditions lasted for an hour when the storm ceased and the vessel ran into fog banks.

Position of ship: 34° 54′S, 20° 06′E.

SEA SMOKE

off Cape Hatteras

m.v. *Northumberland*. Captain E. T. Rowland. Newport News to Kingston (Jamaica). Observers, the Master and Mr. J. W. Spence, 3rd Officer.

6th February 1968. At 1350 GMT, on approaching Cape Hatteras from the north, a brilliant narrow layer was observed above and close to the southern horizon. Extreme refraction was also evident. The air temp. was 45°F, wet bulb 41·5° and sea temp. 43·2°. As the vessel approached the phenomena it could be seen that the layer was sea smoke along and to the south of a very well defined line of demarcation. This line extended NE to SW and the smoke was confined to a layer near the water's surface and was about 3 ft deep. At 1400 the line of demarcation was crossed and, as the vessel moved into the Gulf Stream, the air temp. was 45·3°, wet bulb 41·8° and sea 69·2°, the latter reading showing an increase of 26° in a matter of minutes. At 1405, after continuing further south into the Gulf Stream, the sea smoke thinned but the refraction remained and by 1415 the smoke had almost disappeared.

Position of ship at 1400: 35° 22′N, 75° 12′W.

Note. The synoptic weather chart for 1200 GMT showed cold continental air flowing over a relatively warm sea but with wind speeds of only force 2–3. The observation is in an area where the Labrador Current and Gulf Stream water converge, with the resultant rapid changes in sea temperature. Sea smoke is the result of cold air becoming saturated by evaporation from a very much warmer sea surface. In addition to the moisture, the sea supplies a large amount of heat to the lowest layers of air with the result that a large air-sea temperature difference can only persist if strong winds continually renew the supply of cold air.

off Cape Cod

s.s. *Gloucester City*. Captain J. R. Campbell. Avonmouth to New York. Observer, Mr. A. D. Garner, 2nd Officer.

14th February 1968. For a period of about 12 hours beginning at 0540 GMT very dense sea smoke was experienced, seriously affecting visibility. The smoke reached a height of 20–30 ft in towering pillars where it was blown into a continuous layer. At 1200: Air temp. 27°F, sea 67·5°. Wind WNW, force 8.

Position of ship at 1200: 40° 54′N, 65° 06′W.

Note. The synoptic situation at 1200 GMT showed a complex depression extending from the Davis Strait southwards to the South Newfoundland Sea, with a very cold NW'ly airstream flowing across north-east Canada. In contrast with the *Northumberland*'s experience, the persistence of the sea smoke in this case was the result of the strong winds maintaining a continued supply of cold air over the area.

ABNORMAL CURRENT SETS

off Sierra Leone

s.s. *Benrinnes*. Captain J. R. Muir. Penang to Dakar. Observer, Mr. D. A. Graham, 2nd Officer.

19th–21st February 1968. At 1540 GMT on the 19th the vessel passed through a line of turbulent water formed by smooth, heaped-up waves approximately 2 ft high. The turbulence was in a line about ¼ mile wide and stretching as far as could be seen in a SW–NE direction. The sea temp. was taken immediately after clearing the turbulence and showed a drop of 2°F from the noon reading. The following day, between 1330 and 1400, the vessel went through a series of lines of broken and smooth water, each line adjacent about ¼ mile wide and stretching in a SW–NE direction. Whilst traversing these lines the vessel was seen to swing continuously through a 5° arc in spite of correction to the helm. Once clear of the turbulence it was noticed the water was dark brown in colour but this gradually changed back to normal. Twelve hours later the vessel passed through similar turbulence during darkness. The broken water appeared black but the smooth lines were luminous, opaque with a fairly bright reflection but no individual bright spots. At 1400 on the 20th: wind NE'ly, light. Sea temp. 80·3°F. 2/8 $C_L 1$. Course 323°.

Position of ship at 1400 on 20th: 07° 47′N, 14° 52′W.

Note. This report is similar to an observation made by the m.v. *Clan Macgillivray* in November 1963. The phenomenon is in the area where the Equatorial Counter-current and the Canary Current converge. The resulting vertical exchange is probably deep, as suggested by the discoloration.

DISCOLOURED WATER

S.W. Pacific Ocean

m.v. *Kwantung*. Captain A. Harper. Hong Kong to Suva. Observers, Mr. S. K. Toon, 2nd Officer and Ng Hung Yan, Quartermaster.

17th December 1967. At 0030 GMT a line of golden-brown material was observed in a strip about 50–100 ft wide and parallel to the ship's course. The water for about 200–300 ft around the strip was a light shade of green, whereas the surrounding was deep blue, giving the strip the appearance of a reef. The golden-brown strip appeared to be fine sand suspended just below the surface. At 0150 the strip curved round to the north and continued in that direction as far as the eye could see. At 0205 another strip was observed running in a N–S direction from horizon to horizon. Wind SE'E, force 4. Sea waves 3 ft. Swell 4–5 ft from SE'S. Course 121° at 14 kt.

Position of ship at 0030: 17° 20'S, 175° 25'E.

Position of ship at 0150: 17° 31'S, 175° 43'E.

Note. The *Kwantung* is a Hong Kong Selected Ship.

m.v. *Westmorland.* Captain D. E. Moran. Balboa to Brisbane. Observers, the Master, Mr. A. Leachman, 3rd Officer and Mr. R. W. Baldwin, Jnr. 3rd Officer.

6th January 1968. At 2250 GMT the vessel approached a line of discoloured water lying 320° to 140°. The first patch sighted was approximately 3 miles long by 1 mile wide and was a yellowish-green colour with light-brown lines running along its length. On closer inspection of samples obtained by buckets the water was seen to contain minute particles of a straw-like substance. Also seen were small, blue-coloured bodies swimming and darting about. Air temp. 78°F, wet bulb 75°, sea 81·2°. Wind ESE, force 3.

Position of ship: 22° 19'S, 179° 51'W.

s.s. *Pipiriki.* Captain W. D. F. Cooper. Suva to Wellington. Observers, the Master and all Officers.

8th–9th February 1968. A patch of medium-green discoloured water was sighted at 2220 GMT on the 8th about a mile away on the starboard beam. It was estimated to be 300 yd wide and 1,000 yd long. As it fell astern a much paler green showed on the left-hand end. It gave every appearance of an underwater reef, although no breakers were seen. Later, at about 0030 on the 9th, the vessel passed through far more extensive areas of discoloration, ranging from dark green to yellow in colour. It was then clearly visible as being some form of marine algae floating on the surface and was thickest in the yellower parts. The vessel was steered to pass through a dense orange-yellow patch in order to obtain a sample in the rubber sea-temperature bucket. We were unable to have the sample analysed at Wellington so will try again in London. At 2220 on the 8th: Air temp. 87°F, sea 84°. Wind SE'E, force 3–4. Swell 8 ft from SE'S.

Position of ship at 2220 on 8th: 19° 59'S, 177° 54'E.

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

"The discoloration observed by the *Kwantung* was almost certainly a bloom of *Trichodesmium erythraeum* with perhaps other microscopic plankton algae in much lesser abundance.

"From the *Pipiriki* and the *Westmorland* we received two excellent samples showing *T. erythraeum* dominant, with a little of the rarer form *T. contortum* and a few diatoms (mainly *Rhizosolenia hebetata f. semispina*). These came from roughly the same area and within less than 2 months of the discoloration reported by the *Kwantung*. Evidently the phenomenon was widespread in this area between Suva and New Zealand, near the southern tropics and on either side of the date line, around mid-summer 1967–8."

RADAR ECHOES FROM PORPOISES

Indian Ocean

s.s. *Brandon Priory.* Captain P. Saunders. Las Palmas to Kharg Island. Observer, Mr. D. M. C. Allan, 2nd Officer.

17th January 1968. At 0115 GMT, when 27 miles SW of East London, the vessel was proceeding in a NE'ly direction along the South African coast. The radar, an AEI Escort 655, operating on the 12-mile range, showed a vessel ahead bearing fine on the port bow at a distance of 1·8 miles and moving on a similar course and speed to our own. An echo appeared close to the port of this vessel and rapidly drew astern of her towards our own vessel. No visual indication of a second vessel was seen although the sea was well illuminated by moonlight. The echo became elongated in shape on drawing closer. The scale was reduced to the 3-mile range. When about 2 cables abreast our own vessel the echo changed to numerous small blips and it was observed visually that the cause of the echo was a school of porpoises. Wind calm, visibility good.

Position of ship at 0001: 33° 30′S, 27° 18′E.

BIRDS

Tyrrhenian Sea

s.s. *Mobil Enterprise*. Captain J. H. E. George. Ras Lanuf to Naples. Observer, Mr. D. J. Read, 2nd Officer.

5th March 1968. At about 0100 GMT a large number of birds alighted on the ship and settled anywhere near lights. On the radar mast in the vicinity of the mast light, the platform, yardarms, main aerial and even the halyards on the boat deck where lights shone from portholes, the birds settled up to three deep on flat surfaces. Several managed to get into the chart room. On examination it was decided that the birds were probably starlings. They were 4 to 5 inches in height, dark brown with black and white speckled breasts and rather a long beak. At the first signs of daylight the birds began leaving in well defined groups, 100–300 birds to each group, flying in a N'ly direction. Seven or eight groups were seen to leave between 0550 and 0615. About 30 birds had died, presumably by flying into objects in the dark. Several more were found to be too weak to fly but these left the ship later.

Position of ship at 0001: 39° 30′N, 14° 54′E.

TURTLE

South Pacific Ocean

m.v. *Huntingdon*. Captain T. F. J. Alderman. Port Chambers to Balboa. Observers, Mr. D. R. Mountford, 2nd Officer, Mr. B. T. Davis, Radio Officer and Mr. D. W. Latter, Apprentice.

6th January 1968. At 2000 GMT a large turtle was seen at a distance of 100 ft from the vessel. Unfortunately there was not sufficient time to study it through binoculars. However, with the naked eye it was possible to gauge that the length of its shell was at least 5 ft. Three deep and distinct ridges could be seen along the length of the shell. Although a look-out was kept no more were sighted. The turtle was thought to have been one of the Galapagos family although the ship was some 650 miles from the nearest island in the group.

Position of ship: 7° 39′S, 99° 25′W.

Note. Dr. L. D. Brongersma, Director of the Natural History Museum, Leiden, comments:

"Without any doubt the turtle sighted by m.v. *Huntingdon* is a Leathery Turtle (*Dermochelys coriacea*) and it must have been one of the largest of its kind, having a shell at least 5 ft long. The Leathery Turtle has always been considered a rare species and in 1893 an author even suggested that it would soon become extinct. It occurs in all tropical and subtropical seas but it was not until fairly recently that some of its more important nesting sites on tropical beaches were discovered. It is assumed that the Leathery Turtle spends most of its life in the open sea, often far from land, and the fact that it is not often met with in coastal waters may be one of the reasons why it was considered rare. On its wanderings in the oceans the Leathery Turtle may leave the warmer seas to move into more temperate zones. In the Pacific it has been observed northwards to Sakhalin and to British Columbia, and southwards to New Zealand. In the Indian Ocean it sometimes moves southwards to the Cape of Good Hope; in the Atlantic it more or less regularly visits the waters of Newfoundland, the British Isles and Norway. However, only a very few records are available of Leathery Turtles sighted in the open ocean and therefore the sight record by the *Huntingdon* is of great value."

PHOSPHORESCENT WHEEL

Arabian Sea

s.s. *Rialto*. Captain J. E. Wray. Karachi to Bombay. Observers, the Master, Mr. M. C. Carter, 3rd Officer, Mr. G. D. Atkinson, Chief Officer and Mr. B. Jefferson, Chief Engineer.

23rd March 1968. At about 1530 GMT the vessel encountered what appeared to be many revolving searchlight beams sweeping the surface from below, moving in an anticlockwise direction. Part of the time there seemed to be heavy rollers approaching the vessel and others in the distance moving away. The small wavelets which occasionally broke the sea surface glowed brightly with luminescence. The beams of light faded after several minutes and were then renewed, but now appeared to revolve clockwise, then faded very quickly. At the time the vessel was running off the 20-fm bank across the NE'ly tip of The Swatch deep. Air temp. 74·5°F, wet bulb 70°, sea 75·6°. Wind SW, force 3. No cloud, good visibility.

Position of ship: 23° 40'N, 67° 22'E.

Note 1. This observation was forwarded to Dr. R. H. Kay. See the note following the reports on Luminescence.

Note 2. On p. 19 of the *West Coast of India Pilot* there is a very similar account of this phenomena as witnessed by the Master of the *Ariosto* on 17th February 1912 at 23° 37'N, 67° 20'E, very near the *Rialto*'s reported position.

LUMINESCENCE

West African waters

m.v. *Clan Macdougall*. Captain R. Wise. Durban to Teneriffe. Observers, Mr. J. Simpson, 2nd Officer and the helmsman.

31st January 1968. While proceeding due north from Cape Verde during the middle watch the vessel entered a large patch of luminescence consisting of particles about 3 inches in diameter which flashed brilliantly for about 10 sec at a time. Luminous trails were observed on both sides of the ship and, on shining the Aldis lamp, we saw that these were caused by a moderately-sized school of dolphins. The trails were about 50 ft in length and were visible for at least 20 sec. With the dolphins moving in all directions a criss-cross of trails soon resulted. The school stayed with the ship for about 15 min. Air temp. 67°F, sea 67°. Wind NNE, force 4. No cloud, good visibility.

Position of ship: 16° 30'N, 17° 40'W.

Bismarck Sea

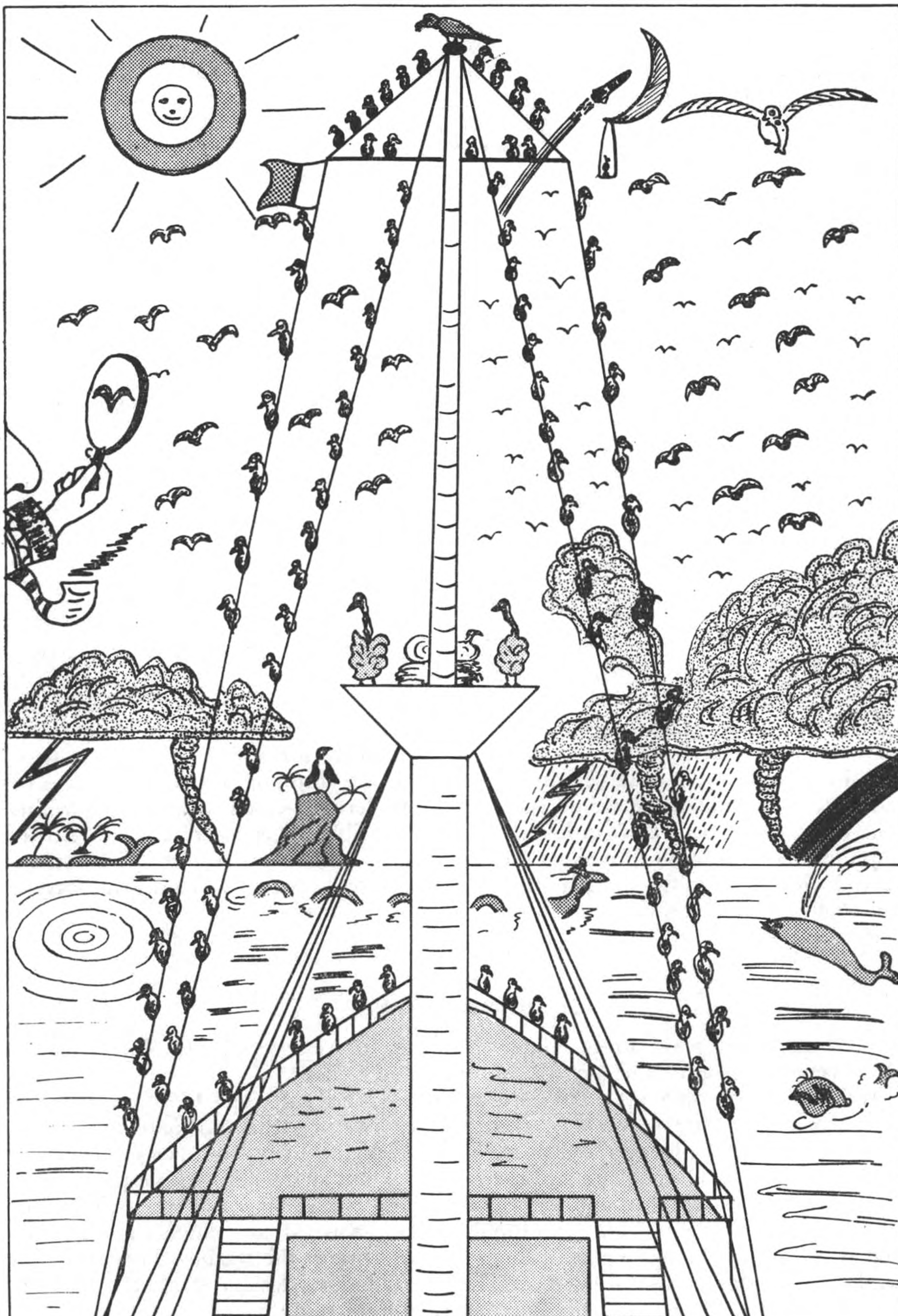
m.v. *Braeside*. Captain Brett Hilder. Wewack to Madang (N.E. New Guinea). Observers, the Master and Mr. W. Monroe, 2nd Officer.

19th February 1968. At 1756 GMT, when 7½ miles off Cape Gordon, a line of bright pulsating patches was observed 2 miles away on the starboard bow. Each patch was about 35 ft long and pear-shaped, flashing in unison every ½ sec. The engine revs. were 112 per min and the radar was not switched on. The patches became brighter as the ship approached them and the radar was then switched on without producing an effect. The ship did not cut through any patches and another line of them was seen off to port in about the same line as the starboard one, possibly marking the edge of a local current. They all faded out astern at 1815. Air temp. 81°F. Wind NW, force 3, Heavily overcast with light rain.

Position of ship: 4° 14'S, 145° 23'E.

Note 1. Dr. R. H. Kay, University Laboratory of Physiology, Oxford, comments:

"I am now analysing almost 1,000 reports received since 1964 and hope to be able to publish



The ones that got away . . . No pages left ! ! !

my findings in *The Marine Observer* in the near future so that Masters and Officers may benefit from their separate, painstaking observations on luminescent phenomena. Because of the limited space available only a small fraction of the detailed reports received can be published. Among the biological samples submitted in good condition, your readers may be interested to know that m.v. *Chindwara* (Mr. P. D. Davies, 3rd Officer) and m.v. *Empire Star* (Mr. P. A. Heathcote, 3rd Officer) have successfully captured and preserved whole specimens of shrimp-like luminescent euphausiids, the 'krill' of fishermen, and this is no mean task from a moving ship for these animals are lively and self-propelled creatures."

Note 2. The *Braeside* is an Australian Selected Ship.

RAINBOWS

Eastern North Pacific

m.v. *Warwickshire.* Captain J. J. Butterworth. Nagoya to Long View (Oregon). Observers, Mr. C. R. Tiller, 2nd Officer and Mr. B. A. Mullan, Radio Officer.

12th March 1968. At 0001 GMT precipitation was observed 3 miles away and the vessel was later overtaken by a heavy shower of small hail which lasted from 0040 to 0050. The shower was very intense although the sun and horizon were visible throughout. As the vessel passed through the shower the temp. dropped to 43°F and steam rose from the wet decks. Three rainbows were visible, rising from the starboard bow to the port wing of the bridge, approx. 100–280° and 10° apart. They gradually disappeared as the shower drew ahead. By 0100 the shower was well clear of the vessel and the temp. had risen to 46°. The cloud was well defined Cb with anvil in the direction the shower was moving. Wind W's, force 7. Course 077° at 18·8 kt.

Position of ship: 43° 47′N, 138° 47′W.

POSTSCRIPT

Atlantic and Indian Oceans

s.s. *Mahseer.* Captain A. B. Davies. Round voyage from London to Liverpool via Suez, Maldive Islands, Colombo, Cape Town, Pensacola and Wilmington. Observers, Mr. K. J. G. Bell, 2nd Officer and Mr. A. H. Lord, 3rd Officer.

8th April–3rd October 1967. The meteorological logbook covering this period contained a wealth of information on Natural History subjects, accompanied by drawings and 7 bottles of preserved entymological specimens. These were forwarded to the Natural History Museum or to the Royal Naval Birdwatching Society, as appropriate, and two of the observations were published in the April 1968 number of *The Marine Observer.* Mr. Lord completed the Additional Remarks pages with this drawing, over the caption as shown.

AURORA

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

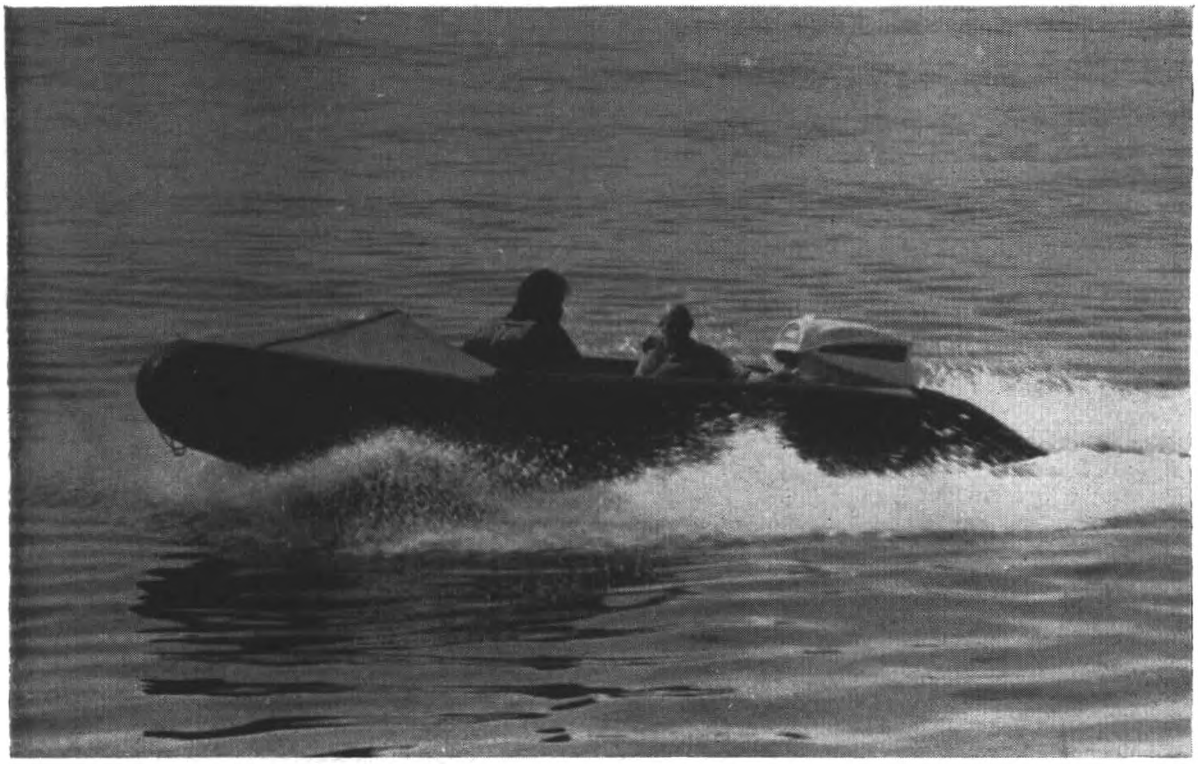
"Below is a summary of the auroral reports for the period January–March 1968 received at the Balfour Stewart Auroral Laboratory of the University of Edinburgh from British ships. Reports are also included for various dates in 1967; these were received too late to be included in the last issue. Among them are reports from observers aboard m.v. *Sagamore.* While *en route* for Murmansk at the end of December, the ship was in the region of the auroral belt (approx. 67° geomagnetic) and detailed reports of nightly auroral displays were accompanied by a series of sketches portraying most vividly auroral forms typical of the zone. Observations made in the southern hemisphere are very welcome and the classic rayed form and its development was well illustrated in m.v. *Rakaia*'s log book—a display synchronizing with a sudden upsurge of geomagnetic activity.

"It was interesting to read an appended note to one report for the period that 'in this instance aurora was active only while wind had backed temporarily NE', and wonder if we dare risk once again an assertion that there is no connection between weather conditions and auroral displays. Having written this, we now have to admit that predictions of auroral displays at lower latitudes have not so far materialized, possibly because the expected maximum in the solar activity cycle is a very 'low' maximum. The Weather Ship reports from the more northerly stations confirm the frequent appearance of the phenomenon within the auroral belt, varying in degree and intensity with the fluctuations in geomagnetic activity, but giving little evidence of anything more widespread. We hope, however, that even without the rewards of spectacular auroral behaviour such as was evident during the IGY maximum, you will continue to watch for auroral displays and send us what information you can, as a take-over by satellites still does not seem to be imminent."

Date (1967–68)	Ship	Geographic Position	Λ	Φ	I	Time (GMT)	Forms
25th Aug.	*Cheviot*	52°26′N 53°10′W	020	63	+75	—	HA
20th Sep.	*Cheviot*	52°27′N 53°15′W	020	63	+75	0300–0500	HA, HB, RA, P
24th Dec.	*Sagamore*	60°00′N 03°00′W	090	63	+73	—	N
25th	*Sagamore*	— —	—	—	—	—	N
26th	*Sagamore*	— —	—	—	—	—	HA, R, N
27th	*Sagamore*	70°00′N 20°00′E	120	67	+78	2000–2305	HA, HB, RB, RR, P, N
28th	*Sagamore*	71°00′N 28°00′E	130	67	+78	1900–2300	All forms
31st	*Sagamore*	70°00′N 34°00′E	130	65	+78	1415–1800	HA, HB, RB, RR, N
1st Jan.	*Weather Adviser*	59°08′N 18°48′W	070	65	+72	0550–0700	N
	Weather Adviser	59°02′N 18°51′W	070	65	+72	2310–2322	RB, RR
2nd	*Rakaia*	41°40′S 176°00′E	250	−46	−65	1040–1115	RA, RB, RR
	Sagamore	68°06′N 12°24′E	120	67	+78	1530–1630	HB, RB, N
5th	*Logna*	62°24′N 05°24′E	100	63	+73	2200–0010	RB, N
6th	*Weather Adviser*	58°55′N 19°12′W	070	65	+72	2337	HA
7th	*Weather Adviser*	58°57′N 19°14′W	070	65	+72	0250–0500	N
13th	*Sagamore*	66°05′N 10°10′E	110	66	+76	2015–0020	HA, HB, RA, RB, RR, N
14th	*Sagamore*	67°40′N 13°35′E	110	66	+77	1900–2020	HA, HB, RA, RB, P
15th	*Weather Monitor*	58°52′N 19°19′W	070	65	+72	2325–0025	HB
16th	*Sagamore*	61°35′N 00°35′W	090	63	+73	1730–1743	RB, RR
19th	*Weather Monitor*	58°52′N 19°20′W	070	65	+72	2335–0010	R
26th	*Weather Monitor*	58°59′N 20°01′W	070	65	+72	2100	N
27th	*Weather Reporter*	61°30′N 30°38′W	060	69	+76	0350	RR, P
29th	*Weather Monitor*	58°49′N 19°33′W	070	65	+72	0001–0500	HA, N
	Weather Reporter	62°13′N 33°19′W	060	70	+76	0045–0300	RB, P, N
	Weather Reporter	62°16′N 33°32′W	060	70	+76	2150–2340	HB, P, N
30th	*Weather Monitor*	58°58′N 18°43′W	070	65	+72	0001–0300	HA
	Weather Reporter	62°07′N 33°22′W	060	70	+76	0455–0655	HB, P, V
	Weather Reporter	62°20′N 33°06′W	060	70	+76	2050–0400	HA, HB, RB, P, N
	Weather Monitor	59°00′N 19°19′W	070	65	+72	2100	HA
31st	*Weather Monitor*	58°58′N 18°53′W	070	65	+72	0300	N
	Weather Reporter	62°02′N 32°56′W	060	70	+76	2300–2400	HB
1st Feb.	*Weather Adviser*	59°05′N 19°09′W	070	65	+72	2155, 2250	N
2nd	*Weather Reporter*	62°14′N 32°48′W	060	70	+76	2015–2200	HB, RB, P, V
	Weather Adviser	58°57′N 18°26′W	070	65	+72	2050–2345	N
6th	*Weather Adviser*	58°42′N 19°14′W	070	65	+72	0350	N
11th	*Weather Reporter*	62°04′N 32°14′W	060	70	+76	2100	RB
17th	*Weather Reporter*	63°38′N 33°08′W	060	70	+76	2100–2400	HB, RB, P, V
	Weather Surveyor	61°00′N 25°30′W	060	68	+74	2155–2207	RA
	Weather Adviser	59°15′N 19°05′W	070	65	+72	2330–2340	RR, V
18th	*Weather Reporter*	62°30′N 30°12′W	060	70	+76	2050–0400	HB, RA, RB, SB
20th	*Weather Adviser*	59°00′N 19°10′W	060	70	+76	2330–2345	N
21st	*Weather Surveyor*	63°34′N 32°30′W	060	70	+76	2120–0300	HB, RA, RR, N
23rd	*Weather Surveyor*	63°38′N 32°23′W	060	70	+76	2050–2330	HA, HB
25th	*Weather Monitor*	58°25′N 17°10′W	070	64	+72	0001	N
26th	*Weather Surveyor*	63°27′N 32°23′W	060	70	+76	0140	R
27th	*Weather Surveyor*	63°28′N 32°47′W	060	70	+76	2140–2335	RA, RR
28th	*Weather Surveyor*	63°40′N 32°45′W	060	70	+76	2145–0500	RR, P, N
29th	*Weather Surveyor*	63°31′N 32°58′W	060	70	+76	2330–0600	HB, RA, RR, V, N
1st Mar.	*Weather Monitor*	59°00′N 19°00′W	070	65	+72	0050–0200	RR, P, V
2nd	*Weather Surveyor*	63°42′N 32°38′W	060	70	+76	0345–0405	RA
7th	*Weather Surveyor*	63°28′N 33°10′W	060	70	+76	0400–0440	HA
14th	*Weather Monitor*	59°00′N 19°00′W	070	65	+72	2220–2230	RR

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

(*Opposite page* 16)



Photos by J. MacMillan

The 10-man P.B.16 inflatable rubber boat with outboard motor as used by British Ocean Weather Ships for air-sea search and rescue operations.

(*Opposite page* 17)

Charybdis edwardsi, carapace breadth 60 mm. The fringes of hairs on the legs and the extreme flattening of the last pair can easily be seen (*see* page 17).

Swarming of Swimming Crabs

By A. L. Rice, Ph.D.
(British Museum (Natural History))

Many crab species are known to be able to swim quite well and the common name 'swimming crabs' is applied to one whole family, the Portunidae, as a result of this habit. The members of this family have a tendency to a flattening of the legs and the development on them of fringes of hairs which increase the resistance to the movement of the appendages through the water. This flattening tendency is particularly marked in the last pair of legs and in many genera they are developed into extremely efficient paddles which can beat across the back, rotating at the end of each stroke in perfect sculling form. These paddles, aided by some or all of the other legs, are able to propel the animal very effectively, mostly sideways but also on occasion forwards, backwards or with the dorsal surface in the lead. Some species are reported to swim at speeds of up to 1 metre per second, but despite this ability the swimming crabs are mostly bottom-living animals, as any self-respecting crabs should be. They probably normally swim only a few metres at a time to escape from a potential predator or to catch a fast moving meal, hardly leaving the bottom to do this.

A notable exception is Henslow's swimming crab, *Polybius henslowi*, a species which is distributed in the western Mediterranean and in the eastern North Atlantic from the coast of Morocco to the south coast of England, occasionally extending into the North Sea and even as far north as the Orkneys. This crab seems to remain close to the bottom during the winter months but quite frequently appears at the surface, sometimes far from land, in swarms of hundreds of thousands of individuals during the summer (Allen[1] and Della Croce[2]). The swarms are very sporadic in occurrence, appearing quite suddenly and disappearing equally abruptly. The swarms are sometimes composed of animals all of the same sex and may have some connection with the reproductive cycle. On the other hand *Polybius henslowi* is a voracious hunter of small fish, such as sardines, and at least some of the swarms may be a response to a temporary abundance of such food in the upper layers. The fact is that the behaviour is not sufficiently well documented for it to be explained with any certainty.

In recent years similar surface swarming has been observed in another swimming crab, *Charybdis edwardsi*, in the western Indian Ocean (*see* photograph opposite). The first scientific report of this phenomenon by Della Croce and Holthuis[3] was based on observations made during a cruise of the research ship *Anton Brunn* of the U.S. National Science Foundation as part of the International Indian Ocean Expedition in 1964. Crabs were seen on the surface of the sea after sunset on three successive evenings (1st to 3rd November) at three separate localities roughly on a line between the Comores and Mombasa, none of the sightings being less than 120 miles from the nearest land. Della Croce and Holthuis referred to an earlier observation made from the m.v. *Herefordshire* on 21st October 1963 when large numbers of crabs were seen at the surface about 300 miles east-south-east of the island of Socotra between 0345 and 0400 GMT (0745 and 0800 ship's time). No specimens were collected on this occasion and the identity of the crabs must remain uncertain, but the description furnished with the report agrees well with *Charybdis edwardsi*.

The *Herefordshire* report had reached Della Croce and Holthuis via Dr. Isabella Gordon of the British Museum (Natural History) to whom it had been sent from the Meteorological Office, but there had been a still earlier observation, similarly unsubstantiated by specimens, but almost certainly also on the same species. This observation was made from the m.v. *Shropshire* on 26th December 1960 when large numbers of crabs were seen at the surface, over 2,000 fathoms of water according to

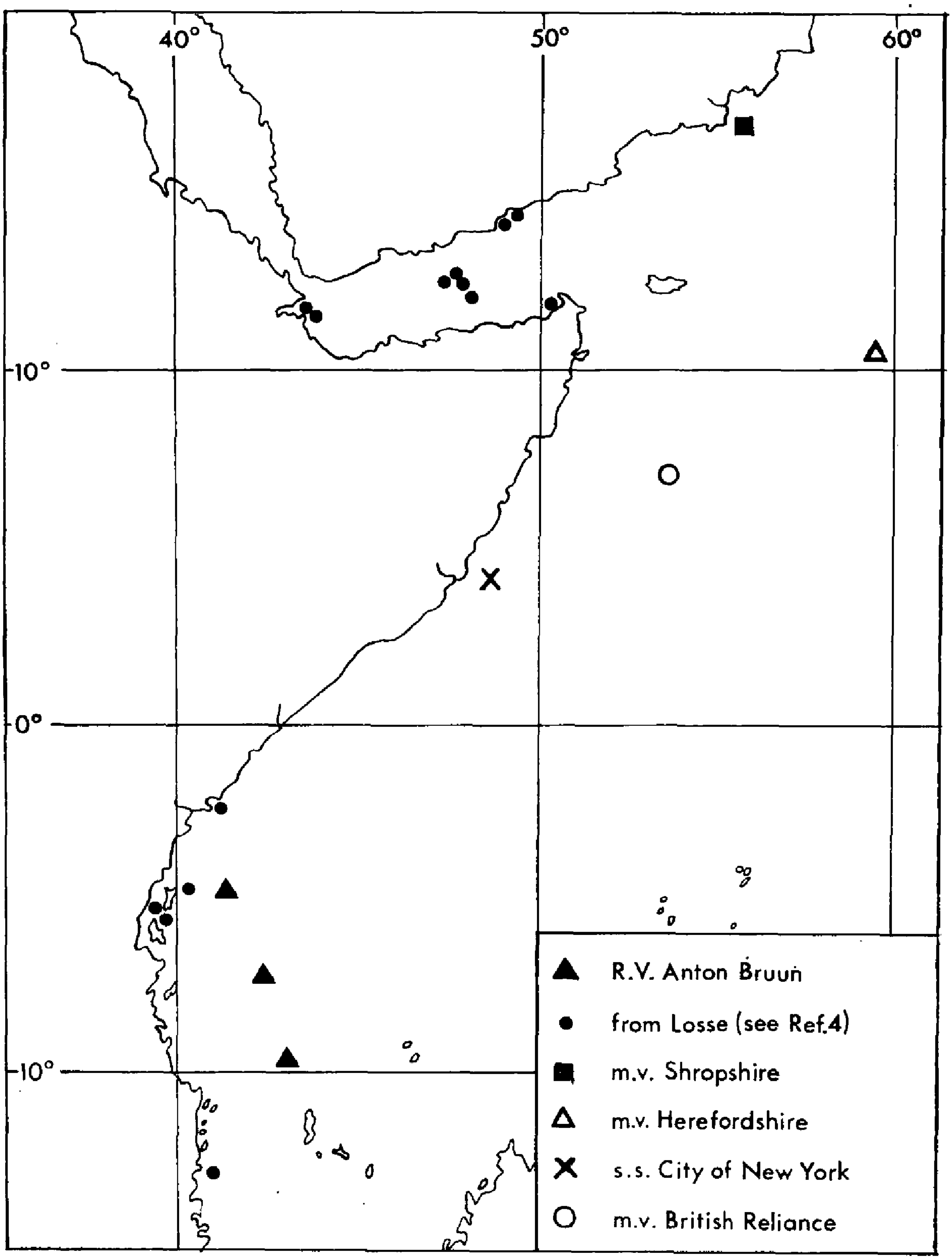


Fig. 1. The western Indian Ocean, showing the localities of the sightings of surface swarms of the swimming crab *Charybdis edwardsi*.

the chart, also in the western Indian Ocean (see Fig. 1) and also at or around sunrise (0230–0430 GMT; 0530–0730 ship's time).

During fishery investigations off East Africa in 1964/65 and in the Gulf of Aden in 1966/67 a number of collections and observations on swarms of *Charybdis edwardsi* were made by G. F. Losse, a biologist with the Food and Agriculture Organization of the United Nations. Losse[4] has reported his observations, including references to the earlier published reports and also an observation from the s.s. *City of New York* off the coast of Somalia in October 1966 (in *The Marine Observer*, October 1967, p. 170). From a consideration of all the reports available to him Losse concluded that *Charybdis edwardsi* is widely distributed in the western Indian Ocean, often occurring in large surface swarms between October and December. The occurrence of the swarms seems to be correlated with a rather restricted range of water temperature (about 25–28°C) and they usually appear at the surface in the late afternoon, during the night or early in the morning, very few crabs being seen at the surface during the hours of bright daylight. Several of the reports refer to crabs lying motionless at or just beneath the surface and moving only when disturbed by the motion of the ship. This suggests that little effort is required to maintain their vertical position in the water and it may well be that the animals are leading a predominantly pelagic existence at these times, spending the day-time in the deeper layers and migrating towards the surface in the evening. Such a pattern of 'diurnal vertical migration' is very typical of many planktonic animals and of the larger pelagic creatures which feed on them. The presence of large sub-surface accumulations of crabs is indicated by the extensive bait losses, attributed to the crabs, which are suffered by the long-line fishermen during the main period of the appearance of the surface swarms. At times these depredations can become so heavy as to constitute a serious threat to the fishing activities.

Since Losse's report was written a further record has been received from the meteorological logbook of the m.v. *British Reliance* (as published in *The Marine Observer*, October 1968, p. 178). This most recent observation was made on 11th October 1967 some 200 miles off the coast of Somalia and, like most of the previous ones, during the hours of darkness.

As in the case of *Polybius henslowi*, neither the 'purpose' of the swarms in *Charybdis edwardsi* nor the particular environmental factors which lead to their appearance are understood. The phenomenon is certainly interesting enough on its own account to warrant the collection of all possible records, but the possible adverse effects of such large congregations of crabs on the local fisheries makes an understanding of the behaviour even more desirable. The localities where the swarms have been sighted, and particularly the offshore ones, are not in areas which are frequently visited by research vessels. Although the swarms are frequently large in terms of the numbers of individuals involved and may extend over fairly wide areas, they are nevertheless rather small in the context of the sea as a whole, so that it is probably not feasible to take out a research vessel specifically to look for them. Long-term records from which patterns may emerge will therefore be collected from occasional observations, such as those mentioned here, made from research ships primarily concerned with other problems and from merchant vessels sailing through the relevant areas. Such records will be most welcome at the British Museum (Natural History), particularly if they are accompanied by specimens of the crabs themselves. Ideally these specimens should be killed in fresh water and preserved in a 5–10% solution of sea-water formalin but, where this is not available, surgical spirit is a fair substitute which is usually to hand; as a last resort sun-dried specimens are better than none at all. Specimens which have been in the preservative for a week or two can be safely sent through the post dry and simply wrapped in paper or some other suitable packing material.

The purpose of this article is to encourage observers to record this and other types of marine biological phenomena and to reassure them that any reports which do come our way are put to good use and do not become lost in dusty archives.

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Some Thoughts on Weather Routeing

By Captain D. S. Cramer, U.S.N.
(Commanding Officer, Military Sea Transportation Service Office, London)

(This is the text of a lecture delivered at a conference of senior Merchant Navy Officers held aboard the *Wellington*, Headquarters ship of the Honourable Company of Master Mariners, in May 1968.)

Many of us who go down to the sea in ships have lost the intimate knowledge that our forefathers had 100 years ago of the environment in which we work: the sea and its interface, with the atmosphere above it. With the abandonment of sails for steam and diesel an era commenced in which sheer power, horse-power, was used to drive our ships and their cargoes through the surface of the oceans. Sailors no longer had to study the horizon, sky and sea surface with the intimate concern of the man under canvas. Speeds progressed from a leisurely yet lively 12 knots to as high as 45 knots for some naval ships and 20–25 knots for merchantmen. All the while our mistress, the sea, was trying to teach us a lesson. Instead of looking aloft to determine when sail should be reefed to protect mast and rigging, the sea was trying to tell her masters "Look to your hull, shell plating, frames and longitudinals!" This preoccupation with speed and brute force was taking a toll in expensive voyage repairs and cargo damage.

Weather routeing of ships is a very old art. It was practised by Benjamin Franklin when, as Postmaster General, he advised ships carrying U.S. mails to sail to Europe on a northern route but to return on a southern route in what was later called the north-east trade-wind zone. It has been suggested above that for almost 100 years we forgot the art of studying our environment and its interfaces because we were obsessed with mechanization. Today we know that horse-power is no substitute for brain power.

In the United States optimum track ship routeing is carried out by the Naval Weather Service in an endeavour to provide the best available routes for ocean crossings by surface vessels. Recommendations are tailored to the requirements of each individual voyage. The service is essentially in two parts: (1) the original route recommendation and (2) weather surveillance throughout the voyage with recommendations for change in track as appropriate to existing and forecast wind and sea conditions.

Optimum track ship routeing (OTSR) is an application of meteorology and oceanography. It involves long-range forecasting for planning the original route, short- and long-range forecasting in providing a weather service during the voyage, and climatology since the operational requirements extend beyond the time limit for which we can forecast accurately.

The basic concept of OTSR is that the routeing authority will recommend optimum routes to ships based on sea conditions expected during the time of the passage. Current knowledge of meteorological and oceanographic conditions and the forecast of these parameters, primarily wind and sea conditions, are used to determine optimum routes for surface vessels. This concept is founded in the belief that we can describe existing conditions and forecast future conditions with sufficient accuracy to provide routeing superior to that based on climatology and superior to the practice of taking the shortest possible track, except as modified by ship handling while in heavy seas.

In all cases OTSR is an advisory service which makes recommendations only. Never is the commanding officer's or master's responsibility and prerogative limited by the OTSR programme.

History

Optimum track ship routeing began at the Oceanographic Office of the U.S.A.

in 1956. In 1956 and 1957 the OTSR service was provided by the Navy Oceanographic Office to Military Sea Transportation Service (MSTS) ships. During this period techniques and operational procedures were evaluated. The service was considered successful and MSTS proceeded toward establishment of OTSR as a part of standard operations.

The routeing service was fully operational by the Naval Weather Service in August 1958. Since that time Fleet Weather Facility, Norfolk (for the Atlantic area) and Fleet Weather Central, Alameda (for the Pacific area) have provided OTSR services for MSTS and Fleet ships. Weather routeing has been used on more than 20,000 ocean crossings.

Objectives

The objectives of ship routeing are: (a) to minimize storm damage to ships and cargo, (b) to save time at sea and to save money by reducing operating time, and (c) to meet special requirements of the individual voyage. Requirements of individual voyages vary according to the types of ships and assigned missions; this implies, in cargo ships, the saving of time with acceptable conditions, and in troopships and passenger ships the maximum passenger comfort consistent with meeting their schedule. For ships with sensitive cargo the schedule is of little importance compared with safe arrival of the cargo.

In every case a route covering the entire voyage is given in the initial route recommendation. This may be a 5-day voyage of a passenger ship from San Francisco to Honolulu, or it may be from the Canal Zone to Saigon, where the great circle distance exceeds 10,000 miles and exceeds 27 days' steaming time for a 15-knot vessel.

The route which is optimum at a given time depends on the ability of the ship and cargo to sustain weather and seas, the urgency of the time schedule, and operational plans while under way, in addition to the expected weather and sea conditions.

Significant advantages of ship routeing can be achieved (a) when the voyage is relatively long, generally about 1,500 miles or more, (b) when weather is a factor in determining the track to be followed, and (c) when the waters are navigationally unrestricted so that there is a choice of routes. Lesser advantages are achieved when these conditions are limited.

Route selection and planning

Optimum routes may not follow the time-honoured 'winter' and 'summer' routes. They are selected after careful study of existing synoptic and prognostic weather and sea conditions. They offer a high probability of one or a combination of the following:

(1) Least steaming time *en route*.
(2) The best weather route.
(3) By-passing areas where storm damage may be expected.

Except for navigational restrictions, a great circle is always a potential route because it is, of course, the shortest distance. However, in practice, relatively few trans-ocean voyages using routeing follow a great circle all the way.

A preliminary route selection is made after studying existing weather conditions over the area of potential routes, studying all available forecasts over the area and relating these to the capabilities and requirements of the ship for the particular voyage.

Beyond the range of actual forecasts, current seasonal trends and climatology are considered. If average conditions prevailed throughout a voyage a seasonal track based on climatology would be fine. However, average conditions seldom, if ever, occur over a large part of an ocean for several consecutive days. Whenever average conditions are expected over an area it is easy to blend the route based on actual and forecast conditions with the optimum route based on climatology. But averages given in climatology obscure all the intense storms occurring on the daily weather map. Sometimes the circulation pattern is a wide departure from climatology. Under such conditions a recommended route may be much shorter or much longer than a seasonal route even if the total mileage is close to that of a seasonal route. It may differ significantly by circumnavigating areas of adverse weather and seas.

Route selection must result in a proper balance between distance and the probability of adverse weather which would slow the ship or require a diversion.

Ocean currents are considered in route selection so as to take advantage of favourable currents or avoid unfavourable currents as much as is feasible. However, the speed advantage of using ocean currents is generally of a lesser order of magnitude than the speed reduction caused by heavy seas. Therefore, for the most part, ocean currents are considered within the areas where weather and seas are expected to be favourable.

Although wind and seas are the weather elements of greatest concern, areas of fog will be avoided as much as is feasible. During the summer months when seas are relatively slight, dense fog normally covers a large area of the western Pacific, for example, north of about 40°N. Therefore, primarily because of fog, summertime routes in that ocean are well south of a great circle between Japan and the west coast of America.

Surveillance procedures

When the initial route recommendation has been transmitted the route is drawn on a strip map. A blank weather chart is used for this purpose and is cut down in size to cover the area of the recommended route, and the area of any potential diversions. Daily OTSR reports are plotted along the track and D.R. positions are computed for each ship for synoptic weather map times. These D.R. positions are plotted onto each six-hour synoptic weather map analysed at the weather central. In fact, the D.R. positions of the ships are plotted first. Therefore the positions of the ships under routeing are always shown in relation to present weather as the maps are plotted and analysed.

All message traffic associated with each route is accumulated on a clipboard with the track chart for each voyage. The daily report from each ship utilizing the service is essential to an effective weather-routeing service. The report gives the ship's position, present wind and sea conditions, and the ship's course and speed which show how the ship is progressing in the seas experienced up to the report time.

Each route is under continuing consideration for possible diversion throughout the voyage. A qualified and experienced naval meteorologist is always on duty to provide weather surveillance for ships under way as well as issuing new routes upon request. The professional-grade forecasters have had considerable experience in forecasting and generally have served two to three years aboard ship, either as a meteorologist or in some other capacity.

About a third of the routes receive one or more diversion recommendations during the voyage. Most of the diversions are successful in avoiding or minimizing adverse weather. About 15% of the routes experience some adverse conditions, i.e. sufficiently heavy seas or reduced visibility in precipitation or fog, to require change of course or reduction in speed.

Use of automatic data-processing methods

Automatic data-processing (ADP) methods are used in a navigation programme providing D.R. positions of routed ships for plotting on the weather maps. Machine methods can be much more beneficial if the programme can be extended to include machine plotting of the D.R. positions on to the weather maps.

A computer programme for route selection has been written. One of the severe limitations for the computer programme as well as subjective route selection is that daily forecasts are not available for the time ranges used in ship routeing. In fact, one of the fundamental problems pointed out by the ship-routeing programme is the need for accurate forecasts for time periods up to 10 or 20 days.

Results of OTSR and present operations

In 1965, Fleet Weather Central, Alameda, provided OTSR for 908 routes. For 1967, the number had increased to 3,072. Every present indication is that 1968 will reflect a still higher total.

Although some individual OTSR routes are longer than seasonal (e.g. climatological) routes they average out appreciably shorter. Based on MSTS figures, the average cost of operating the ships concerned is about $3,500 per day. At the present level of operations, if one day can be saved on each ocean crossing this will result in an annual saving of more than 10 million dollars. Prevention of storm damage results in even greater dollar savings. Out of more than 3,000 routes last fiscal year, only seven ships are known to have sustained damage.

Fleet Weather Facilities, Norfolk, provided 909 routeings in 1967 which means that there were between 2 and 3 route recommendations provided per day on the average and, since most Atlantic operations take 8 to 10 days, this also means that there were some 20 to 30 routes under surveillance on any given day. Four ship-routers (professional meteorologists) rotating through a schedule that assigns primary ship-routeing responsibility for a seven-day period every four weeks, gives for each ship-router an average of 228 routes (transit) per year. If we assume the average shipmaster works ten months in the year and makes an Atlantic crossing every 20 days, then he steams 15 transits per year. To approach the experience of the ship-router in route selection, he would have to have steamed in command 15 years and have had the weather/wave picture for the Atlantic every day of those transits. Our imaginary Captain, of course, would not have had the experience of watching a wide variety of ships—just those he steamed in—and he probably would not have steamed all his time in the Atlantic. Furthermore, even when a ship-router is not assigned the primary ship-routeing responsibility, he does contribute to the total output of the division as an assistant ship-router or as a leading forecaster for the Facility. Thus the ship-routeing personnel obtain more experience (at second hand, admittedly) selecting routes and then following them to arrival using more and better information than any individual Master could obtain in his entire career in command. On the other hand, the ship-router will not have the tactical experience of actual day-to-day encounter with the seas. So there is a team—ship-router concerned with the strategy of the track and Master concerned with the tactics.

Economics

The cost effectiveness of the programme is not one which lends itself to simple answers and the necessary data to do a proper evaluation are not available. We do know that when schedules are available prior to sailing and are based on reasonable estimates of the ship's speed capabilities in seasonal weather/wave conditions the average OTSR-routed ship is slightly ahead of or on schedule. There are times of course when, no matter what the route, the ship will be delayed. However, we expect a least-time transit with minimum risk of damage for the conditions available at the particular time period of the year.

Less than 1% of routed ships report any damage caused by weather and this is usually rather small: I.E. whip antennae lost, life lines and accommodation-ladders damaged, rubber life-rafts lost, an occasional life-boat damaged—things of this nature. It has been reported that marine insurance rates are reduced for those ships that steam under OTSR or weather routeing.

At first there was considerable reluctance on the part of MSTS Masters to letting a shore-side specialist assist in ocean-track selections or provide route-change recommendations, but Masters who stay with the programme at least six months usually are quite pleased with the service unless they happen to get a poor routeing on the first trip. Since no one can promise 'good weather', some Masters will remain sceptical.

It is suggested that the cost per steaming hour of a ship should be compared with the routeing cost. For U.S. ships it is something more than $3,500 per day plus fuel costs, or over $150 per hour. Thus only a one-hour saving would pay the charges and anything better would make money. When MSTS went to OTSR for passenger transport operations in the Pacific we were able to cut a full day off the schedule each way throughout the year and in the summer months we saved another day on west-bounds in about a third of the transits.

The MSTS nucleus fleet has facsimile aboard and uses OTSR and is pleased with both. The two services tend to compliment each other. The OTSR activity has the whole transit always in mind and possesses the experience, skill and facilities to advise on the strategy of the transit. The Master, by using facsimile weather charts, can determine the short-range tactics in any weather situation, whether high-latitude winter gale or tropical storm, and he will be better able to properly evaluate the OTSR recommendations and he will come to have a better appreciation of their value.

It should be pointed out that while ship-routeing probably has its largest value near the normal, i.e. south-west to north-west, storm track in middle and high latitudes, storms do occur in the tropics throughout a considerable part of the year; and that north/south routes can make use of the OTSR service to avoid hazardous weather or to advise the agent on probable delays due to weather, thus saving on some of the port expenses. OTSR makes its largest contribution on transits of 1,500 miles or more in unrestricted waters. Its effectiveness is reduced when used going coastal or when poor communications delay receipt of recommendations beyond usefulness.

It is only when the Master makes the best use of the modern knowledge of long-range weather and wave forecasting available through weather routeing that the ship can consistently make the fastest available transits with the least risk of damage. The Master must be part of the team—Company, Master, Weather-routeing service—to make the programme successful.

The author gratefully acknowledges the assistance provided by the Fleet Weather Centers in Alameda, California and Norfolk, Virginia during preparation of this lecture.

551.509.58:629.12

The Meteorology of Weather Routeing

BY R. F. ZOBEL, O.B.E., B.Sc.
(Assistant Director (Central Forecasting), Meteorological Office)

The main problem in routeing a ship is a rather difficult exercise in weather forecasting. It is somewhat similar in nature to routeing an aircraft for least-time track—a problem which has been successfully solved long ago—but it is much more difficult with a ship because the time over the journey is greater and the factors involved are more complex.

What is really needed to route a ship over the North Atlantic is a weather forecast of wind, sea wave and swell conditions for a week to 10 days ahead. At the present time there is nothing but a hope that we shall be able to do this some time in the future. So we must manage with a good deal less. All we can provide at the moment is a wind and sea wave forecast for 48 hours ahead, with an outlook of the type of pressure distribution we may expect for another 24–48 hours beyond that. Add to that the fact that these forecasts are not perfect—no forecast ever is—and it may be felt that we have not much on which to base our advice.

This brief note is devised to show what can be done by using the forecasts we can make at present, how we produce these forecasts and how they are used to derive the route which it would be advisable for a ship to follow in order to achieve the most favourable crossing in relation to elapsed time and lack of damage to ship and cargo. At our Central Forecast Office in Bracknell the solution is based on two main things. Firstly, there is quite a large and fast electronic computer at Bracknell which is used to make the forecasts, but, secondly, it is recognized that these forecasts cannot be perfect, so as simple a method as possible is used for the sea wave forecasting. The computer provides analyses and forecasts of the wind field every 12 hours up to 48 hours ahead, also a forecast for 72 hours ahead. These wind fields are strictly forecasts of wind above the layer of surface friction which extends upwards to about 2,000 ft. So the first job is to get the computer to work out the wind at the sea surface. This is done by a formula obtained some years ago by research in the Meteorological Office.

This wind is then converted into the sea wave field by means of a very simple equation:

$$H = 0{\cdot}075V^{1{\cdot}5} + H_s$$

where H is the height of the significant sea wave in feet and V is the surface wind in knots. H_s is a term added to account for swell. It takes the form of a number of fixed values for different seasons of the year. These have been arrived at from long-period wave recordings made at Ocean Weather Ships. The significant wave height is, of course, the average height of the highest one-third of the well-developed waves observed over a fixed length of time.

The swell waves could also be predicted by the computer by solving the appropriate equations but the uncertainty of the history of the wave fields required, coupled with the imperfections of the wind forecasts and of their mathematical conversion into waves, do not justify such a course at the present time. However, the forecaster does make subjective adjustments for swell when he feels this to be required in the light of previous or present conditions.

This note is confined to a description of the method of obtaining the underlying weather forecasts necessary for ship routeing, as carried out in the Meteorological Office. The procedure for determining the route itself was described in the July 1968 number of *The Marine Observer*.

551.5:061.3:629.12

Maritime Meteorologists meet in Rhode Island

By C. E. N. Frankcom
(Marine Superintendent, Meteorological Office)

On 23rd August 1853 the first International Meteorological Conference opened at Brussels under the guidance of an American Naval Officer, Lt. M. F. Maury. Almost exactly 115 years later the Commission for Maritime Meteorology (CMM) met in the United States of America for the first time when its fifth Session, under the auspices of the World Meteorological Organization (WMO), opened on 19th August 1968 at Rhode Island University. As Maury can be considered the father of maritime meteorology it seemed natural that the conference should feel at home in Maury's native country. Under the International Meteorological Organization, prior to the formation of the WMO, the Commission for Maritime Meteorology held 18 meetings between 1909 and 1937 so the Commission is, in effect, a direct descendant of the 1853 Brussels meeting.

Rhode Island University, although about five miles away from the sea, was not an inappropriate venue for the conference because it has a faculty of oceanography and owns a research ship and its President used to work for the United States Weather Bureau. The University is situated in a small village miles from anywhere, has an enormous campus and is quite 'dry', so the delegates had few diversions (apart from the youth and beauty of the University's vacation students) except during weekends, which was just as well because they had over 60 basic documents and about 50 working papers to digest and discuss.

Twenty-eight countries were represented at the Session: 4 from Africa, 4 from Asia, 14 from Europe, 3 from North and Central America, 2 from South America and 1 from the south-east Pacific—a nice, wide geographic distribution. The eight International Organizations represented included the International Chamber of Shipping and the Inter-Governmental Maritime Consultative Organization (IMCO). The mariners present included the former Port Liaison Officer at Cape Town, the Port Liaison Officer at Haifa and the Marine Superintendent of the Meteorological Office.

Mr. K. T. McLeod (Canada), President of CMM, presided. During the opening session the Commission had the honour of receiving a telegram from Mr. Hubert Humphrey, Vice-President of the United States, in which he welcomed the Commission to his country and went on to say "President Johnson recently proposed that all nations, large and small, join in an historic and unprecedented adventure—an international decade of ocean exploration for the 1970s—to extend our knowledge, to develop our resources and to strengthen international understanding. The World Meteorological Organization has already made significant progress in developing the global atmospheric research programme and the World Weather Watch. Through these programmes we can remedy age-old deficiencies in our weather prediction. We look to the WMO, working with the Intergovernmental Oceanographic Commission and other international organizations, to provide the beacons which will guide our course. I extend my very best wishes for a successful meeting to advance international co-operation which benefits the marine meteorological services of all nations."

The Commission had last met in 1964 and during the intervening four years various subjects came under active study and consultation, mostly by correspondence, by five Working Groups under the following headings: Marine Climatology, Sea Ice, Technical Problems, Ocean-Atmosphere Interaction and the Collection of Ships' Weather Reports and Provision of Shipping Forecasts. The work of the Session was based largely upon reports submitted by the Chairman of these Working Groups; there were two notable exceptions, marine meteorological aspects of

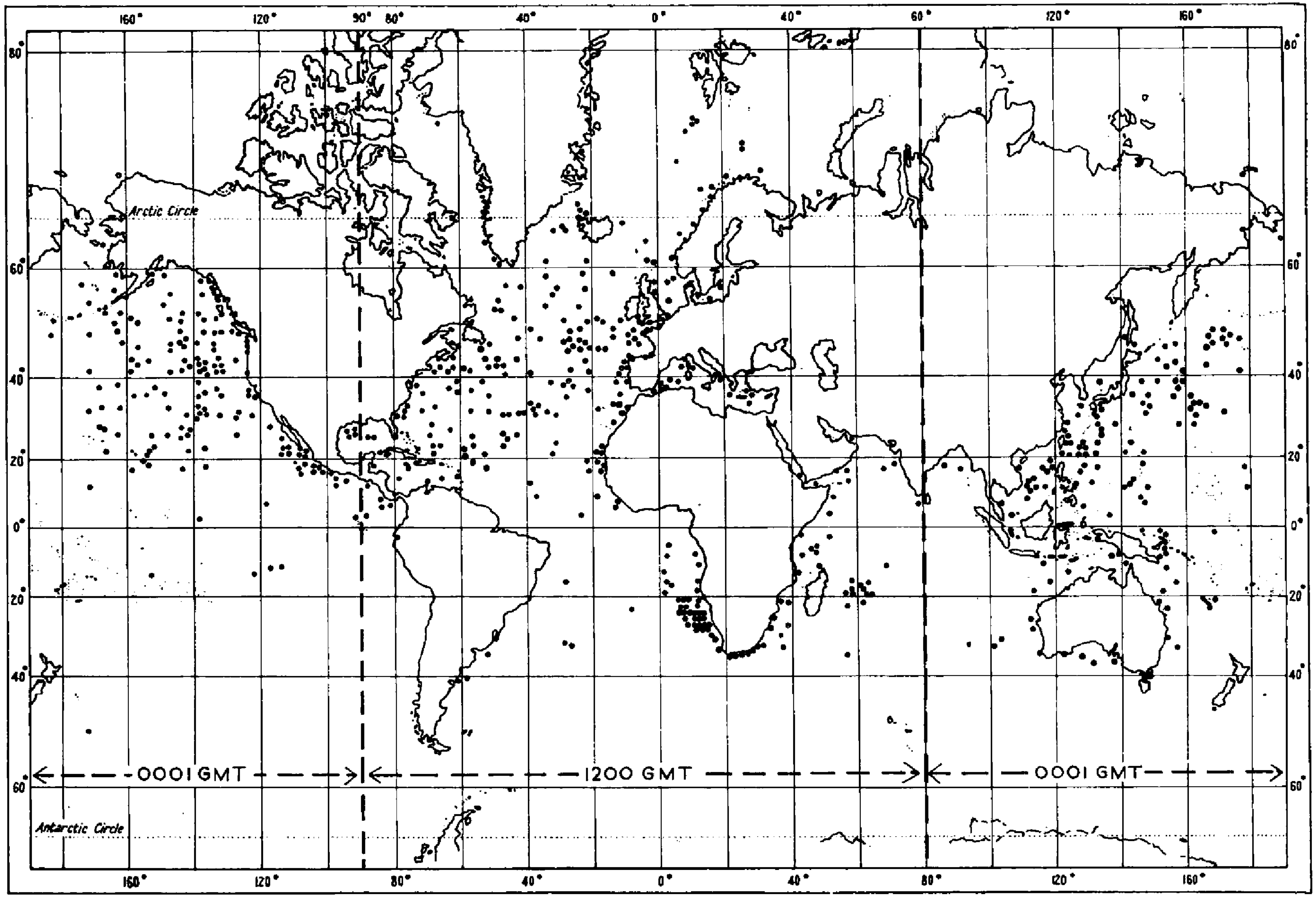


Fig. 1. The distribution of ships from which weather reports (for 0001 or 1200 GMT) were received on 1st September 1967.

World Weather Watch and the general question of co-operation between oceanographers and meteorologists, both of which were submitted by the WMO Secretariat. Most of the work of the Session was carried out by two committees: Committee A, dealing with scientific and technical questions and Committee B, with operational matters. The plenary meetings merely needed to take final action on the reports from these two Committees.

The work of Committee B is probably of primary interest to voluntary observers at sea. One of its main jobs was to take action on a report of a detailed survey that had been made by a working group concerning the strength and weakness of the present system for the collection and dissemination of radio weather messages from ships. The basic principle of this system, which came into force in 1965 (see *The Marine Observer*, April 1965), is that the radio officer is given much freedom of choice as to which radio station he sends his report, within the WMO region in which the ship is situated. The survey was very detailed and was based upon world-wide statistics taken from ships' logbooks during a period of 7 days concerning time of each observation, ships' position, time of transmission of the report, name of coastal radio station and remarks on any difficulties experienced in clearing the message. A separate study was then made of the number of reports received during another period of 5 days at the coastal radio stations of the various countries and the time of reception at the national meteorological centres. The studies showed that, in general, the present scheme is satisfactory from the viewpoint of the radio officer, which means that a high proportion of the observations made aboard ship are successfully transmitted. Fig. 1 shows the distribution of ships from which reports were received on 1st September 1967 at 1200 GMT between 80°E through 0° to 90°W and at 0001 GMT for the remainder of the oceans, the times selected being those when the maximum number of reports was received during 'single operator' watch periods. Obviously, the sooner the message is received after the observation hour the more valuable it is. The survey indicates that reception delays which occur when the radio officer is on watch can vary according to local conditions: traffic load at the shore station, its degree of efficiency and the number of operators available there, the power of the ship's transmitter and the distance of the ship from the coast station. The success of the scheme whereby the radio officer in a 'single operator ship', when coming on watch, transmits all the observations made while he was off duty is shown clearly in the survey. At first glance this affects the statistics adversely in some areas because of the apparent delay in transmission—but there is no doubt that these 'late' observations are extremely valuable, especially in areas where shipping is sparse. Resulting from these studies, the Commission recommended that ships' officers be invited again to take full advantage of all the facilities and alternatives provided for in the present scheme, both for making the observations and for transmitting them at convenient times; that special care be made to include the prefix OBS in weather messages to ensure priorities; that steps be taken to improve communication facilities at coastal radio stations and, in particular, that special arrangements be made to ensure that all ships' radio messages, as soon as they are received ashore, are rapidly re-transmitted within specified minimum time limits to national meteorological centres and thence to regional and world meteorological centres, with particular emphasis on their value for World Weather Watch, and that surveys be made from time to time by international experts to make sure that this is being done. The Commission noted that there is no radio station at present in the Persian Gulf designated officially by WMO to receive weather reports from ships and recommended that steps be taken to remedy this deficiency.

In view of the value of data from the oceans for World Weather Watch the Commission recommended that member countries endeavour to intensify their Selected Ship programme, particularly in 'sparse' areas of the ocean, and that steps be taken to establish ocean weather stations in the southern hemisphere. Also that special efforts be made to increase the number of reports from fishing vessels and research vessels and that these be urged to send radio weather messages to radio stations in the region where the ship is operating, in accordance with the WMO scheme, rather than to transmit them (as many of them do at present) only to their parent country. The Conference recognized the voluntary nature of this meteorological work at sea and recommended that in addition to national incentives the possibility of an international incentive programme be given immediate study. The Commission noted the steps being taken, in consultation with the Inter-Governmental Maritime Consultative Organization, to encourage the owners of Greek, Panamanian and Liberian ships to take part in the Selected Ship programme; these ships are so numerous that they could make a major contribution to the Selected Ship scheme. It was noted that very few merchant ships have so far been used for upper-air observations. On the basis of a report on the successful programme aboard the *Sugar Exporter*, special arrangements were recommended for ensuring reception and rapid dissemination of the lengthy radio messages likely to be received from such ships.

The Committee critically examined a booklet on the use of radio facsimile maps aboard ship which had been prepared by a working group and recommended that it be reproduced in an inexpensive form with a view to its distribution to shipowners and shipmasters. The representatives of IMCO and the International Chamber of Shipping urged that written or symbolic information be included, where appropriate, in facsimile maps intended for use aboard ship and that there should be more standardization of certain technical features of facsimile transmissions, with consequent lessening in capital cost to the shipowner. The Committee recommended that the Secretary-General of WMO should make an enquiry among member countries about these questions.

The general question of providing meteorological information, including storm warnings and weather bulletins, for shipping, fishing and other marine activities was examined in detail and some minor 'tidying up' was done in connection with gale and storm warnings. It was recommended that action be taken by WMO in an endeavour to provide weather bulletins in areas where these are not already supplied. It was also recommended that a study be made of the possibility of providing a continuous VHF weather broadcast in the vicinity of major ports, in view of the increased size and speed of ships and the risk of major disaster in the event of collision or stranding of such ships. The Secretary-General was requested to study in consultation with the International Telecommunication Union and IMCO the possibility of obtaining a standard world-wide VHF frequency for this purpose.

The first task of Committee A was to deal with the report of the Working Group on Sea Ice which had brought up to date the international Sea Ice Nomenclature to take into account recent increased knowledge on this subject, had provided a set of internationally-agreed photographs to illustrate the nomenclature and had recommended the use of Russian ice symbols for use on ice maps and a new code for reporting sea ice by research vessels. Other subjects dealt with by Committee A included marine climatology, methods of observation at sea, including marine meteorological instruments, co-operation between meteorologists and oceanographers, and problems concerning meteorological codes used at sea. Voluntary observers will be glad to know that CMM recommended that code changes should only be made when a major revision of the code is needed and that any changes that are made should have the aim of simplifying the code. There was much discussion about the different methods of taking sea-temperature observations; a working group has been investigating this with the aid of various instruments and is going to continue its work. Sea temperatures are considered of very great importance nowadays in view of the increasing interest in air-sea interaction and in oceanography generally and a series of scientific lectures was held, with sea temperature as the theme, on two evenings during the Session. Much interest was also shown in wave observations for a variety of users and it was recommended that all Selected

Ships be encouraged to make and report wave observations. Precipitation measurements at sea, investigations into wind structure and some proposed changes in the wind-speed equivalents of the Beaufort scale were also discussed.

At the closure of the Session, Mr. S. L. Tierney (Ireland), who has been a Member of CMM since 1956, was elected President. The next Session will be in 1972; new working groups were established to deal with the work of the Commission in the interim.

551.590.3(99:42):551.42

Meteorology of an Erupting Island

By D. W. S. Limbert

(Mr. Limbert, who is now in the Meteorological Office at Bracknell, was one of the meteorologists working at Halley Bay, Antarctica in 1956 and 1959)

The eruption in December 1967 at Deception Island, South Shetlands, ended a continuous record of meteorological observations by the British Antarctic Survey (formerly the Falkland Islands Dependencies Survey) that was inaugurated in 1944. Prior to 1944 intermittent and sketchy records were kept by whalers. The island, one of the largest crater islands in the world (see Fig. 1), has long been known for its hot springs and, in 1829, members of the crew of H.M.S. *Chanticleer* recorded temperatures of 185–190°F. In 1936 the water in a stream in Whalers Bay was 127°F and, at low tide, the sea was 95°F along the shore but only 38·5° one-cable distance off shore.

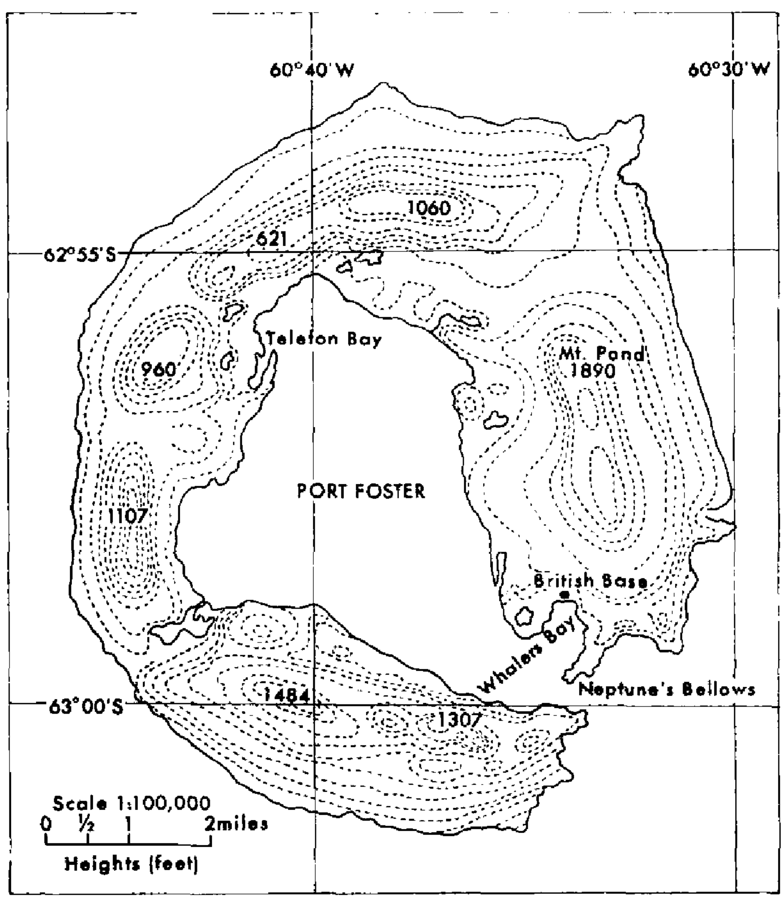
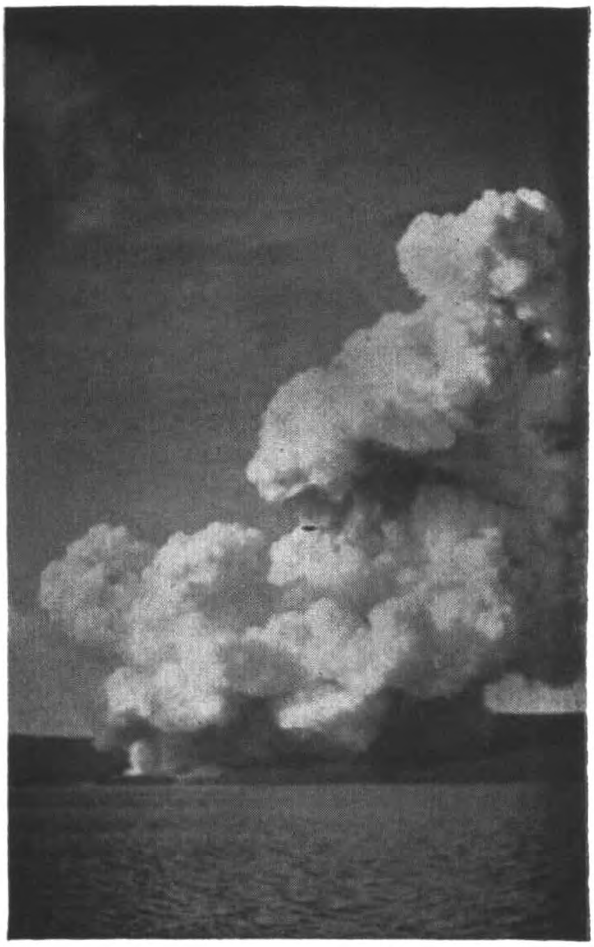


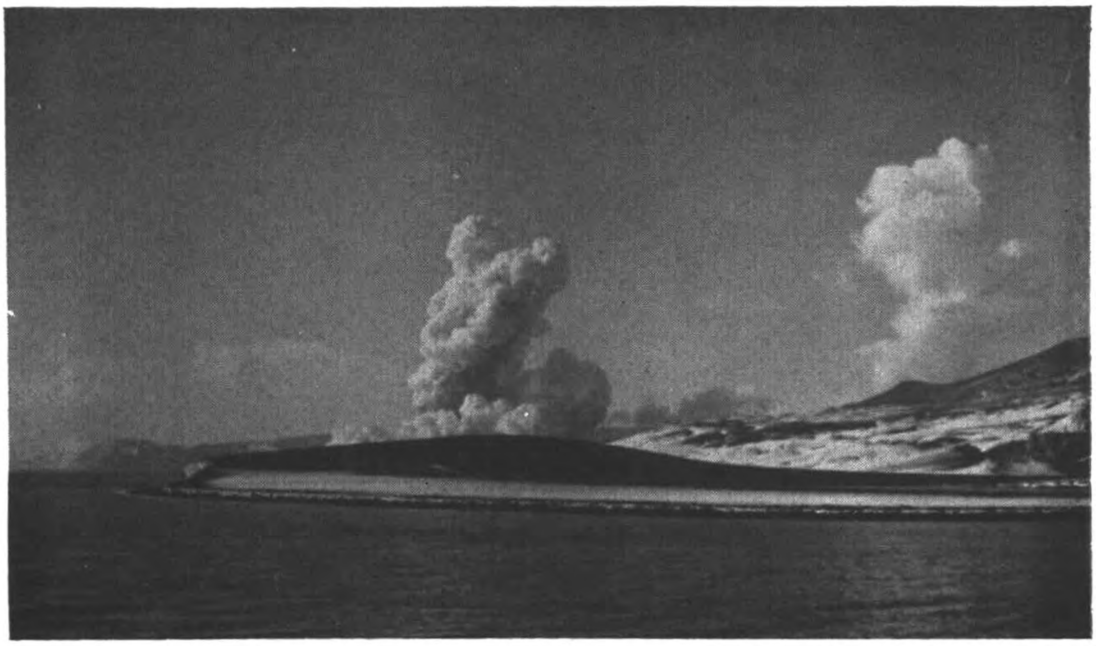
Fig. 1. Deception Island.

Since World War I there have been several occasions of more obvious volcanic activity. The whaling station was partially destroyed in 1921 when the shore of Whalers Bay subsided and the water in the bay boiled, removing the paint from the hulls of ships in the immediate vicinity. When visited in 1927 by R.R.S. *Discovery* the island showed signs of recent volcanic activity and in 1930 there was an earthquake. More recently, in 1951, a minor eruption on Mount Pond produced a lava flow but did not imperil the FIDS base. Tremors were again felt in April 1953.

The eruption of 4th December 1967 was centred on Telefon Bay, Port Foster, about 5 miles north-west of the British base in Whalers Bay. Throughout 1967 there had been minor tremors which increased in frequency in November and culminated in two Grade 4 quakes (on the International Scale of 12 grades) on the morning of 4th December. These were followed by tremors at 5-minute intervals,

(Opposite page 32)





Photos by D. H. Turnbull

The eruptions on Deception Island on 7th December 1967 as seen from R.R.S. *Shackleton* (*see* page 33).

(*Opposite page* 33)

Photo by D. H. Turnbull

Iceberg seen near Elephant Island, some weeks later, with a covering of volcanic ash (*see* page 34).

increasing to Grade 5. The first eruption occurred at 1840 LMT (2240 GMT) on land with a column of smoke and ash rising to about 2,500 m (8,200 ft), accompanied by an underwater eruption in Telefon Bay. Cumulonimbus cloud developed rapidly over the centre of volcanic activity. By 2000 LMT a violent thunderstorm was in progress and the 25-mile visibility at the British base had been reduced to 100 yards by a combination of hail and ash. The hail was about ½ cm in diameter. The wind was 10–15 kt, gusting to 30 kt, mainly from a northerly quarter, and on a 300 ft hill half a mile north-west of the British base the wind at 2200 LMT was estimated to be force 8–9. The peak of the eruption and storm appears to have occurred between 2000 and 2300 LMT after more volcanic explosions had been heard at 2030 LMT. There was a fall of 1·5 degC in the air temperature during the storm.

Simultaneously with the eruption, the sea level in Port Foster was rising and falling 2 m, causing chaos at Neptune's Bellows, the entrance to the crater harbour. The meteorological observations were discontinued at 0500 LMT on 5th December and the personnel of the British and Chilean bases were evacuated by helicopter to the Chilean ship *Piloto Pardo*. The Argentine personnel were rescued from the north-west side of the island by the *Bahia Aguirre*. During all this time the thunder and lightning had been maintained to a greater or lesser degree by the hot volcanic up-draught, liberally supplied with moisture from Telefon Bay. The formation of Surtsey, off Iceland, and the associated storm are comparable if somewhat larger events.

Thunderstorms are a rarity in polar regions because of the absence of strong vertical currents and in 23 years' records only one previous occasion, in 1956, is cited at Deception Island which, by the very lack of comment, arouses doubts as to its validity. Hailstones of the diameter encountered during the eruption (½ cm in diameter) have terminal velocities in the region of 10 m/sec (20 kt), which indicate that the up-draughts were of this order. According to aircraft reports, erupted material reached 10 km (33,000 ft) but does not appear to have penetrated the strong inversion at the tropopause to enter the stratosphere as was the case with the 1963 Bali eruption, the dust of which encircled the globe several times. The normal height that could possibly be reached by the cumuliform cloud on 4th December would have been about 2,500–2,700 m (8,200–8,800 ft), as given by the radiosonde ascent at Argentine Islands, 180 miles to the south-west, the inversion at that level clearly limiting the rise of the plume of the first eruption. To achieve a 10 km height required a cloud-base temperature of the order of 20–30 degC warmer than the ambient air which was about −5°C at 1,000 ft, the estimated cloud base. Although the vent temperature close to the volcano would be several hundred degC, the rapid expansion of the effluent gases would reduce the effective temperature at the edges of the gas plume, but with the centre retaining a large temperature differential to maintain buoyancy. The underwater eruption supplied the necessary large increase of water vapour in the form of steam. At the vent itself the vertical velocities of the up-draughts in the core of the gas plume would be at least an order of magnitude greater than the hailstone terminal velocity suggests. The gusty wind and the temperature fall of 1·5 degC at the British base were probably associated with the down-draught from the very large storm cloud centred over the volcano. By 0800 LMT on the 5th, subsidence of the air in the weak ridge of high pressure and the approach of a frontal system from the west would have restricted the height of the cloud top to 6,000 m (20,000 ft). A study of the upper winds suggests that the spread of debris would have been eastwards and then south-eastwards. But, in general, the volcanic dust does not appear to have been remarked on by other Antarctic bases and we must conclude that the effects were restricted to a fairly small area.

In smaller eruptions on 7th December columns of steam and ash eventually rose to 6,000 m (20,000 ft). These were witnessed from R.R.S. *Shackleton* and her Master, Captain D. H. Turnbull, took the series of photographs which inspired the writing of this article. Three of them are reproduced opposite page 32. The first was taken at a distance of 30 miles and the second at a distance of 2 miles after entering Port Foster; the ridge of ash in the background was estimated to be about 1,000 ft high. The third photograph was taken just off the British base at a distance of 5 miles. To the right is the source of the vapour and cloud columns, in the centre is another crater erupting big rocks as well as ash and vapour and, to the left, vapour is coming from a small island of ash which formed near the inner shore of the Island. By 15th December, when R.R.S. *John Biscoe* arrived, this small new island in Telefon Bay, consisting of 3 craters, was 65 m (210 ft) high and about 1 km in diameter. There was also a new vent in an old crater on the main Island.

Some weeks later Captain Turnbull saw a large iceberg covered with ash near Elephant Island, about 220 miles from Deception Island (*see* photograph opposite page 33). From his observations of the ash cover on Deception and on other islands in the vicinity he thought that this berg must have been at one time within 10 miles of the main series of eruptions.

The author wishes to thank Messrs. Norman, Taylor, Chambers and Platt for supplying the meteorological observations which they had maintained throughout what must have been a frightening event. He is also grateful for the information provided by Mr. A. N. Walton, meteorologist at Deception Island in 1951.

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AUSTRALIAN SATELLITE STATION WATCHES INDIAN OCEAN WEATHER

(From the Australian News and Information Bureau, Canberra House, London)

Ships and aircraft crossing the Indian Ocean often know that a storm is in the area only when it strikes them. Over the south Indian Ocean the only observations available until recently were from isolated islands and those ships which voluntarily make and transmit meteorological observations by radio. As a result, weather forecasting was chancy because of the vast expanse of ocean without a stable weather check-point.

Satellite weather pictures have changed the situation dramatically. When the satellite read-out station at Perth, Western Australia, came into operation last October the photographs taken above the Indian Ocean provided much of the necessary weather information. Stored satellite pictures of the area have been available before, but they had to come from the United States. This could take up to two days. During this time-lapse the weather patterns shown in the satellite pictures had frequently changed.

The new Perth read-out station can pick up direct, or line-of-sight readings from the weather satellites of the United States Environmental Science Services Administration (ESSA) and can receive information from ESSA's television cameras and radiation sensors. The United States National Aeronautical and Space Administration is in charge of the satellites and the United States Weather Bureau controls the meteorological programme of cloud photographs. The ESSA satellites are cylindrical and weigh 290 lb. The power for their electronic systems is generated by solar units on the top and sides.

The new station is on the foreshore at Swanbourne, a Perth suburb. Here a two-man team mans the electronic equipment that receives and processes data from the satellite. Later, automatic tracking equipment will be installed. Then only one man will be needed to run the station.

Satellite weather information monitored by the Perth station covers the area east of 80°E to south of 10°S. Read-out stations at Melbourne and Darwin were already in operation and the addition of the Perth station completes the satellite coverage of weather developments in and around Australia.

The weather bureau at Perth has always had a difficult task in forecasting weather conditions in the south Indian Ocean. The nearest stable report centres are at Amsterdam Island and Kerguelen Island, both some 1,500 nautical miles from Australia. The Perth bureau is responsible for weather information for the area to 80°E and from 10°S to 50°S. Reports from ships have proved inadequate to bridge the gap, not because the ships do not collaborate but because shipping in these waters is relatively sparse. In much of the vast unmonitored ocean areas of the south Indian Ocean major storm systems can exist for days without detection.

Satellite readings have helped to bridge the gap in information. Direct satellite readings will help even more. The regional director of the Perth Weather Bureau, Mr. G. W. Mackey, gets at least one direct satellite reading a day from the new read-out station. He said the new source of weather information was another valuable tool in weather forecasting. "We will still have forecast failure, but we hope it will be considerably less," he said.

NOTES ON ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM JULY TO SEPTEMBER 1968

JULY

Pressure was exceptionally high over the north-east of the Atlantic and also, to a somewhat lesser extent, over the eastern Beaufort Sea. On the other hand there was an anomalous low

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

(This does not include growlers or radar targets)

Limits of Latitude and Longitude		Degrees North and West												
		66	64	62	60	58	56	54	52	50	48	46	44	42
Number of bergs reported south of limit	July	> 415	> 414	> 411	> 407	> 401	> 401	> 387	> 244	> 81	> 32	16	6	0
	Aug.	> 286	> 285	> 281	> 177	> 145	> 145	> 136	> 51	4	4	0	0	0
	Sept.	14	14	14	14	14	14	14	8	4	4	0	0	0
	Total	> 715	> 713	> 706	> 598	> 560	> 560	> 537	> 303	> 89	> 40	16	6	0
Number of bergs reported east of limit	July	> 415	> 415	> 415	> 415	> 415	> 339	> 122	> 57	> 28	> 15	> 7	1	0
	Aug.	> 286	> 286	> 286	> 285	> 285	> 263	> 219	> 185	> 140	> 102	> 33	14	0
	Sept.	14	14	14	14	14	13	13	9	4	1	0	0	0
	Total	> 715	> 715	> 715	> 714	> 714	> 615	> 354	> 251	> 172	> 118	> 40	15	0
Extreme southern limit	July	43° 15′N, 48° 35′W on 15.7.68												
	Aug.	47° 34′N, 47° 50′W on 1.8.68												
	Sept.	47° 31′N, 49° 00′W on 7.9.68												
Extreme eastern limit	July	59° 30′N, 43° 42′W on 26.7.68												
	Aug.	59° 30′N, 42° 54′W on 16.8.68												
	Sept.	47° 46′N, 47° 55′W on 5.9.68												

> ('greater than') has been inserted where there is some doubt as to the actual number of icebergs at some of the sightings, but the true value is probably greater than the value given.
Extreme limits during the 3-month period are underlined.

pressure area covering the whole of Siberia and another to the north of Hudson Bay. From the resulting atmospheric circulation it followed that from Iceland westwards across Greenland to Alaska and over Siberia as far as 110°E there was an area where it was less cold than usual whereas Scandinavia and northern European Russia, together with north-east Canada, were much colder than normal.

Canadian Arctic Archipelago, Baffin Bay, Foxe Basin and Hudson Strait. Winds nearly everywhere over this region had an easterly component and, although temperatures were mostly a little above normal, ice coverage was slightly excessive, especially along the Greenland coast of Baffin Bay, except in the south-west of the Canadian Archipelago which continued to have more open water than usual.

Hudson Bay. In spite of the fact that mainly north-westerly winds kept air temperatures lower than normal, melting of the ice here was earlier than usual, probably as a consequence of the warmth of the previous month.

Davis Strait. Mainly south-easterly winds were operative during the period with variable air temperatures. Curiously enough, although sea temperature was on the high side, ice amounts were excessive but this was certainly due to the mobility of the pack passing from the east coast of Greenland round Cape Farewell into the Strait.

Labrador Sea and Great Bank. Winds were variable in direction but both air and sea remained much cooler than normal, temperatures of both being about 4 or 5 degC lower than usual. Early on there was much pack ice along the coast of Labrador but this cleared during the month. Many icebergs were reported, however, further out than usual.

Greenland Sea. North of 70°N, in spite of mainly south-westerly winds, the temperature of the air was relatively low although in the east of this area the sea was slightly warmer than usual. Ice was mobile and the excess near Jan Mayen was still apparent, the pack extending in places 150 miles beyond normal limits. Further south, under the influence of the persistent anticyclone to the north-west of Britain, temperatures of both air and sea rose and the ice, although excessive at first, quickly melted. Nevertheless, close into the south-east of Greenland, there was still more ice than usual but the pack was well broken.

Spitsbergen and Barents Sea. Mostly north-westerly winds kept air temperatures low, with a negative anomaly of as much as 4 degC. Once again, however, there was the paradox that somewhat warmer than usual sea did not prevent there being more than the average amount of ice: in the Barents Sea, indeed, the pack was reported up to 100 miles south of normal.

August

Pressure was low over north-east Canada, Spitsbergen and the Barents Sea. There was an anomalous high pressure area over the Faroe Islands extending westward into the Beaufort Sea. Winds in general were light and variable in direction. Temperatures over the Beaufort Sea and the Russian Arctic were much warmer than usual.

Canadian Arctic Archipelago. Winds at first were mainly from the north or north-east, becoming more southerly later. The break-up of the ice proceeded slowly and by the end of the month the Queen Maud Gulf was mainly ice-free.

Baffin Bay. By the middle of the month, in the east and south-east, there was a rapid break-up of the ice, but there was rather more pack ice than normal near the coast of Baffin Island. Some old ice moved south close to the Lancaster Sound.

Davis Strait. Light easterly winds persisted during the period and temperatures were slightly below normal. All the pack ice had melted except for small patches near the Cumberland Sound.

Labrador Sea and Great Bank. The area remained free of pack ice although the sea and air temperatures were well below normal. Icebergs moved east from the Labrador coast and at one time were reported near 48°N. By the end of the month the bergs were confined to the Labrador Sea and only very isolated bergs were reported in the extreme north of the Great Bank.

Foxe Basin and Hudson Strait. Very open pack was reported at first in the south and south-east, gradually breaking up from the east. There were scattered bergs in the east of the Hudson Strait by the end of the month.

Hudson Bay. This area is normally ice-free in August, but patches of open pack were reported in the south-east, decreasing slowly during the month. Air temperature was about 2 degC lower than normal.

Gulf of St. Lawrence. Late in the month isolated bergs were reported entering the Belle Isle Strait and moving south-westward.

Greenland Sea. South-westerly winds at first helped to push the ice edge about 50 n.miles further east than usual in the north-west of the area, but by the middle of the month light north-easterly winds brought the ice edge back to a more normal position. The area of close pack ice near the east coast of Greenland extended south to reach about 73°N, which was slightly further south than usual. A narrow strip of open pack extended along the coast to within about 100 miles of the southern tip of Greenland.

Spitsbergen. Air and sea temperatures were relatively low and there was more ice than usual in the north-west. Normally by the end of August there is a lead to the north of Spitsbergen, but this did not appear.

Barents Sea. Ice had extended about 150 n.miles further south than usual, especially on the east side.

Baltic. Ice-free. Both sea and air temperatures well above normal.

SEPTEMBER

Throughout the month pressure was low over the eastern Atlantic with one trough extending into the Barents Sea and another extending into the Davis Strait and Baffin Bay. High pressure covered north-east Greenland and eastern Canada. The overall effect of these pressure systems was to give a mainly north to north-easterly airstream across Spitsbergen and the east Greenland Sea, becoming north-westerly over the Labrador Sea and Great Bank. The air was warmer than usual over Hudson Bay and the Canadian Arctic Archipelago, and colder over Spitsbergen and Barents Sea.

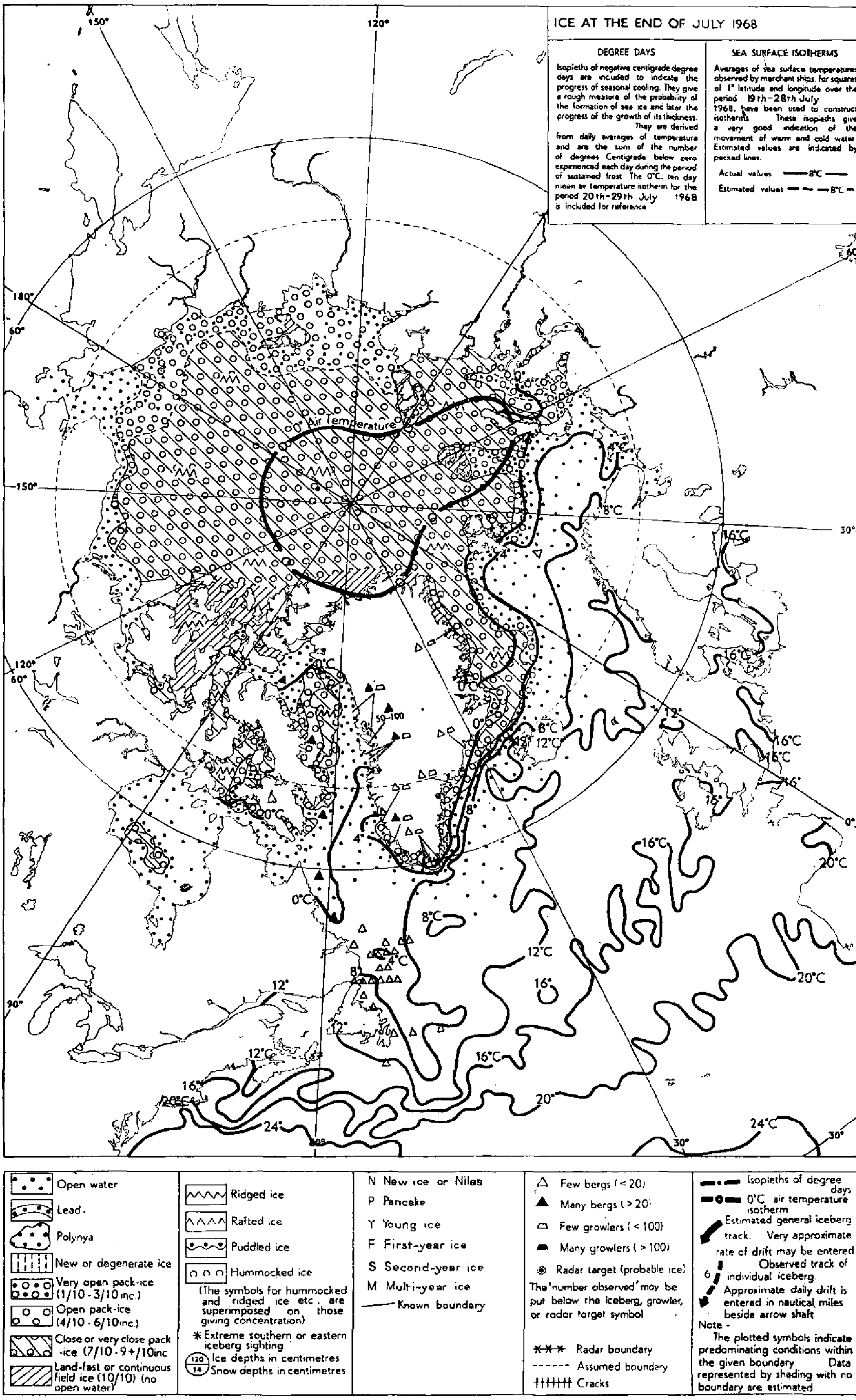
Canadian Arctic Archipelago. The situation regarding pack ice was about normal. With the general fall of air temperatures new ice began to form around the middle of the month and by the end of the month only the extreme south remained relatively ice-free.

Baffin Bay, Davis Strait, Labrador Sea, Great Bank. Sea and air temperatures were about normal except in the south-east of the Great Bank where temperatures were about 3 degC below normal. Concentrations of icebergs were reported near the coast of Baffin Island, becoming much less frequent off Labrador. At one time a few bergs were reported as far south as 47°N.

Foxe Basin, Hudson Strait. There was rather more ice than usual in the south of Foxe Basin, starting off as close pack, but by the end of the month amounts had decreased to open or very open pack. Air temperatures were 2–4 degC above normal.

Greenland Sea. The area of close pack near the Greenland coast continued to extend slowly southwards to give more ice than usual in the vicinity of Scoresby Sound. Apart from scattered bergs, the coast south of about 69°N remained ice-free.

Spitsbergen. Air and sea temperatures remained below normal with the air temperature at Bear Island as much as 6 degC below normal by the end of the month. In the north-west of the area the ice edge was 40–50 miles south-east of the normal position. There was some open pack off south-east Spitsbergen.


ICE AT THE END OF JULY 1968
DEGREE DAYS
Isopleths of negative centigrade degree days are included to indicate the progress of seasonal cooling. They give a rough measure of the probability of the formation of sea ice and later the progress of the growth of its thickness. They are derived from daily averages of temperature and are the sum of the number of degrees Centigrade below zero experienced each day during the period of sustained frost. The 0°C. ten day mean air temperature isotherm for the period 20th-29th July 1968 is included for reference
SEA SURFACE ISOTHERMS
Averages of sea surface temperatures observed by merchant ships, for squares of 1° latitude and longitude over the period 19th-28th July 1968, have been used to construct isotherms. These isopleths give a very good indication of the movement of warm and cold water. Estimated values are indicated by pecked lines.
Actual values 8°C
Estimated values 8°C
Air Temperature
Open water
Lead.
Polynya
New or degenerate ice
Very open pack-ice (1/10 - 3/10 inc.)
Open pack-ice (4/10 - 6/10 inc.)
Close or very close pack -ice (7/10 - 9+/10 inc
Land-fast or continuous field ice (10/10) (no open water)
Ridged ice
Rafted ice
Puddled ice
Hummocked ice
(The symbols for hummocked and ridged ice etc. are superimposed on those giving concentration)
* Extreme southern or eastern iceberg sighting
120 Ice depths in centimetres
14 Snow depths in centimetres
N New ice or Nilas
P Pancake
Y Young ice
F First-year ice
S Second-year ice
M Multi-year ice
Known boundary
Few bergs (< 20)
Many bergs (> 20)
Few growlers (< 100)
Many growlers (> 100)
Radar target (probable ice)
The 'number observed' may be put below the iceberg, growler, or radar target symbol
Radar boundary
Assumed boundary
Cracks
Isopleths of degree days
0°C air temperature isotherm
Estimated general iceberg track. Very approximate rate of drift may be entered
Observed track of individual iceberg.
Approximate daily drift is entered in nautical miles beside arrow shaft
Note -
The plotted symbols indicate predominating conditions within the given boundary. Data represented by shading with no boundary are estimated

Barents Sea. Air and sea temperatures were 2–4 degC below normal. The ice edge continued to drift southwards and reached about 150–200 miles south of its usual position.

Baltic. Ice-free. Southerly winds at first maintained the sea temperatures well above normal. However, by the end of the month, with the advent of northerly or westerly winds, sea temperatures were nearer their usual values.

N. B. M. & R. G. H.

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

Book Reviews

Magnetic Compasses and Magnetometers, by Alfred Hine. 10 in × 7 in, pp. 385, *illus.* Adam Hilger Ltd., 98 St. Pancras Way, London, N.W.1, 1968. Price: £10 10*s.*

Much of the contents of this excellent book, particularly those dealing with magnetic compasses of the types with which most seafarers are familiar, have been more fully discussed in previous publications. Nevertheless, their inclusion is fundamental to this history and development of magnetic directional instruments. Primarily a reference work, it must surely be a welcome addition to the library of anyone concerned with the design, construction and operation of its subject.

For members of the profession with a sound knowledge of the principles of magnetism it will provide interesting and valuable reading. Others with a tendency towards the more practical aspects of compass correction might be overawed by its theoretics which, with relevant diagrams, are concisely presented to illustrate the causes and effects of magnetic fields at the compass position. However, simplification of these can be obtained in other books dealing more comprehensively with the subject, some of which are referred to in the included bibliography.

On the development of more sophisticated types of compass, notably the transmitting and gyro magnetic, it provides a wealth of interesting material and reveals the diligent research which has taken the instrument from the form that possibly gave origin to 'la rose des vents' to its present standard which, particularly when independent of power supply, is without peer among its contemporaries.

One mistake was noted on p. 343: the word 'deviations' in lines 15 and 21 should read 'errors'.

A. W. M.

Mischief goes South, by H. W. Tilman. 8¾ in × 5⅝ in, pp. 190, *illus.* Hollis and Carter Ltd., 9 Bow Street, London, W.C.2, 1968. Price: 30*s.*

In reviewing Major Tilman's previous book, *Mostly Mischief*, in January 1967 the reviewer mentioned that he would look forward to receiving another *Mischief* book in due course; *Mischief goes South* is that book. It records his voyage to the South Shetlands in 1966–67 and also an earlier and previously undocumented voyage in 1957–58.

Mischief sailed from Lymington on 14th July 1966 and, as on the three previous occasions that she had made the passage since 1955, reached Las Palmas in 16 days. The voyage was to be by way of the Canaries, Montevideo and Punta Arenas to the Antarctic where Major Tilman hoped to land on Smith Island and to climb its two 6,000 feet peaks. But this first leg of the journey seems to have been the only one which was not marred by frustration, unpleasantness and even tragedy.

On the second leg Major Tilman admits his mistake in turning to the westward before he had made enough southing to keep him clear of west-going equatorial currents which ultimately might have left him unable to weather Cape San Roque, a mistake which was not altogether uncommon in the days of sail.

At 0740 on 27th August he came on deck to find no sign of the helmsman. Only a broken logline, with the clock reading one mile more than the last logbook entry at 0600, showed that young David Shaw (an officer on leave from the Royal Mail Line, having just passed for master) must already have been overboard for an hour and three-quarters. Although almost inevitably foredoomed to failure, a search was made, crossing and recrossing the area which had been covered in the interim. "The sea that for the last three weeks we had sailed over so carefree and unthinkingly had suddenly assumed a pitiless aspect . . . a small school of dolphin had chosen this day, of all days, to accompany *Mischief*, leaping out of the water and turning somersaults with a gay abandon that contrasted bitterly with our despairing gloom."

Major Tilman mentions that the possibility that Shaw had fallen overboard whilst leaning out under the guard rail to take a sea temperature for the 0600 observation had occurred to him at once but, as both thermometers were subsequently found in their usual place, this possibility had to be ruled out.

Though Major Tilman himself now felt like turning back no one else wished to do so and Montevideo was reached 60 days out from Las Palmas. But it was a trying passage and four of the crew had had enough; he was left alone with the cook who subsequently persuaded one of them to return.

"At Montevideo I regretted that there were no longer any crimps . . . two or three bodies delivered on board drunk or doped would have been as useful as those we eventually got and might have been less of a nuisance." Three men, each with a somewhat dubious background, were eventually obtained from the Sailors Home (which, run by the Salvation Army, did not cater only for sailors but extended a welcome to all).

Thus did *Mischief* sail on 28th October for Punta Arenas, a distance of 1,200 miles, though she had to sail 1,700 miles and took 28 days to do it—a measure of the fickleness and contrariness of the winds. And once again tedium, frustration and incompatibility made their mark and perhaps Major Tilman may be forgiven for recalling that it was in these parts that "both Magellan and then Drake, 60 years later, stayed for some time in order to refit and to nip in the bud incipient mutinies; where Magellan hanged two of the leading trouble-makers and marooned two others and where Drake had John Doughty beheaded".

After the loss of Shaw the original object of landing on Smith Island had been abandoned but it was still hoped to carry out a reconnaissance and 20 days out of Punta Arenas *Mischief* arrived at Deception Island, having made the crossing of the Drake Strait in generally fine weather. But here, on Boxing Day 1966, she attempted to anchor in the teeth of a north-easterly blizzard, dragged three times and finally moored alongside R.R.S. *Shackleton* which had fortuitously just arrived. Hot baths and hot food did much to revive morale but *Mischief*'s subsequent adventures and misadventures amongst the islands are best left to the reader to discover for himself.

Homeward bound, Montevideo was made the next stop and here, once again, the crew deserted. Eventually, late in March 1967, *Mischief* sailed with a crew of one Italian student, one Uruguayan, one repentant deserter and one young man lately from Pangbourne who had flown out, being keen to make an adventure voyage before he settled down to a more normal sea life. Her passage of 6,260 miles to Horta occupied 86 days, the longest that she had ever been at sea.

From the Azores to the Channel is about 1,200 miles on a rhumb-line but, owing to light and perverse winds and calms, no less than 1,500 miles were covered and this took 25 days, the slowest leg of the whole voyage. She arrived in Lymington on 15th July 1967, just a year and a day after she had left.

The second part of the book details Major Tilman's first attempt to reach the Kerguelen and Crozet Islands in *Mischief*. She sailed from Lymington on 30th June 1957, called at Las Palmas but, as in her later voyage, turned to the westward much too soon and thus made a landfall more than 300 miles too far north; this involved a long beat to windward again before she made Bahia whence she sailed across to Cape Town. Here Major Tilman found little encouragement to proceed and the prophets of doom proved to be only too right; a series of storms caused considerable damage and, with the loss of the dinghy overboard, all hope of landing on the Crozets had to be abandoned. He therefore withdrew to Durban and the voyage then turned into a circumnavigation of Africa, the homeward passage being made through the Suez Canal. Though this is somewhat away from the usual Tilman beat, the story of his visits to Comoro and Aldabra Islands makes very interesting reading indeed. Early in July he reached Lymington after a voyage of 22,000 miles and an absence of 13 months.

In his preface the author writes "From my point of view both voyages were failures. On the more recent one, though we reached our objective, we achieved nothing and on the earlier one we did not even reach our objective." But one has to wonder if anything which can produce a book of this calibre can honestly be termed a failure. Major Tilman's style is irresistible and made all the more charming by his frequent quotations from other works and other authors; his character and thirst for adventure in strange places show through his writings and your reviewer counts himself fortunate in having been allowed to read the *Mischief* books even before publication.

In June 1968 *Mischief* again put to sea from Lymington, this time northwards and, almost simultaneously with the arrival of the book *Mischief goes South* from the publishers, news came that she had foundered 30 miles east of Jan Mayen whilst being towed across to Bodö following a stranding and subsequent ice damage. Happily there was no loss of life but to Major Tilman this must have been a very black moment; she had been almost his entire life since he bought her in 1954 and in her he had covered 116,000 miles. It is characteristic of the man that he saved and subsequently sent us the meteorological logbook which covered this last sea passage.

Mischief started life as a Bristol Channel pilot cutter in 1906 and her name is perpetuated in two mountains and a cape: Mont de Mischief on Ile de la Possession, Crozet Islands; Cap Mischief on Iles de Kerguelen and Mount Mischief on Exeter Sound, Baffin Island, commemorating her visits to those lonely parts.

In the Meteorological Office, too, she will be remembered for the ten meteorological logbooks which came from her and are now preserved in our archives. These have been translated into some 2,000 punched cards of observations from areas of which our knowledge is scanty.

To the reviewer, however, her memorial will always be this admirable series of five books, each of which deserves to become a classic.

L. B. P.

A Guide to Fishing Boats and their Gear, by Carvel Hall Blair and Willits Dyer Ansel, 9 in × 6¼ in, pp. 142, *illus*. Cornell Maritime Press, Inc., Cambridge, Maryland, U.S.A., 1968. Price: $5.00.

Captain Blair, U.S.N. became aware of the great variety of the world's fishing vessels when in the United Kingdom on duty. A search for more information on the subject revealed that no comprehensive recognition guide to fishing vessels existed on the lines of Talbot-Booth's *Merchant Ships* or *Jane's Fighting Ships* so he decided to produce such a guide with the help of Mr. Ansel, his brother-in-law, who made the detailed pen-and-ink sketches and wash drawings. Over fifty types of commercial fishing methods are described and illustrated. A glossary explains terms not covered elsewhere in the book.

Five years of spare-time research were devoted to the task, described by the authors as an attempt on a very modest scale to do for the world's fishing vessels what Jane and his successors have done for naval vessels, and Talbot-Booth for merchant ships.

In making available for the first time a handy-sized guide to fishing vessels and their gear a surprising gap in the wealth of literature written in the last half-century about ships, large and small, has been filled.

Mariners may find this book helpful in fulfilling their obligation under the International Rules for Prevention of Collision at Sea which requires all vessels not engaged in fishing, when under way, to keep out of the way of vessels which are so engaged. To keep well out of the way it is useful to recognize the type of fishing vessel and know the type of gear she is using, e.g. whether a trawl or drift net. How many ships' officers can claim to know that the net of the typical North Sea seiner is 1,500 feet in length and 450 in depth, while the typical Japanese purse seine has a length of 8,500 feet and a depth of 1,000 feet? These figures show how easily the unwary officer-of-the-watch can find his ship tangling with a fishing vessel's nets, although the vessel herself may be well clear.

With a rapidly increasing world population, and malnutrition rife in many parts of the world largely due to a diet deficient in protein, there is likely to be a considerable increase in commercial fishing operations within the next few years as one of the most practicable means of reducing the magnitude of this problem.

Trawlers will increase in size and extend their operations to many remote areas not so far exploited. Improvements in fishing gear and electronic aids will simplify the locating and catching of fish.

Landsmen as well as mariners may well wish to know something about this vital industry; this book presents the subject in very readable form.

A. D. W.

The Search for Speed under Sail 1700–1855, by Howard I. Chapelle. 10¼ × 7½ in, pp. 453, *illus*. George Allen and Unwin Ltd., Ruskin House, 40 Museum Street, London W.C.1, 1968. Price: 90*s*.

In all forms of transport an increase of speed has always been sought and has been accepted as a fundamental indication of progress. Nations and individuals still vie with each other to build or to own fast ships, aircraft, trains, lorries or cars, perhaps not solely for commercial reasons but also for national prestige or private status.

In the 18th and early 19th centuries, when seaborne transport was entirely by sail, speed had perhaps an even greater importance than it has today. Not only was it essential for the normal commercial operation of ships but the long wars at sea of this period and the lawlessness that characterized the short periods of peace made many trade routes unsafe and the peaceful shipowner found himself at a disadvantage unless he had a ship fast enough to keep out of trouble. At the same time the privateer or man-of-war needed speed to overtake a fleeing vessel or to escape from a powerful foe.

This book is essentially an American work (its author is the Senior Historian in the Museum of History and Technology, Smithsonian Institution) and it was perhaps in the days when America was emerging as an independent nation that the need for speed under sail reached its zenith. The War of Independence brought the need for fast blockade runners; the restrictions on normal trade imposed by the mother country (today they would be called sanctions) found their answer in an illegal trade with the West Indies and this called for other fast vessels, the smugglers. After the War of Independence the young republic was weak and, for a time, without the protection of a Navy; speed under sail then became of paramount importance. Throughout the Napoleonic Wars fast sailing vessels were in great demand; slow carriers which ventured out of American ports were too often the victims of foreign men-of-war or privateers.

Speed under sail being so much a matter of wind and weather, and wind and weather being our business, it is rather disappointing to find little or no meteorological references in the book. It is a work for the student of Naval architecture rather than for the meteorologically-minded mariner but, as such, it must be unique. The author has contrived to approach, from a completely new angle, the problem of comparing the speed of sailing vessels built at different dates and of different dimensions. His analysis, comprising over a hundred American sailing vessels, includes vessels from the days of the Colonial period to the time when clipper ships reached perfection. There are over a hundred hull plans but few sail and spar plans.

A few British ships come in for mention, notably those that were concerned with the protection of the American colonies and, later, with efforts to prevent their secession, and in an Appendix, Contemporary Accounts of Clipper Ships, there are 5 pages and 3 plans of the famous *Lightning*. She, however, though British owned and manned, was American built.

The bulk and price of this book will not commend it to the general reader but it is surely worthy of study and would be a useful addition to a library.

L. B. P.

Personalities

RETIREMENT.—CAPTAIN G. CAMPBELL retired recently as Commodore of the Shaw Savill fleet after 49 years at sea, 41 of which he spent with the company.

George Campbell was born at Loch Aldet, Inverness-shire, and first went to sea in 1919 as an apprentice with Messrs. Easton, Grieg & Co. of Glasgow.

After obtaining his Master's Certificate in 1927, he joined the Shaw Savill Line and was appointed to his first command, the *Tropic*, in 1947; in 1967, whilst in command of the *Gothic*, he was appointed Commodore.

Captain Campbell had an uneventful war service and 'kept his feet dry' throughout hostilities.

His association with the Meteorological Office goes back 40 years to 1928 when he sent in his first meteorological logbook from the *Arawa*; in 17 years of voluntary observing he sent in 33 logbooks of which 8 were classed 'Excellent'.

We wish him health and happiness in his retirement.

J. C. M.

RETIREMENT.—CAPTAIN L. H. EDMEADS retired last summer after 47 years at sea.

Leslie Henry Edmeads was born at Gravesend in 1905 and signed indentures with Ellerman's Hall Line of Liverpool in 1921, his first ship being their *City of Tokyo.*

He passed for 2nd Mate in December 1925 and was appointed 4th Officer of the *City of Lahore.* He remained with the company until July 1933 when he was 2nd Officer of the *City of Sydney* and then joined the Shaw Savill & Albion Co. as 4th Officer of their *Tamaroa* in January 1934.

He passed for Master in December 1931 and Extra Master in the following year and was appointed to his first command, the *Tropic*, in June 1950. Captain Edmeads served the greater part of World War II as 2nd and Chief Officer of the troopship *Arawa*, a period which he describes as producing no adventures of note.

Our association with Captain Edmeads goes back to 1932 when he sent us his first meteorological logbook from the *City of Sydney*. Since then in 19 years he sent us 60 meteorological logbooks and received Excellent Awards in 1957, 1958, 1959, 1960, 1961, 1962 and 1964.

We wish him health and happiness in his retirement.

L. B. P.

RETIREMENT.—CAPTAIN C. S. S. HOLBROOK, M.B.E., Commodore Master of the Bank Line, has retired after 50 years' service at sea.

Charles Stanley Swinnerton Holbrook was born in 1901 of seafaring stock. His father was Master in sail, both his grandfathers had been in the Royal Navy and he can trace his seafaring ancestors back to 1770.

In May 1918 he signed indentures with Messrs. Andrew Weir & Co. and was appointed to their *War African*, an oiler supporting the Royal Navy in the Mediterranean and, after the Turkish surrender, in the Bosphorus. In 1919 he made a Baltic voyage in her with fuel for the small craft engaged in the Kronstadt raid.

He passed for 2nd Mate in 1922 and was appointed 3rd Officer of Andrew Weir's *Mineric*.

Passing for Master in 1926, he remained with the Company and was appointed to his first command, the *Inveravon*, in 1929.

Captain Holbrook describes his service during World War II as comparatively uneventful though, in command successively of the *Lossiebank* and *Irisbank*, he was engaged in trooping to the Middle East and later in the evacuation of the Australian 6th Division from Crete. Following the return of the Allies to Europe in June 1944, he served a year as Superintendent for the Ministry of War Transport in France.

Returning to the Bank Line, Captain Holbrook was early on the scene as a post-war voluntary marine observer, in command of the *Nairnbank*. He was appointed M.B.E. in 1958.

Captain Holbrook's association with the Meteorological Office goes back to 1937 when he commanded the *Myrtlebank*; in 10 years of observing he sent us 30 meteorological logbooks and received Excellent Awards in 1949 and 1953.

We wish him health and happiness in his retirement to Bristol.

L. B. P.

Notice to Mariners

SEA-WAVE CHARTS BY RADIO FACSIMILE

On 1st October 1968 the transmission by radio facsimile of sea-wave charts for the North Atlantic Ocean was commenced by the Meteorological Office, Bracknell. The area covered by these charts is from 30° to 65°N and from 10° to 70°W.

The charts show wave-height isopleths in metres drawn at 1-metre intervals (starting at 2 metres), with arrows showing the direction of movement, and are prepared by the forecaster on duty in the Ship-Routeing Section from data produced by electronic computer. The forecaster modifies this data subjectively, using his own experience and in the light of latest ship reports, surface synoptic analyses and surface forecast charts.

Six wave charts are transmitted daily and these consist of analyses for midnight and midday GMT and two sets of 24- and 48-hour forecasts related to the two analyses. The midnight analysis is broadcast at 0837 GMT, followed by the 24- and 48-hour forecasts at 1250 and 1301 GMT respectively. The midday analysis is broadcast at 2037 GMT, followed by the 24- and 48-hour forecasts at 2350 and 0001 GMT respectively. All these wave charts are transmitted from GFA on frequencies 3,289·5, 4,610, 8,040, 11,086·5 and 14,582·5 kc/s.

Surface synoptic analyses and forecast charts have been transmitted from GFA on the above frequencies for some time now (analyses for 0000, 0600, 1200 and 1800 GMT at 0332, 0932, 1532 and 2132 GMT, respectively; 24-hour forecasts for 0000, 0600, 1200 and 1800 GMT at 0433, 1033, 1633 and 2233 GMT respectively). The addition of sea-wave charts to the facsimile programme is designed to comply with WMO commitments, although these have been in use by the Ship-Routeing Section for several months.

Fleet Lists

Corrections to the list published in the July 1968 number of *The Marine Observer*

Information regarding these corrections is required by 20th October each year. Information for the July lists is required by 20th April each year.

GREAT BRITAIN (Information dated 14.10.68)

The following coasting vessels ('Marid' ships) have been recruited:

Name of Vessel	Captain	Owner/Manager
Kinnaird Head	A. E. Alun	Henry & MacGregor Ltd.
Plover	L. A. Buntyn	General S.N. Co. Ltd.
Sydenham	H. G. N. D'Evelin	South Eastern Gas Board

The following vessels have been deleted:

Irish Coast, Kelvin, Lord Tedder, Mountstewart, Netherland Coast, St. Leger, Tay, Whitby Abbey.

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

Skipper	Radio Operator	Trawler Owner/Manager
W. Bilton	H. Scott	Ross Trawlers Ltd.
V. Buschini	R. Green	Hewitt Steam Trawling Co. Ltd.
G. Cheevers	C. Bird	Boyd Line Ltd.
J. W. Dunne	E. W. Christy	J. Marr & Sons Ltd.
R. Ford	H. G. Pask	T. Hamling & Co. Ltd.
J. N. Kerr	R. H. Wilson	Ross Trawlers Ltd.
E. March	A. J. Nettleship	Hellyer Bros. Ltd.
T. Nelson	J. S. Hallam	Newington Steam Fishing Co. Ltd.
C. Newton	G. Swallow	Boston Deep Sea Fisheries, Ltd.
C. W. Oneill	G. A. Osborne	T. Hamling & Co. Ltd.
F. Penistone	P. R. Hickson	Northern Trawlers Ltd.
E. M. Ward	D. Redshaw	Hellyer Bros. Ltd.
F. Wilson	E. W. Christy	J. Marr & Sons Ltd.

GREAT BRITAIN (*contd.*)

The following ships have been recruited as Selected Ships:

Name of Vessel	Date of Recruitment	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Alice Bowater	4.4.68	I. W. Bennett	C. D. Hindley, J. Buttress, N. Coombs	R. Davies	Cayzer Irvine & Co. Ltd.
Anadara	14.5.68	H. Morrison	G. Henderson, J. Minshall, P. D. Keyte	P. J. Monaghan	Shell Tankers (U.K.) Ltd.
Auckland Star	5.6.68	M. R. Bremberg	J. D. McGill, A. Goodman, J. Leask		Blue Star Line Ltd.
Benavon	31.7.68	D. Wright	M. Rayson, T. C. McKenzie, R. Arkles, A. K. Dewar	P. Mannion	Ben Line Steamers Ltd.
Camelot	20.5.68	W. Darnbrough	J. Guthrie, A. Niblock, J. Fullbrook	T. Firby	British India S.N. Co. Ltd.
City of Bedford	17.7.68	A. G. Hine	C. W. Harvey, B. K. Keith	D. English	Ellerman Lines Ltd.
City of Ottawa	19.6.68	M. W. Hartley	T. Grimes, M. J. Swan, G. D. Sumpton	J. McGill	Ellerman Lines Ltd.
Clan Alpine	18.7.68	N. Stewart		D. A. P. Galbraith	Clan Line Steamers Ltd.
Clan Malcolm	7.8.68	R. M. Bessant	O. T. Ross, J. Pearce		Clan Line Steamers Ltd.
Clan Matheson	29.5.68	J. G. Smith	R. A. G. Simmons, R. Cringle, J. Fairclough	G. McGarigle	Clan Line Steamers Ltd.
Corella	30.9.68	W. Craig	C. Snowling		Ministry of Agriculture & Fisheries
Demodocus	15.7.68	W. J. S. Eynon	G. J. J. Mansfield, J. G. Stewart, H. S. M. Roodenburg	R. A. Browne	Ocean Fleets Ltd.
Elizabeth Bowater	3.10.68	A. G. Allson	G. H. Watt, J. Buttress	R. Caine	Cayzer Irvine & Co. Ltd.
Finnamore Meadow	17.7.68	—. McCullock	B. Vart, N. Allwood, G. Cowling	G. Wyley	Mavroleon Bros. Ltd.
Fremantle Star	29.2.68	T. D. Brewster	J. Lock, R. N. Landall, H. Fell	L. K. Livie	Blue Star Line Ltd.
Glenfinlas	28.5.68	G. W. Povey	P. Lloyd-Jones, M. J. Boddington, D. Laing	R. Binding	Glen Line Ltd.
Icenic	19.9.68	G. V. Conolly, D.S.C.	A. Webber, C. Phelan, C. Sharp		Shaw Savill & Albion Co. Ltd.
King George	1.8.68	A. A. Graham	D. Lewis, A. Oxley		Cayzer Irvine & Co. Ltd.
Nardana	18.9.68	J. D. Stephenson	M. B. Harvey, R. G. Dance, R. O'Callaghan	J. W. Field	British India S.N. Co. Ltd.
Nina Bowater	8.5.68	G. B. Thomson	J. Cotton, P. Bagley, C. E. Walford	V. Bracegirdle	Cayzer Irvine & Co. Ltd.
Patonga	18.7.68	M. H. Haggas	R. Coldham, A. Tinsley, G. T. Dickins	R. Ridley	P. & O. Lines Management Ltd.
Peleus	27.5.68	F. N. Curphey	M. J. Thurman, J. A. S. Case, R. Mack	W. S. Young	Ocean Fleets Ltd.
Pembrokeshire	28.6.68	R. B. Tiplady	L. Saverimutto, G. Wood, B. Pollock, A. Palmer	N. Kinley	Glen Line Ltd.
Port Caroline	7.10.68	R. Holmes	G. Lascelles, O. Parry, W. Corbett	W. Hughes	Blue Star Port Lines Ltd.
Port Chalmers	13.4.68	J. G. A. Dunn	F. P. L. Onslow-Free, B. R. Stephenson, P. Coombs	S. A. White	Blue Star Port Lines Ltd.
Ribblehead	28.6.68	J. Parsloe	C. R. H. Ingham, J. W. Lovell, H. Thomas	R. I. McIntosh	Bolton S.S. Co. Ltd.
Rowanmore	27.9.68	A. M. Cameron	M. Brown, R. J. Blackburn, D. Milburn		Furness Ship Management Ltd.
Sheaf Crest	28.5.68	J. Walker	J. W. Smith, K. G. Geest, D. Sandercock	P. J. Tomlinson	W. A. Souter Co. Ltd.
Silversea	25.7.68	J. G. Tew	J. H. Bates, D. McCormack, H. P. Prior	K. J. Curran	Silver Line Ltd.
Strathbrora	20.9.68	J. A. Clifford	C. J. C. Johnston, D. A. Rodger, M. Hall-Thompson	J. Rice	P. & O. Lines Management Ltd.
Sugar Producer	24.4.68	J. R. L. Atkinson	E. McEwen, D. Thompson, K. Morris	J. L. Johns	Sugar Line Ltd.
Surat	7.5.68	L. C. Kingswood, R.D.	J. M. G. Temple, N. R. Messenger, R. G. Young	D. E. Hicks	P. & O. Lines Management Ltd.
Tamworth	4.10.68	A. Hurst	D. M. Burn, G. Bowman, J. Williams	R. Cruse	R. S. Dalgliesh Ltd.
Taupo	23.5.68	B. Austen-Smith	P. R. Simpson, G. Walker, D. Watt	A. Titley	New Zealand Shipping Co. Ltd.
Victore	1.4.68	P. B. Hall	K. P. Parkin, P. K. Whitny-Smith, B. M. Stear	B. Carney	Mavroleon Bros. Ltd.
Westminster Bridge	14.3.68	E. Pierce	J. R. Freestone, A. W. Hughes, R. A. MacManus	R. Holinshead	Britain S.S. Co. Ltd.

The following Selected and Supplementary ships have been deleted:

Baron Maclay, Benvannoch, Brecon Beacon, California Star, Canara, Caxton, Cheshire, Esso Exeter, Gloucester City, Inverewe, Manchester Spinner, Matina, Mobil Endeavour, Port Macquarie, Rangitane, Regent Royal, Romanic, Ross Leonis, Ross Orion, Ruahine, Ruysdael, St. Giles, Sicilia, Suffolk, Sylvania, Tourmaline, Truro.

GREAT BRITAIN (*contd.*)

The following Supplementary Ships have been recruited:

Name of Vessel	Date of Recruitment	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Dunadd	23.7.68	D. McDonald	R. N. Morgan, B. W. Jordan, D. M. Marshall	T. B. Dobson	J. & J. Denholm Ltd.
Ian Fleming	30.8.68	D. Cawood	E. D'Constantine	E. D'Constantine	Newington Steam Trawling Co. Ltd.
Jamaica	2.4.68	W. Gowen	A. Scrivens, P. Marriot		East Coast Fish Sales Ltd.
Joseph Conrad	20.8.68	R. Taylor	B. E. K. Robinson	B. E. K. Robinson	Newington Steam Trawling Co. Ltd.
Maretta	9.8.68	S. Christy	J. Hind	J. Hind	J. Marr & Sons, Ltd.
Oulton Queen	3.4.68	L. A. Woodruff	J. Chason, R. Smith		Talisman Trawlers Ltd.
St. Jerome	9.9.68	M. F. Hough	K. C. Stone	K. C. Stone	Thos. Hamling & Co. Ltd.

BRITISH COMMONWEALTH

HONG KONG (Information dated 10.9.68)

The following ships have been recruited:

Name of Vessel	Captain	Observing Officers	Senior Radio Officer	Owner
Tai Poo Sek	W. M. Pearson	Cheng Shu Ming, Wong Kwok Hung, Yip Moon Tong	Chan Gan Cheun	Shun Cheong S.N. Co. Ltd.
Tong Jit	W. C. Towell	K. G. James, Abu Bakar Bin Awang, Khoo Gark	Mui Siew Loon	Kie Hock Shipping Co. Ltd.

The following ships have been deleted: *Chungking*, *Dana*, *Hunan*, and *Hang Sang*.

INDIA (Information dated 1.9.68)

The following ships have been recruited as Supplementary Ships:

Vishva Kaushal (Shipping Corporation of India Ltd.)
Vishva Vijay (Shipping Corporation of India Ltd.)

The following ships have been deleted:

Bande Nawaz, Bharatratna, Garib Nawaz, Jag Mitra, Jalamayur, Jalamudra, Vishva Shanti.

SINGAPORE (Information dated 3.10.68)

Name of Vessel	Captain	Observing Officers	Senior Radio Officer	Owner
Bidor	J. Wroughton	Nemat bin Awal, W. J. Nair	Mohd. bin Shariff	Sharikat Perkapalan Kris Tanah Melayu Ltd.
Cable Enterprise	G. H. C. Reynolds, O.B.E.	J. H. Killick, J. G. Patterson, G. R. Plummer	A. Dalton	Cable and Wireless Ltd.
Golden Spring	R. E. Morley	Max. Darling, Gary Tan Soo Peng	Fong Pai Kiat	Guan Guan Shipping Ltd.
Golden Wonder	T. A. Sheppard	G. Carmichael, D. E. D. Blazey, Goh Siow Yong	Edwin Tan	Guan Guan Shipping Ltd.
Kah Poh	Budin bin Ahmad	Wan Ahmad bin Dollah	Nik Ismail bin Nik Sar	Ho Chiang Shipping Co. Ltd.
Katong	G. C. Carter	W. L. G. Frith	Tan Choon Huat	Straits S.S. Co. Ltd.
Keningau	R. C. Barker	R. E. Dyson, Yeoh See Peng, Jaffar bin Amat	P. V. Abraham, How Lock Kwan	Straits S.S. Co. Ltd.
Kimanis	E. H. Robinson	C. J. Brazier	Tan Yee Seng, Ng Tuan Hock	Straits S.S. Co. Ltd.
Kim Hock	J. H. Davies	C. F. Theseira, Ng Kiat Keong, Wee Ah Sai	Chan Kian Beng	Guan Guan Shipping Ltd.
Kinabalu	R. E. Davies	M. F. James	Lee Yeun Fatt	Straits S.S. Co. Ltd.
King Bay	J. L. Wyles	Lim Theng Toon, Jamaludin Amin, Theodomis Tedja Sendjaja	Wong Lay Kuan	Hong Kong South Sea Shipping Co. Ltd.
Kota Naga	Abdul Latiff bin Omar	Said Mohamed	Hew Yoong Sang	Pacific International Lines Ltd.
Kunak	E. E. Fenwick	I. D. Campbell, Azin bin Madon, Abdul Rahman bin Hassan	K. A. Menon, E. De Souza	Straits S.S. Co. Ltd.
Perak	A. Lockwood	Amzah bin Abu	V. Krishnan	Sharikat Perkapalan Kris Tanah Melayu Ltd.
Perlis	P. Ho Kia Tuang	Omar bin Mohd.	Said bin Osman	Sharikat Perkapalan Kris Tanah Melayu Ltd.

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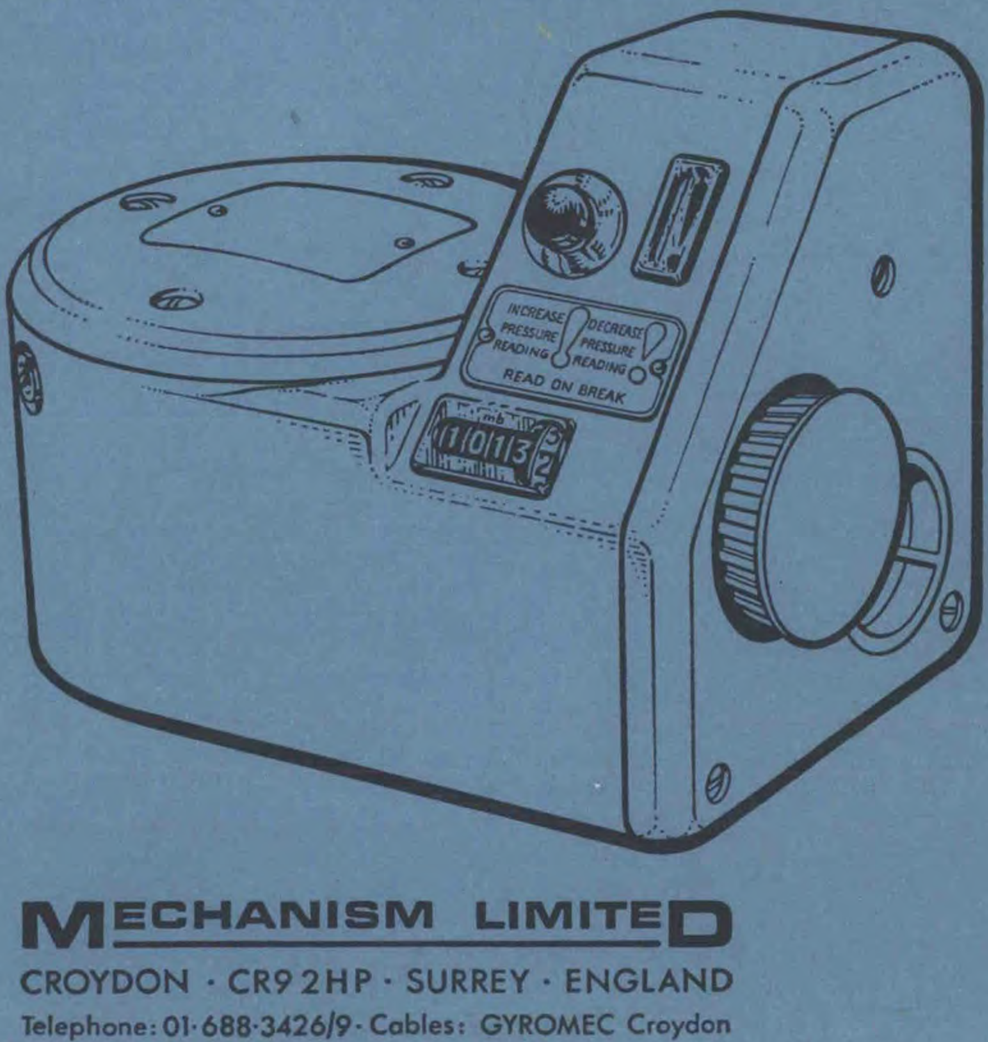

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