Met.O. 777

The Marine Observer

A quarterly journal of Maritime Meteorology

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April 1966

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THE MARINE OBSERVER

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

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Editorial

It does not seem very long ago that the writer, anxious to prove the words on the bright new certificate in his cabin that he was now "duly qualified to fulfil the duties of second mate of a foreign going steamship", leaped to the standard compass on sighting a lighthouse with the idea of 'doubling the angle on the bow', and, on explaining this to the officer under whom he was keeping watch, a 'shellback' of the old school who had demanded to know what he thought he was doing, was told to "wait until it's on the four points, that's what you want". At this, the young officer felt a little hurt and must have shown it but he still remembers his kindly mentor's closing remark, "Do what you like now, but always get it on the four points as well".

Indeed, in many ships even forty years ago, around the land, the four point bearing, and at sea, the morning sun run up to the meridan altitude, seem to have been the be all and end all of navigation. Ships were slower then, times of arrival were not so critical and, because cargo plans could seldom race a ship to her destination, it was uneconomic to order stevedore gangs before she was actually alongside and the plans had been scrutinized. One wonders what those old timers would think of to-day's radar and electronic aids, with the doppler and inertial navigation systems, though at present a somewhat expensive pipe dream, possibly just around the corner and of cargo plans going ahead by air mail or even transmitted by facsimile. One likes to think that there is some corner of the Elysian fields, within sight and sound of the sea, where they meet and yarn about the four L's—Lead, Log, Latitude and Lookout—as they knew them. And when a newcomer arrives, perhaps they will ask him "Is it still the four point bearing and the sun on the meridian at noon?" One hopes that such a newcomer will not be too impatient at hearing of how things were done in their day, because these were the methods which assisted at the birth of a great maritime nation.

As the science of navigation and 'the business of a seaman' have enlarged their scope, so have the syllabuses of the Board of Trade examinations covered a wider field and become more exacting. To-day's officer, whilst he may have lost many of the attributes of his predecessors, has, at the same time, become skilled in crafts undreamed of yesterday and tomorrow's ships may be operated by men familiar with apparatus and sciences undreamed of even today. The institution, later this year, of degree courses in nautical sciences by certain universities, though not connected with the Board of Trade Certificates of Competency, is perhaps a pointer to the future status and qualifications of a shipmaster.

This is the Age of the Computer and for meteorology, not less than for a dozen other sciences and projects, this undoubtedly means progress for, unlike the human brain, the computer is able to digest and use a virtually unlimited amount of data and to solve many problems in a fraction of the time taken by man. The Meteorological Office has been producing numerical forecasts for sometime past, though at present these are regarded simply as another forecasting tool; the computer, too, enables the meteorologist to dissect weather patterns of past years and to compare them with those of the present day, thus facilitating the production of long range weather forecasts. The day may not be far distant when a meteorological observation from a land station in a fixed position may be fed, as made, into a machine and appear almost instantaneously plotted in its correct position on a weather map. Later it may even be possible for a moving ship's radio weather message to be transmitted and appear as a plotted observation on the forecaster's working chart at Bracknell without any human interception. Thus will the time lag between the reception of the observation and the broadcasting of a weather bulletin be immeasurably reduced and any ship equipped with facsimile will be able to receive a complete weather chart within minutes even of the recording of the observations around which it is built.

But the computer is not human. It has no experience and can make no decisions and it can work only on the data on which it is fed. It follows then that it will demand that greater attention be paid to the accuracy and completeness of its diet. Moreover, it can only work to rule and, in order that those rules may be made inflexible, it may demand certain extra items of diet to aid its digestion; one sees the possibility for instance of a position check group being introduced into the radio weather message or perhaps some rearrangement of the order in which the groups are transmitted may be necessary.

But in all this change, or progress, whichever we may choose to call it, one thing is virtually certain; the sea, which has not changed for thousands of years, will not change now. Max Pemberton, through the mouth of his piratical Captain Black, said "Study her a thousand years and she's not a day older. Say that you have mastered her and she'll beat the life out of you, because she owns no master. Aye, the sea's the glory of the world and there's none like her. If you kneel before the Unseen Powers, lift your hands first to the sea." Conrad called the sea "The restless mirror of the Infinite . . . like a beautiful and unscrupulous woman . . . glorious in its smiles, irresistible in its anger, capricious, enticing, illogical, irresponsible, a thing to love, a thing to fear. It cast a spell, it gave joy, it lulled gently into boundless faith, then with quick and causeless anger it killed". No seaman will deny that that is the Sea, now and always. No computer will ever change the moods or habits of the sea but a properly fed computer may help us to come to terms with it.

Lead, Log, Latitude and Lookout all doubtless served a long apprenticeship before they became known collectively as the four L's of our early training, just as the computer will have to serve a long apprenticeship before it becomes part of our daily lives. And the greatest of these is the last: Lookout. For the menacing cloud, for the sudden shift of wind, for the falling pressure, for the decrease in visibility, for the iceberg and every phenomenon connected with the sea or its neighbour, the atmosphere, the prudent seaman will always keep a sharp lookout.

L. B. P.

April, May, June

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

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

TYPHOON CARLA

Western Pacific Ocean

s.s. *Esso York*. Captain R. R. Phillips. Kobe to Bahrain. Observers, the Master, Mr. W. H. Moore, Chief Officer, Mr. S. T. Waite, 2nd Officer and Mr. E. Hodge, Radio Officer.

Ist June 1965.

1630 GMT: Wind SE'S, force 5, beginning to veer and increase. Bar. 1008·0 mb and falling rapidly. Visibility 3 miles.

1730: Wind SW, force 12, and continuing to veer. Lowest bar. reading 992·5 mb. Visibility 1 cable due to driving spray.

1800: Wind NW'N, force 6. Pressure 1000·0 mb and rising. Visibility 10 miles.

1930: Wind NW, force 3. Pressure 1006·0 mb and rising more slowly. Visibility 10 miles.

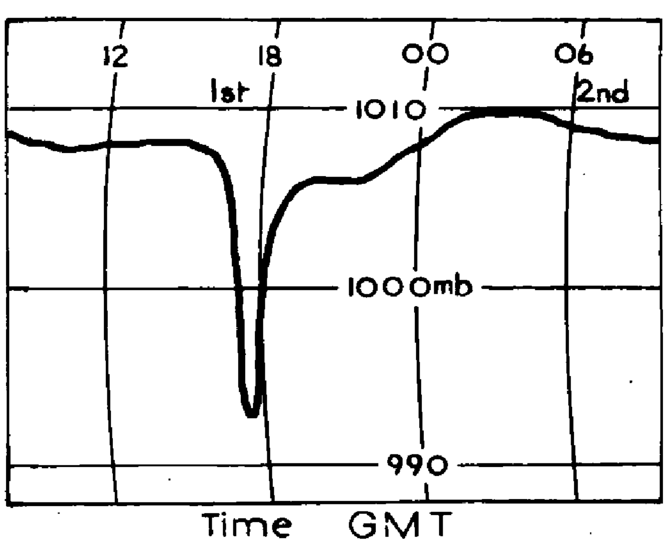
8/8 cloud throughout the period.

Course 224°. The rapid fall and rise of pressure during the afternoon may be seen from the accompanying barograph trace.

Position of ship at 1630: 21° 40'N, 123° 24'E.

Note. The Director of the Royal Observatory Hong Kong, to whom this observation was forwarded, comments:

"A study of the synoptic situation on 1st June 1965 reveals that the *Esso York* must have passed very close to the centre of tropical storm 'Carla' just shortly before 1730 GMT. At this time the storm was moving north-eastwards at about 18 kt towards the Loochoos, its circulation was rather small and winds 70 miles from the centre were only about 15 kt. However, maximum winds near the centre observed by USAF reconnaissance aircraft were 50 kt at 0945 GMT on 1st June and 65 kt at 0350 GMT the next day. The observation taken by the *Esso York* at 1730 GMT indicates that Carla must have intensified to a typhoon by this time. This example shows the extreme importance of ship observations in tropical cyclones, particularly in storms of very small dimensions such as Carla. There is always some uncertainty estimating the intensity of a storm unless there is an observation in the vicinity of its centre."



EXTENSIVE SQUALL

off Sierra Leone

m.v. *Cardiff City*. Captain I. Williams. Dakar to Luanda. Observers, Mr. D. C. Griffith-Jones, Chief Officer and Mr. T. Lawson, 2nd Officer.

7th May 1965. At 0405 GMT when Cape St. Ann's Light Vessel was abeam at a distance of 25 miles, a squall was picked up on the radar which was on maximum range of 48 miles. The squall was this distance away when first picked up. As it approached, the radar picture had the appearance as if the pulses were hitting a coastline with steep-to cliffs and mountains extending backwards for at least 10 miles. At 0600 the squall was 10 miles away and covered all the PPI ahead of the vessel, the radar being at the time on the 25 mile range. Both pressure and temperature now began to rise and conditions became 'clammy': there was no wind and the sea was flat calm. A massive build-up of cloud was seen visually to be taking place and at 0630 the squall was coming very near. The wind backed from SE'S to E, increasing quickly and moderate rain began to fall. Five minutes later the squall hit the vessel, and the wind increased to force 9 with torrential rain. Visibility decreased to nil. The PPI, now on the 10 mile range, was completely covered by the squall. By 0700 the wind was decreasing, though the rain still continued. The squall passed by 0730 and the wind became E'ly, force 4: the sea was very rough and choppy. The PPI showed the same picture on the 48 mile range as the squall moved away, as it did when the squall approached. After the passage of the squall the barograph became steady.

Position of ship at 0600: 7° 12'N, 13° 42'W

Note. It is highly probable that the phenomena reported by m.v. *Cardiff City* had been associated with the Intertropical Convergence Zone. In this area, the convergence often produces a broad belt of thick convection cloud reaching to great heights, giving rise to numerous thunderstorms and heavy rain.

WATERSPOUT

Indian Ocean

m.v. *Achilles.* Captain R. G. Boyd. Aden to Port Swettenham. Observer, Mr. B. Sawyers, Extra 3rd Officer.

22nd March 1965. At 1200 GMT a waterspout in its early stage of development was seen towards the SE at a distance of half a mile. It was moving towards the ship, and was indicated by an area of rough confused sea about 100 yd across, under a large Cb cloud. Although the base of the cloud was ragged there was no funnel yet associated with it.

At the moment when the disturbance passed over the vessel the wind rose to force 6, from the SE, for about 15 sec, and the observer was subjected to considerable buffeting. Spray was lifted on to the foredeck and various members of the crew reported that curtains were instantaneously sucked out of the open port-holes, together with loose pieces of paper etc.

After the passing of the disturbance, a fully developed column was seen to form between the sea and the cloud base, but by this time it was about 3 or 4 miles away from the ship. At 1200: Air temp. 82·3°F, wet bulb 78·0°, sea 84°.

Position of ship: 5° 54'N, 90° 48'E.

Note. It is most unusual for a vessel actually to encounter a waterspout, even an incipient one, and this account of what happened is therefore particularly interesting.

LIGHTNING

Malacca Straits

s.s. *Caltex Edinburgh.* Captain J. W. Cook. Bahrain to Manila.

14th May 1965. At 2040 GMT, a single jagged flash of lightning was seen coming from a well developed Cb cloud with anvil, several miles to the southwards. Instead of following the normal cloud-to-earth direction, this flash appeared to begin in a horizontal direction, curving to earth a considerable distance to the east and well clear of the cloud itself. Although there was another similar cloud over Sumatra the sky to the east was devoid of any type of cloud. Air temp. 82·5°F, wet bulb 78·7°, sea 84·3°.

Position of ship: 3° 05'N, 100° 38'E.

SEVERE HAIL STORM

at Marseilles

s.s. *Clan Mactavish*. Captain W. C. Rodger. Observers, the ship's company.

7th June 1965. At 0500 GMT when arriving off Marseilles the vessel was forced to reduce speed in a very heavy thunderstorm. This continued until we secured alongside at 0720 when the rain changed to hailstones measuring up to $\frac{3}{4}$ in across. Although the majority of the stones were about $\frac{3}{8}$ in diameter and almost perfect spheres of solid ice, the larger stones were almost square and appeared to consist of a mass of smaller stones about $\frac{1}{8}$ in diameter. The stones were dropping at a terrific speed and bouncing up to 6 ft off the deck forcing everyone to take shelter and doing damage to canvas boat covers. The hail fell for 20 min leaving a 2 in layer on the deck and it did not melt completely, in spite of the resumption of the rain, until 0930. Air temp. 60°F, wet bulb 57°, sea 62°. Wind NE, force 4.

Note. The thunderstorm and hail were associated with the passage of a cold front across the high ground in the neighbourhood of Marseilles. The forced ascent of the air had given rise to a build-up of massive Cb clouds, in which the growth of the hailstone depends upon (*a*) the liquid water content of the air, (*b*) its upward velocity and (*c*) the heat exchanges between the hailstones, the air and the supercooled water. Hailstones of many shapes, sizes and differences in structure have been seen; the more spectacular forms being found in regions of great atmospheric instability where hailstones of 4–5 in diameter and weighing about 2 lb are on record.

LARGE WET BULB DEPRESSION

Suez Canal

m.v. *Glenorchy*. Captain H. S. Taylor. Suez to Aden.

23rd April 1965. During the Suez Canal transit the depression of the wet bulb at 1700 GMT was 22°F, the dry bulb reading being 84°. The vessel was moored at the time in the western branch of the Canal. Wind, S'ly, force 4.

Note. Although the depression of 22°F is a large one, it was exceeded in the Suez Canal at noon on 3rd June 1961, when s.s. *Oxfordshire* reported an air temp. of 101·5°F and a wet bulb reading of 70·5°—a depression of 31°F.

FOG

West coast of N. America

m.v. *Welsh City*. Captain D. Beynon. Victoria (B.C.) to San Francisco. Observers, the Master and all officers.

30th June–2nd July 1965. When the vessel sailed from Victoria the visibility was good, but as we went down the Strait of Juan de Fuca low cloud could be seen falling down the sides of the hills and soon we were proceeding through dense fog. The Master, in the light of past experience, took the vessel over to the port-hand side of the Strait and there, about 1,000 yd off the shore the weather was clear and remained so until we reached the open sea when dense fog was again encountered. The vessel was hauled away from the coast to a distance of 50 miles for the first 12 hours, but there was no improvement. Afterwards however the fog cleared and there were only occasional patches.

When we came to the coast again in the vicinity of the San Francisco pilots there was very dense fog once more with almost zero visibility. The fog stayed with us all the way to Stockton, some 85 miles up river, and then dispersed. Average air temp. was 54°F, sea 52°.

SANDSTORM

Gulf of Sidra

s.s. *Esso Warwickshire*. Captain A. C. Alexander. Fawley to El Brega.

3rd May 1965.

1230 GMT: Sandstorm encountered. Visibility reduced to less than ¼ mile. Wind NE'ly, force 3.

1630 GMT: Sandstorm continuing. Visibility now ½ mile. Wind force 4, backing then veering to W's.

1700 GMT: Wind NW'ly, force 5. Visibility improving.

1730 GMT: Visibility now ¾ mile. Horizon hazy. Some C_L4 cloud present. Wind NW, force 5.

1930 GMT: Wind now NW'ly, force 3. Visibility 10 miles. Barometer rising slowly and steadily.

During the storm the air temp. rose to 85°F. It fell to 68° as the storm cleared.

Position of ship at 1230: 31°N, 19°E.

Note. The synoptic charts issued by the United Arab Republic show that at 1200 GMT a depression was centred about 120 miles north of Benghazi. The associated warm front extended from the centre to near Matruh and the cold front lay in a sw'ly direction towards the western part of the Gulf of Sidra. In the warm sector of the depression strong winds, from a general southerly direction, were blowing sand off the desert and carrying it round in the cyclonic wind circulation of the depression. When the cold front passed the vessel the wind veered to about NW with a consequent marked improvement in visibility. The temperature of the air at Benina was 93°F before the passage of the cold front. At Sirte, at noon, in the cold air behind the front, the temperature was down to 65°.

at Khorramshahr

m.v. *Farsistan*. Captain R. Connacher. Observers, Mr. C. E. J. Simmons, 2nd Officer and Mr. B. E. Peck, 3rd Officer.

19th April 1965. The day began with a light sw'ly breeze and clear sky, but at approx. 0800 the wind freshened from the SW and the sky became dark along the horizon. At 0820 the dark section quickly increased and black curving streaks were swept ahead of it along the direction of the wind, which increased to force 6–7. The air became thick with driving sand, so thick indeed that it was difficult to see car headlights on the jetty. Rain then began to fall heavily, at first with large isolated drops and soon developing into a steady downpour which dispersed the sand. After about 15 min the wind decreased and the rain stopped. Later, the sky cleared and by evening the wind had veered and fallen to a light N'ly breeze. The barograph showed a rise of 3·9 mb in about 20 min.

Position of ship: alongside Santab jetty.

Note. Reference to the weather charts issued by the United Arab Republic shows that at 1200 GMT a depression was centred at about Lat 32½°N, Long 49°E. A cold front, lying SSW from the centre, passed eastwards across the head of the Persian Gulf around noon causing the wind to veer from SW to about NW and effecting a clearance.

CURRENT RIPS

East African Waters

m.v. *Clan Macleod*. Captain T. H. Graham. Aden to Mombasa. Observer, Mr. R. A. Bryans, 3rd Officer.

27th April 1965. Shortly before 0800 SMT the vessel entered an area in which there were parallel bands of disturbed sea running in a N–S direction. Although the wind was only S'E, force 2, the sea state resembled that produced by a wind of force 5–6.

The bands were continuous and about $1\frac{1}{2}$ miles wide, the distance between them varying from $\frac{1}{2}$ mile to 2 miles. The sea between the bands was only slightly disturbed. Sea temp. 82°F. Depth of water, 480 fm.

Position of ship: 2° 42′S, 41° 12′E to 3° 05′S, 40° 38′E.

Note. The current rips encountered by m.v. *Clan Macleod* were due to the interaction taking place between the NW going Equatorial Current and the NE going East African Coast current. From May to July the latter current on a substantial number of occasions exceeds a rate of 3 knots.

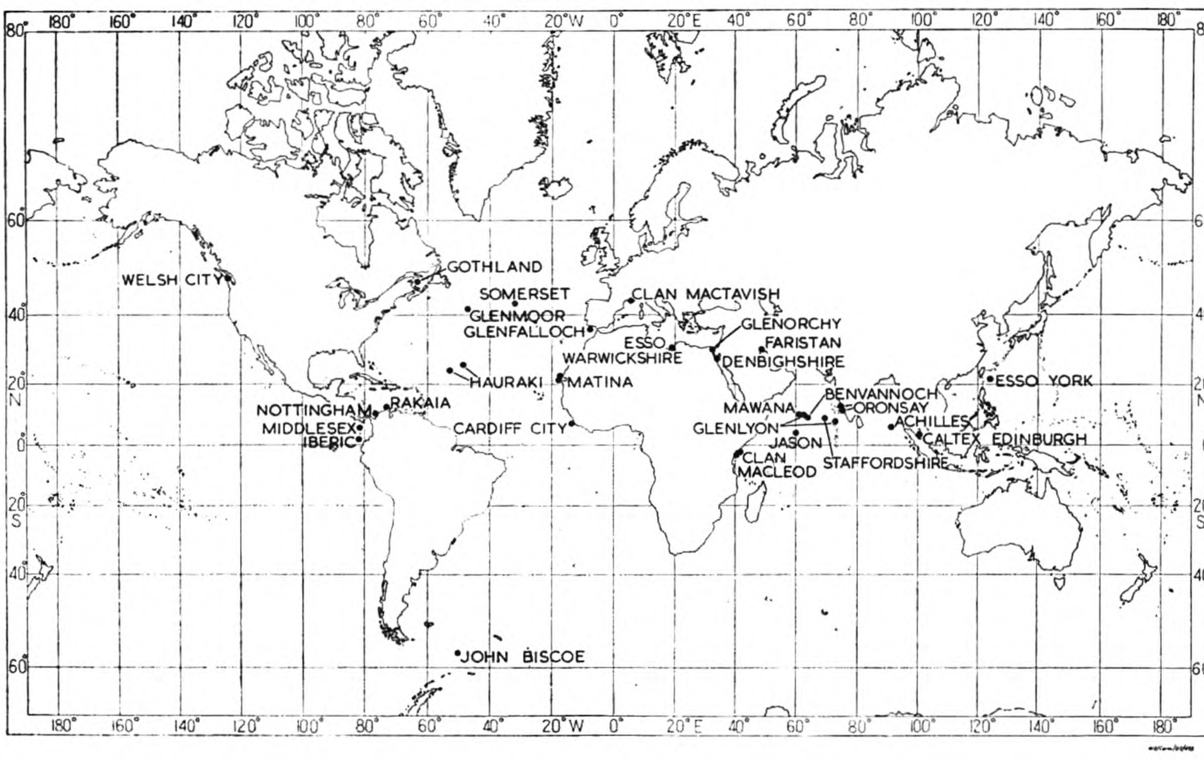
Gulf of Panama

m.v. *Middlesex*. Captain R. E. Baker. Dunedin to Panama. Observer, Mr. P. J. Zealley, 3rd Officer.

14th May 1965. The vessel encountered a strong current rip at 0500 GMT, which caused the ship to sheer off 10° to port of the course which was 051°. The surface of the sea, which had been almost calm, suddenly assumed the appearance that a northerly wind of force 4 would have produced. This state lasted for 5 min after which the sea became calm again and the steering conditions normal. Sea temp. 84°F: at 0000 it was 83°.

Position of ship: 6° 00′N, 81° 34′W.

Note. m.v. *Middlesex* was in a region where interaction takes place between the N going branch of the Peru current which brings water into the eastern part of the Gulf of Panama, and the outgoing water from the western part of the Gulf. This latter current flows at first in a predominantly SW'ly direction, but north of the equator it merges later on with the W going branch of the Peru current. From June to November the outflow from the Gulf of Panama does not extend southwards of about Lat 6°N.



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

LINE OF DEMARCATION

off coast of Colombia

m.v. *Iberic*. Captain J. Gunning. Port Chalmers to Panama. Observers, the Master and Mr. C. Sharp, 2nd Officer.

29th May 1965. An area of considerable turbulence was observed at 1715 GMT, lying in a W'N–E'S direction. The surface of the sea was whipped up to waves approx. 2 ft high, with a lot of white foam and seaweed, in spite of the fact that the wind was only force 2 from SSE. The width of the turbulent area was about half a mile and it extended from horizon to horizon. On passing through the disturbed water the ship's head was sharply diverted 5° to starboard and only by holding on 10° of port helm was the required course of 043° maintained. Speed 18·3 kt. Air temp. 81°F, sea 80°.

Position of ship: 1° 55'N, 81° 52'W.

Note. Dr. L. H. N. Cooper of the Marine Biological Association of the U.K. at Plymouth comments:

"At first sight this looks to be the same phenomenon as that seen by the *Cotopaxi* described in the January 1966 number of *The Marine Observer* but it may not be. The position is north of the Equator in late spring. More probably what was seen was the convergence of the Humboldt or Peru coastal current with the equatorial counter-current which often occurs thereabouts. The waters of the two currents probably had different densities, so that one had to sink beneath the other. This is the opposite of upwelling and brings about no surface enrichment with nutrients.

'Old' surface water which has supported the growth of many plants and animals may retain excretory products beneficial to later organisms. Indeed some are completely dependent on such 'endocrines' but can make do with very limited supplies of inorganic nutrients like phosphate. When two such waters mix there may be a small flowering of unicellular organisms like flagellates which may start a food chain along the turbulent line of convergents. From this a few birds may benefit. A powerful convergence may therefore seem to simulate weak upwelling.

Only a full systematic study can give an assured answer in a situation like this."

Caribbean Sea

m.v. *Rakaia*. Captain F. S. Angus, R.D. Curaçao to Colon. Observer, Mr. N. Drummond, 3rd Officer.

10th April 1965. At 1530 GMT the vessel passed through a line of broken water running NNW–SSE. The ship's course was WSW and on crossing the line the quartermaster reported a paying off to port although the vessel was carrying starboard helm at the time. The sea on the western side of the line was a greener colour than on the eastern side. At 1200 the sea temp. was 75·2°F, but after crossing the line of broken water the sea temp. rose to 82·3°F. The echo sounder was operated but no echo was obtained.

Position of ship: 12° 06'N, 73° 03'W.

Note. In this region the W going South Equatorial current flowing into the Caribbean, meets the Caribbean Counter Current flowing NE'wards along the coast of Colombia. The rate of flow of the South Equatorial Current is considerably greater than that of the Caribbean Counter Current.

CHANGES OF SEA TEMPERATURE

North Atlantic Ocean

m.v. *Glenmoor*. Captain F. Lamb. New Orleans to Manchester. Observer, Mr. G. W. Richardson, 3rd Officer.

9th May 1965. The sea temperature reading, taken by rubber bucket, was found to be 45°F at 0000 GMT. At 1200 and 1800 the previous day it had been 58°. Readings taken later on the 9th at 0600 and 1200, gave values of 58° again. There is no doubt about the accuracy of the reading of 45°, as it was checked twice.

Position of ship: 41° 06′N, 47° 30′W.

Note. The vessel was traversing an area in which there is normally a very rapid falling-off of sea tempetature with increasing distance northwards. Reference to our large scale chart of actual sea surface temperature means for the period 1st–10th May 1965 shows that a tongue of cold water had extended southwards across the track of the vessel at Long 46°–47°W.

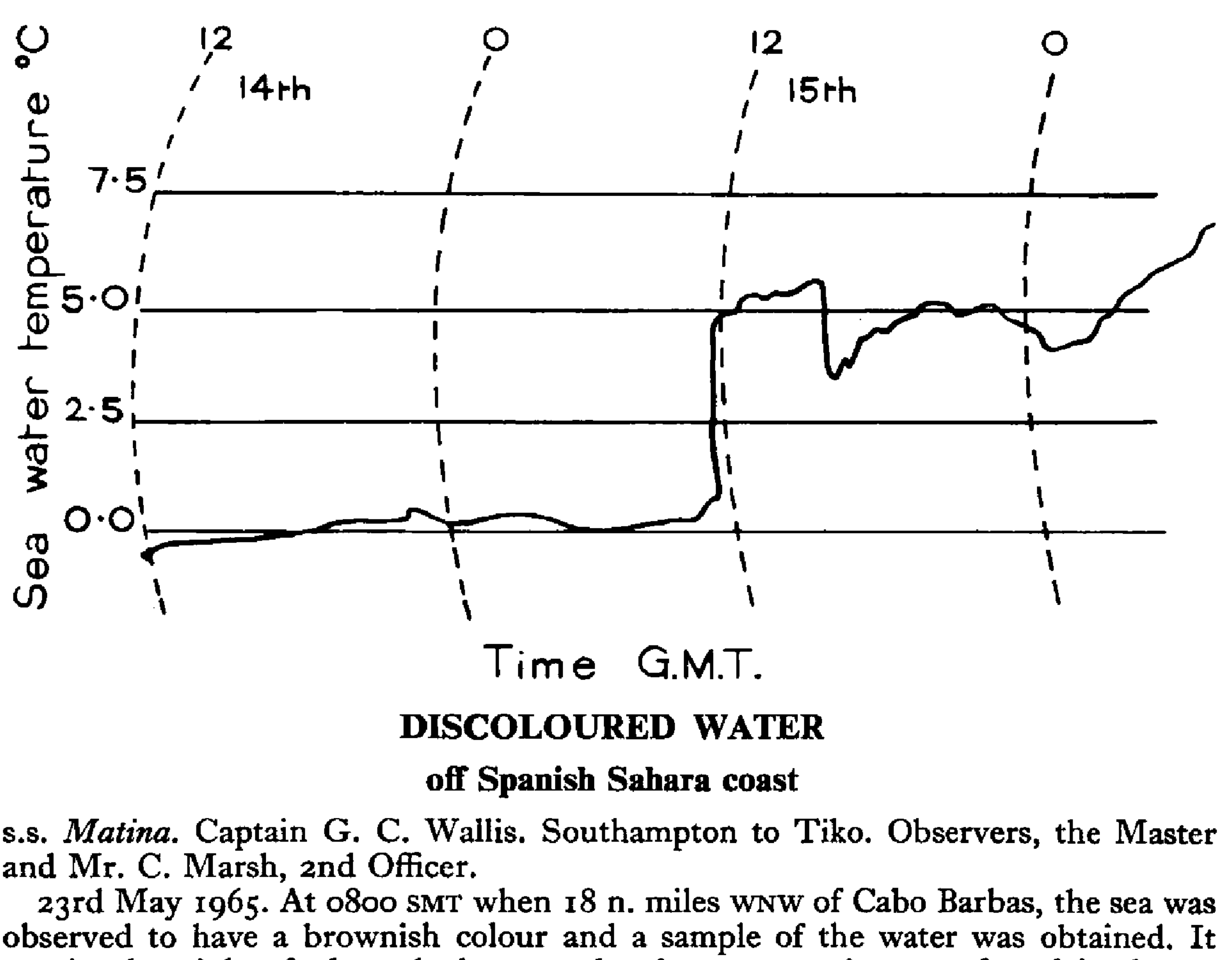
ANTARCTIC CONVERGENCE

Scotia Sea

R.R.S. *John Biscoe.* Captain T. Woodfield. Signy Island, S. Orkneys to Port Stanley, Falkland Islands. Observer, Mr. A. B. D. Joubert, 3rd Officer.

15th April 1965. At 1200 GMT the vessel began to cross the Antarctic Convergence, the very definite sea temperature change which occurred being clearly shown by the reproduction of the trace of the distant-reading thermograph.

Position of ship: 56° 53′S, 51° 34′W.



DISCOLOURED WATER

off Spanish Sahara coast

S.S. *Matina.* Captain G. C. Wallis. Southampton to Tiko. Observers, the Master and Mr. C. Marsh, 2nd Officer.

23rd May 1965. At 0800 SMT when 18 n. miles WNW of Cabo Barbas, the sea was observed to have a brownish colour and a sample of the water was obtained. It consisted mainly of phytoplankton, and only one organism was found in the 50 gallons filtered. Sea temp. 67°F. Wind NNE, force 5.

Position of ship: 22° 30′N, 17° 00′ W.

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

"The diatoms sketched aboard the *Matina* from a sample of a rich mixed bloom off C. Barbas appear to be *Ditylum Brightwellii Grunow ex Hewick.* It is not possible to be quite certain of the species without seeing the specimens, but there can be no doubt of the Genus.

D. Brightwellii is a cosmopolitan coastal plankton diatom of warm and warm-temperate seas frequent in our western approaches, especially in late summer and autumn and earlier as one proceeds towards the tropics."

off coast of Kerala

s.s. *Oronsay*. Captain S. Ayles, R.D. Singapore to Bombay.

2nd May 1965, 0415 GMT. The ship passed through an area of discoloured water, in the form of a brown scum on the sea surface. It lay in definite streaks along the direction of the wind and covered an area roughly 2 miles long and about 400 yd wide. No unusual soundings or changes in sea temperature, which was 85°F, were observed.

Position of ship: 11° 26′N, 75° 18′E.

2nd May, 0600—0800.

The discoloration previously seen, occurred again. Also adjacent to the discoloured patches were many shoals of fish jumping out of the water, and these were so numerous in places that the sea was white. The shoals were seen for two hours and then they disappeared, as did the discoloured water at the same time. Other sea life was seen, such as dolphins jumping and a whale blowing and submerging. No change in sea temperature was found. Depth of water 21 fm.

Position of ship: 12° 10′N, 74° 58′E.

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

"Phytoplankton blooms of all the main types are known to occur at times in this area. *Trichodesmium* is just possibly the most probable in view of the surface concentration of the brown scum. The observation that dense shoals of fish were adjacent to, but apparently not in, the discoloured areas may be significant. It often seems that plankton feeders congregate on the fringes of concentrations which of themselves are too dense to provide healthy feeding conditions, but it is very difficult to obtain clear proof of this."

MIGRATION OF STORKS

Gulf of Suez

m.v. *Denbighshire*. Captain C. R. B. Goodman, M.B.E. Suez to Singapore. Observer, Mr. P. A. Brown, 3rd Officer.

15th April 1965. At 0800 GMT observed overhead was a flock of crane-like birds in three main groups, extending over about 10 miles and numbering all told about 5,000. They were white on the underside, with black flight feathers. The groups were heading in an 020° direction. The wind was NW, force 5, at the time.

Position of ship: 28° 00′N, 33° 32′E.

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

"Of the many reports on birds occurring in the meteorological logbooks of merchant ships, this one particularly caught my eye. For here indeed is an opportunity for observers in ships passing through the Mediterranean and Gulf of Suez to witness a never-to-be-forgotten sight between certain very limited dates—the migration of the White Stork, *Ciconia ciconia*.

The migration was known well before Mr. P. A. Brown wrote this report. He will forgive me quoting from the Prophets of Old: 'Yea, the Stork in the heaven knoweth her appointed times and the time of her coming'—Jeremiah 8, VII. How right he was, for today great flocks of these birds cross the Gulf of Suez, usually in vast numbers over the northern half, to and from their wintering quarters far down the banks of the Nile.

During the first fortnight in April they will be moving northwards to their breeding quarters in eastern Europe and Asia and in the last days of August and first week in September they may be seen on the return journey. Further west in the Mediterranean their northward migration usually occurs earlier and in the vicinity of Gibraltar they often cross during the last days of February. Often they travel high in the sky, but in contrary winds may pass in long waving lines and groups close over a ship.

These great birds, whose white plumage is only broken by the contrasting black flight feathers, the bright red bill and long red legs, fly with their necks fully extended and are thus easily recognized.

Some travel from South Africa to nest from Spain northwards into Germany, Holland, Denmark, Scandinavia and further east.

They favour buildings and chimney pots on which they build untidy nests of sticks which are never disturbed by the inhabitants, for these birds are intimately connected in folk lore and fairy tales with happy memories of an increase in the population or in parts of North Africa, with the spirits of the departed.

I was glad to add another record in confirmation of the Prophets of Old".

Note 2. A previous report of a ship witnessing this migration was published in the January 1954 number of *The Marine Observer*.

SEALS

Spanish Sahara waters

s.s. *Matina*. Captain G. C. Wallis. Southampton to Tiko.

23rd May 1965. At 1215 GMT when one mile off the coast of Spanish Sahara, 24 miles north of Cape Blanco, a large dark grey-brown seal with a flat body was seen swimming on the surface, close to the ship. Although I have observed seals previously on three occasions in 1963–1964, in this area, I do not know of any seal colonies off the Desert.

Position of ship: 21° 10′N, 17° 04′W.

Note. Miss J. E. King of the Osteology Section at the Natural History Museum comments:

"The seals seen near Cape Blanco would be Monk Seals, *Monachus monachus*. These seals are natives of the Mediterranean and North African coasts and used to be more abundant in these areas when they were less disturbed by shipping. Now there are fewer animals in the Mediterranean although they are by no means unknown in the more remote places, but the larger colonies are present along the western coast of Africa down to Cape Blanco. The Monk Seal has been known since the days of the ancient Greeks, but there is still more to be found out about it and I would be most grateful for further records."

FISH

North Atlantic Ocean

m.v. *Hauraki*. Captain E. F. H. Allen. London to Curaçao. Observers, Mr. J. Thomson, Chief Officer and Mr. T. Wright, 2nd Officer.

13th June 1965. Between 20°N, 49½°W and 24°N, 53°W, many fish were seen in the surface water. They were about 1 ft long and had large square heads with the body tapering to the tail, the general appearance being rather like that of a very large tadpole, and having the same swimming motion. The colour was a mottled grey and no fins were seen. The eyes were on the flat of the head rather than at the sides. Sea temp. 77°F rising to 80°.

Note. This is a most unusual observation. Dr. P. H. Greenwood of the Department of Zoology, British Museum, comments:

"I have puzzled over this, my marine colleagues have also puzzled over it and none of us can come up with an answer. The only tadpole-like fishes which we know are of either fresh-water (and certainly never likely to occur in the sea except as corpses) or are deep-sea fishes and unlikely to be swimming at the surface in an apparently natural way. Thus, regrettably for the moment I am afraid we will have to record these as unidentifiable."

LUMINESCENT BEETLE

off Rio de Magdalena

m.v. *Nottingham*. Captain A. B. Stalker. Colon to Curaçao. Observers, Mr. W. Killackey, Junior 2nd Officer and Mr. D Williams, lookout.

4th June 1965. When the vessel was 9 miles abeam of the Rio de Magdalena entrance, the lookout on the foc'sle reported by phone that blue sparks were flashing on deck immediately forward of the forepeak booby hatch. On investigation no fault could be found in the electric wiring and no other reason could be found for the incident.

When the sparks were seen again, further examination showed that an insect not unlike a cockroach, though lighter in colour and smaller, was emitting the flashes. Wind NE'E, force 4–5. Air temp. 81°F.

Position of ship at 0000: 10° 30'N, 77° 06'W.

Note. Mr. J. P. Doncaster, Keeper of Entomology at the Natural History Museum, comments:

"The 'blue sparks' seen by the look-out were probably beetles of the Family *Lampyridae* (which includes the glow-worms), some South American species of which look not unlike small cockroaches and emit a bright green-blue light from the hind end of the body. Other reports of a similar kind received here suggest that these insects get blown out to sea quite often."

ABNORMAL REFRACTION

Gulf of Cadiz

m.v. *Glenfalloch*. Captain T. R. Walker. Port Said to Hamburg.

18th April 1965. Visibility was exceptionally good at 0200 GMT, Cape St. Vincent Light, range 22 miles, being seen at a distance of 52 miles. Radar echoes were affected by the atmospheric conditions and a band of interference with the appearance of sea clutter was observed on the PPI at a distance of 2 miles ahead of the ship. It had a depth of one mile and extended about 20° on either bow. Normal sea clutter was also present in the centre of the screen. Air temp. 64°F, wet bulb 60°, sea 59°.

Position of ship at 0000: 36° 24'N, 7° 12'W.

Note. Captain F. J. Wylie, Director of the Radio Advisory Service, comments:

"This report undoubtedly relates to conditions which supported tropospheric reflections. In this instance these were reflections of echoes of distant sea clutter which appeared in every respect similar to normal sea clutter. These echoes may be seen when the sea surface is perfectly calm in the locality of the observing vessel.

The Marine Observer of April 1964 and July 1964 (table on page 137) refer.

There have now been several reports of this phenomenon in the area Cape Verde, Cape St. Vincent and the Western Mediterranean."

St. Lawrence River

m.v. *Gothland*. Captain J. M. Laing. Seven Islands to Middlesbrough. Observers, Mr. C. E. J. Dowswell, 2nd Officer.

22nd May 1965. From 0400 to 0600 GMT, the conditions of visibility and radar reception were quite remarkable. Cape Magdalen light normally visible up to 18 miles was still showing clearly when 60 miles astern and many ships showed double inverted images of the navigation lights. The coast of Anticosti Island was seen on the radar with great clarity up to 40 miles and ships also presented reasonable targets at the same distance. At approx. 0535 the moon, rising on a bearing of 127° from behind a cloud bank on the horizon, was distorted to a shape resembling an inverted half-pear. Air temp. 44·6°F, wet bulb 41·6°, sea 40·5°. Wind W'S, force 2.

Position of ship: 48° 07'N, 63° 47'W.

Note. At the time when the abnormal refraction occurred, a ridge of high pressure lay over the Gulf of St. Lawrence. In this type of pressure system there is an increase of air temperature with height throughout the first few hundred feet or so, before the temperature starts to fall. When the air is warmer than the sea, as in the present case, the rays of light from a distant object are bent in such a way that they tend to follow the curvature of the earth, thus bringing into view objects which would otherwise be out of sight, below the horizon.

RED AND GREEN FLASH AT SUNRISE

North Atlantic Ocean

m.v. *Somerset*. Captain I. Y. Batley. Curaçao to Le Havre. Observer, Mr. M. Rowland-Hill, Junior 3rd Officer.

18th April 1965. At sunrise, the sky was almost completely covered with Ac., but a very narrow belt of clear sky was present above the eastern horizon. As the sun's upper limb appeared above the horizon, a very distinct green flash was seen, which remained visible until about ¼ of the diameter was showing.

When the sun had cleared the horizon it immediately disappeared behind the edge of the cloud sheet: a very marked red flash then appeared on the lower limb, as distinctive as the green flash which had preceded it. Air temp. 59°F, dew point 54°, sea 62°. Wind ESE, force 3. Visibility excellent.

Position of ship: 42° 40′N, 31° 50′W.

Note. The atmosphere is more dense at lower levels, so that rays of light on their way through the air are bent, this bending being somewhat slighter for red light than for the blue-green rays. This causes two sun's discs, partially covering one another, to be seen, the blue-green one being a little higher and the red one a little lower, thus accounting for the red rim on the sun's lower limb and the green rim on the upper limb.

LUMINESCENCE

Arabian Sea

m.v. *Benvannoch*. Captain W. J. Kinnaird. Penang to Aden. Observer, Mr. B. C. Smith, 2nd Officer and Chan Ping, Quartermaster.

4th April 1965. At 2100 GMT whilst using the Aldis lamp for signalling purposes, it was noticed that the sea surface, touched by the beam, was immediately lit by brilliant phosphorescence. On experimenting it was found that, by manipulating the beam, whole areas of the surface could be lit in this way. The vessel then passed out of the patch after 15 minutes and no more results were obtained. Sea temp. 84°F.

Position of ship: 9° 32′N, 62° 50′E.

s.s. *Mawana*. Captain J. P. Jackson. Aden to Calcutta. Observer, Mr. T. R. Scarrott, 3rd Officer.

5th April 1965. Between 1800 and 2100 GMT various forms of marine bioluminescence were observed as follows:

(*a*) Dense speckling of a flashing nature, bluish-white in colour. The density and brilliance increased greatly upon shining the Aldis lamp at the surface. By directing the Aldis beam around the ship it was possible to light up the water all around to a distance of about 100 yards. This water retained its luminescence for several minutes after the Aldis was switched off.

(*b*) Similar in colour to type (*a*) but larger patches (6–12 ft in diameter) and not as brilliant; also of a flashing nature. This type, of which very little was seen, seemed little affected by shining the Aldis lamp on to it.

(*c*) Upon shining the Aldis lamp at type (*a*), occasional tiny bright gold flashes were revealed but disappeared immediately the Aldis was taken away. This type was of exceptional brilliance.

Mean position of ship: 10°N, 61°E.

m.v. *Staffordshire*. Captain T. Cooper, D.S.C. Trincomalee to Aden. Observer, Mr. M. Kingsmill, Senior 3rd Officer.

23rd May 1965. Between 1930 and 1945 GMT, about twenty light patches of great intensity were observed from between a quarter of a mile and five miles from the ship. They started as a small patch of light and in about 15 sec spread to about 50 yd in width and length from the centre point. They gave out a terrific amount of light which lasted for one minute, then a cloudy glow for about two minutes. When the ship passed through a patch, about two minutes after the start of the phenomena, no increase of light or disturbance was caused and the Aldis had little or no effect. The patch seemed to be made up of hundreds of objects about 1 in in size.

The initial colour was a pure brilliant white and the whole disturbance seemed to be caused by something forcing a large quantity of water upwards. Sea temp. 86°F.

Position of ship: 8° 32′N, 68° 57′E.

m.v. *Glenlyon*. Captain W. K. Hole. Suez to Singapore. Observer, Mr. J. P. A. Clarke, 3rd Officer.

7th April 1965. Between 1900 and 2200 GMT extensive phosphorescence was observed whilst passing through this area. It appeared mainly in the bow wave and in the wash, though wave tops did show occasional signs of it. The areas of illumination would quickly spread out from the bow wave for a distance of up to 600 ft and would take about 6 sec to fade out after reaching their maximum brilliance. The Aldis would not increase areas already lit but would, when shone at random, cause illumination in areas not already lit, taking about 5–6 sec to fade out. The Aldis could activate the sea surface up to 1,000 ft approximately from the ship. In all areas, scattered pinpoints of sharper light were observed. Spray landing on deck gave off a deep-blue glow from scattered pinpoints. Sea temp. 80°F.

Position of ship: 10°N, 62° 30′E.

Penang to Aden.

3rd June 1965. Between 1800 and 1900 GMT extensive phosphorescence was observed for an hour. It appeared to be caused by the accommodation lights shining on the wash and it was also seen in the form of underwater eruptions. These exploded all round the ship up to 800 ft away and were clear of any apparent disturbance caused by the ship. They first appeared as small whitish glowing patches not more than a foot across, which rapidly increased in size and intensity, taking about 5 sec to reach maximum brilliance and a further 6–8 sec to fade out. Even a one-second flash from the Aldis lamp on these areas tended to increase the activity, but the same time was taken for it to fade out, leaving a greenish white glow. The Aldis lamp directed on to the other areas activated the phosphorescence in the same way as on the 7th April when outward bound, causing similar scattered pinpoints of light to be seen. Sea temp. 83°F.

Position of ship: 8°N, 73°E.

s.s. *Jason*. Captain H. S. Clarke. Aden to Fremantle.

22nd June 1965. Between 1900 and 1930 GMT, small specks of bioluminescence were observed near the ship where the accommodation lighting fell on the water. Shining the Aldis lamp on the sea caused the specks to expand and intensify rapidly, so that the area covered by the beam became a vivid electric blue, the phosphorescence persisting for up to 30 sec in some places. The intense phosphorescence was confined only to where the beam of light actually touched the surface of the sea, though the reaction to the light appeared to extend to a depth estimated at 6–10 ft rather than being confined to the surface. In the turbulence of the ship's wake large balls of light up to 18 in diameter which persisted for 1–2 sec were observed but the Aldis light had no effect upon their size or intensity. Switching on the radar had no effect other than that of waking the Master.

Position of ship: 4° 43′N, 59° 58′E.

Note. Dr. R. H. Kay, of the University Laboratory of Physiology at Oxford, to whom all observations of luminescence contained in ships' meteorological logbooks are forwarded, has chosen the above observations, all from the Arabian Sea, for publication in this number because they are concerned with the effect of external light on luminescence.

AURORA

The following notes have been received from Mrs. Mary Hallissey, of the Aurora Survey: "Listed very briefly below are reports of aurora seen during April–June 1965; also one for March which came too late to be included in the January 1966 journal. The reports have been extracted from ships' log books at the Meteorological Office, Bracknell, or taken from original reports forwarded from the Ocean Weather Ship Base at Greenock.

"The observations in m.v. *Silversand*, m.v. *Rosemary Everard* and m.v. *Crystal Crown* (the two latter being welcome new names to the list) occurred during periods of greater solar activity in what were otherwise quiet months. Observations made in the Weather Ships in the higher latitudes were hampered by cloud and, later, by lack of darkness.

"At the time of publication of this edition of the *Marine Observer*, we shall again be appoaching the season for observing noctilucent clouds, i.e. mid-June to mid-August in the northern hemisphere latitudes around 50°–60°. Then the sun, at 6°–16° below the horizon, illuminates these tenuous clouds at a height of around 82 km. Many of our land based voluntary observers are unable to watch for these clouds night after night, and we should be most grateful to any on duty at night who might keep a look-out for their appearance.

"We thank again all who send us (at the Balfour Stewart Auroral Laboratory, Edinburgh) written records or sketches of your observations, and hope for your continued assistance."

Date (1965)	Ship	Geographic Position	Λ	Φ	I	Time	Forms
22nd Mar.	*Rosemary Everard*	58°19'N 05°43'W	080	62	+72	2140–2300	HA, RR, N
7th Apr.	*Weather Surveyor*	59°20'N 18°24'W	070	65	+72	0001, 0300	N
19th	*Weather Surveyor*	59°20'N 19°00'W	070	65	+72	0001	N
22nd	*Weather Surveyor*	58°50'N 18°35'W	070	65	+72	0001–0200	N
23rd	*Weather Surveyor*	58°55'N 18°40'W	070	65	+72	2330–0245	HB, RR, N
25th	*Weather Surveyor*	58°55'N 19°10'W	070	65	+72	0200–0400 2300–0100	N
26th	*Weather Adviser*	61°53'N 32°53'W	060	70	+76	0100, 0300	HB
27th	*Weather Surveyor*	58°40'N 18°20'W	070	65	+72	0001–1300	N
28th	*Weather Surveyor*	59°00'N 19°00'W	070	65	+72	0200–0300	N
30th	*Weather Adviser*	62°05'N 33°09'W	060	70	+76	0100	N
5th May	*Silversand*	49°15'N 64°08'W	010	61	+75	0300–0530	HA, RA, RB, RR
7th	*Weather Adviser*	62°03'N 32°58'W	060	70	+76	0150, 0250	N
17th Jun.	*Crystal Crown*	47°30'N 89°10'W	340	58	+77	0745–0805	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.

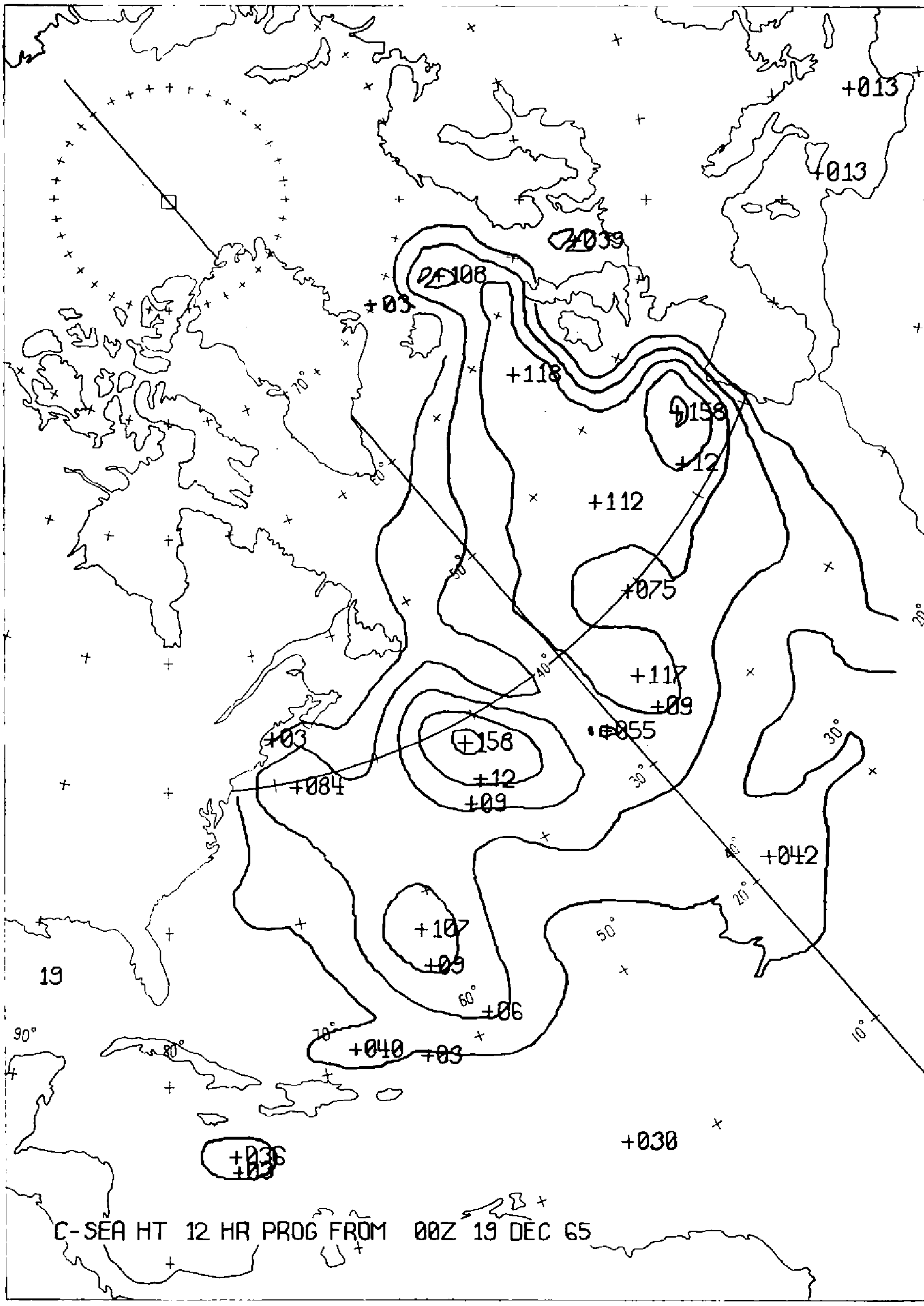
551.509.25: 551.466.33: 621.397.12

Development and Characteristics of Sea Wave Charts on the NSS Facsimile Broadcast

By CDR F. R. SIMS, Jr. USNR
(U.S. Fleet Weather Central)

The U.S. Fleet Weather Central, Suitland, Maryland (FWC, Suitland) has a mission to provide oceanographic forecasts to the U.S. Armed Services within an area of responsibility which includes the North Atlantic Ocean. The earliest oceanographic products published were sea condition charts which went on the air on 1st April 1956.

These first charts were produced manually using basic principles established by H.O. 603[1], the Pierson-Neumann-James 'spectrum' method. After ship reports had been plotted, an analyst drew lines of equal wave heights. This analysis was then superposed on the synoptic surface weather map pattern so that the forecaster



Map 1. Shows the 12 hour forecast for 1200 z/19 December as received in the computer room of FWC, Suitland.

could associate centres of high waves with wind generation or fetch areas in the surface wind field. The forecaster then compared the surface weather map with the prognostic map to see how these fetch areas moved and changed. High wave areas were moved and modified to coincide with the wind generation areas of the surface weather map. New wave areas were introduced for new fetches that formed or for high wind areas that moved to sea from over land. Prognostic contours of wave heights were then drawn using principles of continuity to fill in the blank areas.

Wave charts were produced in basically the same manner for the next several years. During this period the meteorological profession was beginning to feel the birth tremors of the computer evolution. The Navy entered this new field by establishing the Fleet Numerical Weather Facility (FNWF) in Monterey, California, in 1961.

FNWF was already publishing a vast array of meteorological products by means of high speed data link by the time that the first numerical wave charts were transmitted to FWC, Suitland, on 1st November 1962. In the beginning only an adventurous forecaster would look at the FNWF charts and modify his forecast as a result. As time went by, however, the machine charts revealed fewer and fewer spurious anomalies and the contours became more realistic and probable.

By the spring of 1964 it was clear that the FNWF product was approaching an accuracy which made the duplicate production of wave charts by manual means a very inefficient process. On 10th June 1964 the forecasters began using the machine charts as base maps for their analyses and prognoses. Locally prepared charts were no longer analysed and hand drawn modifications to the contours on the machine charts were made only where the wave heights were clearly incorrect or unreasonable.

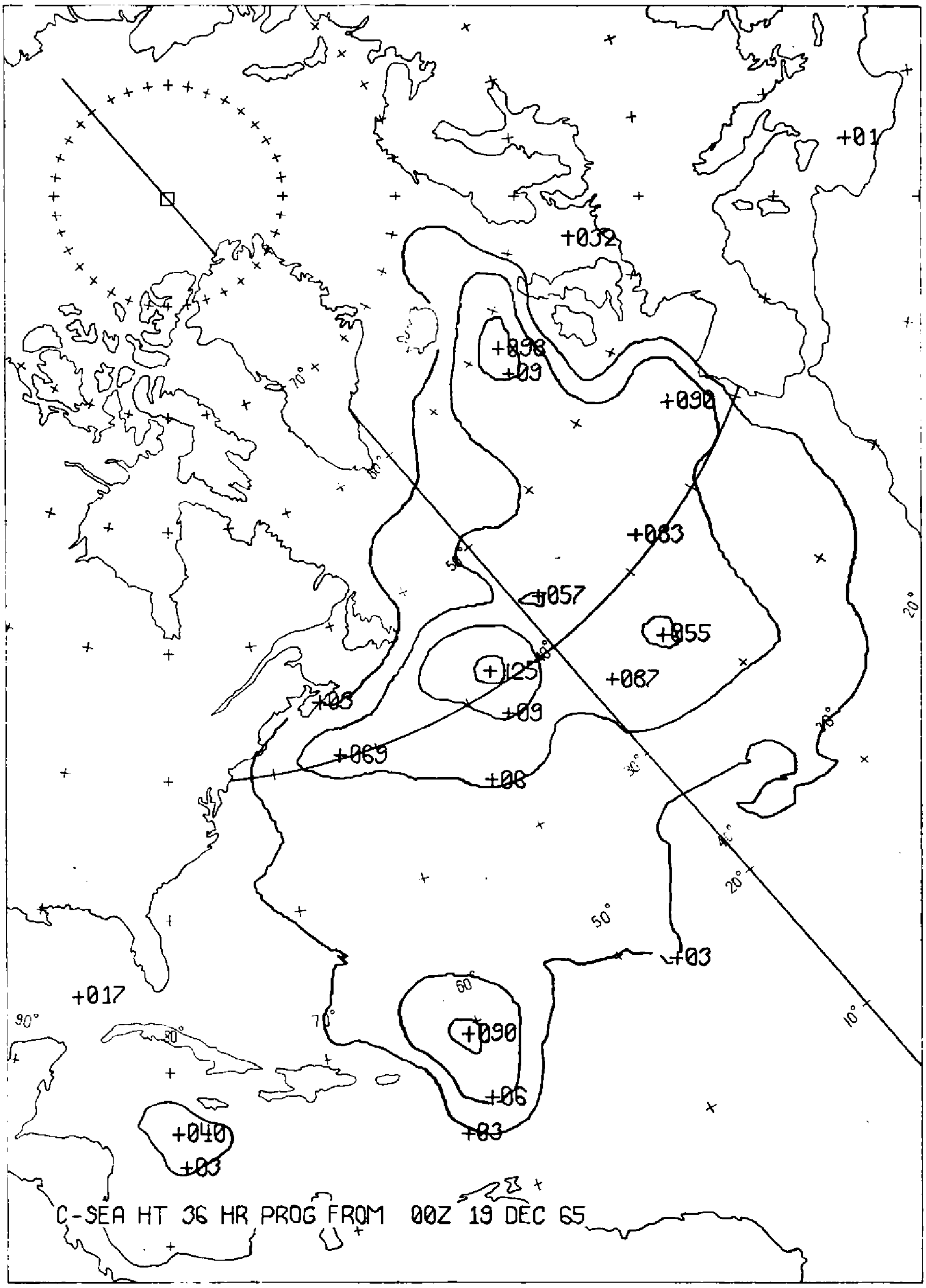
It was stated earlier that manually produced wave charts were derived by use of the spectrum method. This is a modern method of using statistics to obtain information on the behaviour of a wide spectrum of waves developed in a fetch based on the introduction of a finite quantity of energy from the wind. This is a method which offers much promise, but it has not yet been adapted to numerical processes. Computers use the older 'singular' method based on the Sverdrup-Munk forecasting system described in H.O. 601[2]. In this method an empirical relationship is used to calculate wave heights from specific parameters such as wind speed, wind direction, and fetch length.

FNWF uses two separate computer programmes written specially for this task; one for the production of wind wave analyses and one for the production of swell wave analyses. Wind waves are considered to be those waves located in the area of generation. Swell waves are considered to be those waves which have travelled for at least 24 hours after leaving the area of generation. After the separate programmes are completed by the computer, the wind wave heights and the swell wave heights are brought together to make a combined sea wave height chart.

The wind wave analysis programme commences with a gridded field of wind speeds and directions covering the ocean area under consideration. The next step is to determine the duration, or length of time, the wind has been blowing from the same direction at each grid point. The significant wave height is then computed using a singular relationship determined empirically at FNWF which incorporates the synoptic reports received from ships at sea. The last step is a correction for fetch limitation for areas near land. The analysed wave heights are smoothed slightly and contours are drawn.

The programme for the prognostic wave height charts is the same as for wave height analyses except that the data field is prepared from forecast surface maps rather than analyses and ship reports do not exist, of course.

The swell wave analysis programme starts with a field of wind wave heights and directions obtained from the wind wave height computer programme. The wave trains are moved outward from their sources, spread out moderately along and



Map 2. Shows the 36 hour forecast for 1200 z/20 December as received in the computer room of FWC, Suitland.

across the track, and decayed in accordance with their travel distance. Wave trains are discarded if they encounter land or ice. If wave trains cross, only the highest is retained. Upon completion of these steps, the swell heights are computed for each grid point and contours are drawn. Again, the prognostic swell programme is similar to the swell analysis programme except that the field used to start the process is composed of forecast wave heights rather than existing wave heights.

Wind wave heights and swell wave heights are joined to produce a combined sea wave chart by means of two rules. If the wind waves and swell waves are within 30° in direction, the combined height is the square root of the sum of the squares of the separate heights. If the two waves are not within 30° in direction, only the highest of the two is retained. This combined sea wave chart is the product transmitted on the NSS Facsimile Broadcast from Washington. A complete description of the FNWF programmes is contained in Captain W. E. Hubert's pamphlet, *Operational Forecasts of Sea and Swell*[3]. Examples of 12 hour and 36 hour prognostic combined sea height charts as they are received in FWC, Suitland, are shown in Maps 1 and 2. (*See* pages 65 and 67.)

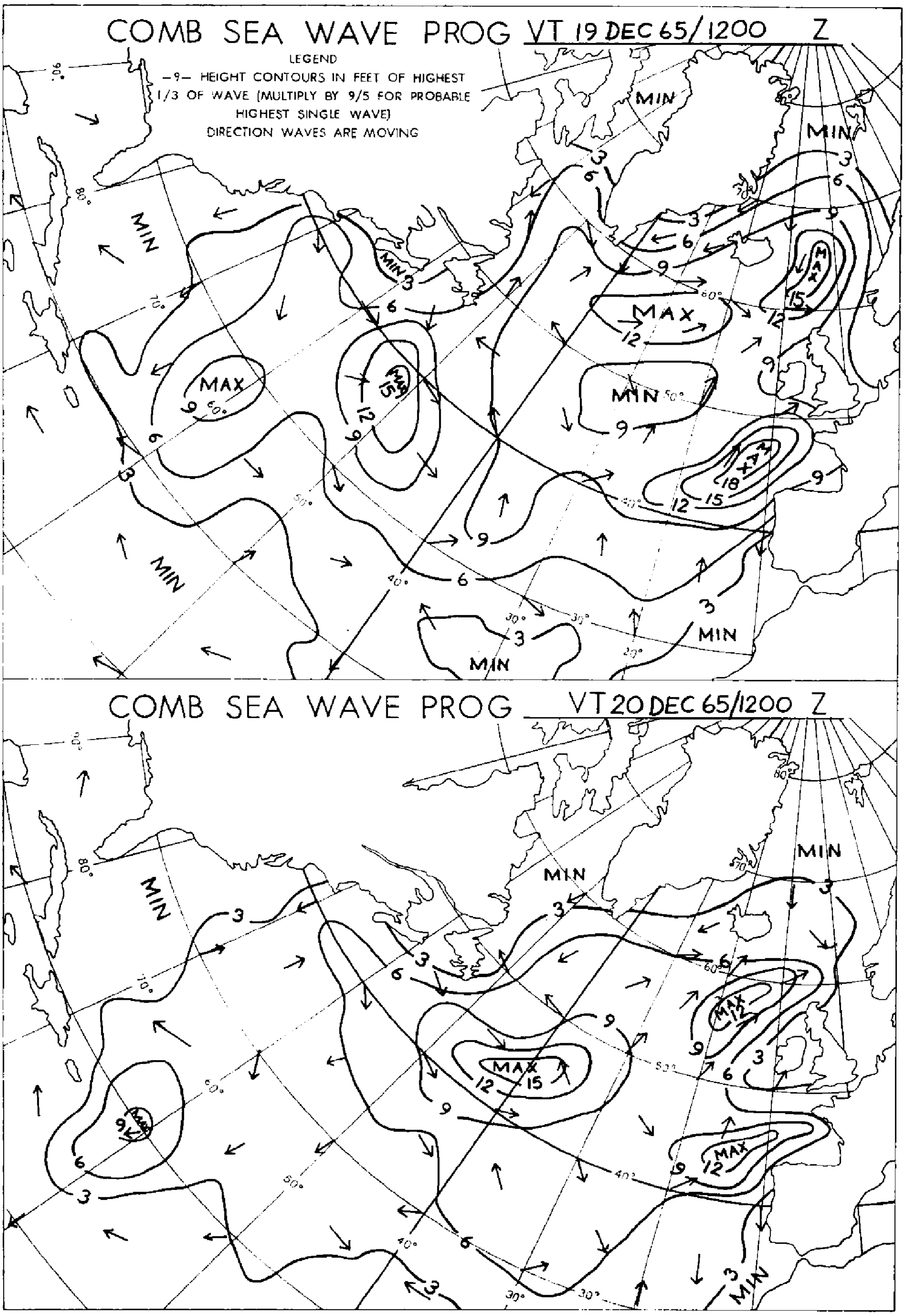
There are certain idiosyncrasies of any numerical product from a computer which introduce unusual effects in the wave charts. The maps are composed of isolines of one variable only. Analyses do not show station reports. This means that the raw wave height charts show isoheights with no information as to direction or periods.

The same contouring programme is used in the computer to produce wave isoheights as is used for ordinary numerical weather maps. This standardizes the labelling of contours at two digits and the labelling of centres at three digits; this leads to the over-refined reporting of wave height centres to the tenth of a foot. The common contouring programme also allows the centres to be labelled 'high' or 'low' or '+' or '−.' Since the 'high/low' labels are inappropriate for wave heights, the '+'s' are used with the '−'s' suppressed. (All these details are illustrated in Maps 1 and 2.)

The contouring programme further draws isolines at intervals specified by the 'scaling' of the variable in question. If the field does not span the interval or spans only a few intervals there will be no or few contours but the centres will, nevertheless, be printed out. Thus, a summer wave chart may have very few contours, but still have several centres.

While the verifications of the FNWF wave charts are improving continuously, at the time of writing there remain some deficiencies in the FNWF empirical relationships which should be recognized. The basic grid used for analysis work is too coarse for the detection of small vortices. Since a tropical storm normally packs its great energy into a very small geographic area, its effects may not be reflected in the wave height programme until it has reached sizeable hurricane proportions. Wave height values tend to be inaccurate in tropical areas where low values of the latitude factor cause a breakdown in the geostrophic wind equation. Computers tend to peak up height maxima in excess of normal expectations and flatten out the patterns too much near the coastlines.

After the raw 12 hour and 36 hour prognostic charts have been sent from FNWF to FWC, Suitland, the Suitland forecaster examines them and indicates any modifications made necessary by the above-mentioned deficiencies. He then gives them to a meteorological assistant who traces them on to a base facsimile chart which combines the two charts on one sheet of paper. The '+'s' and centre values are deleted and the centres are marked as 'max' and 'min.' The contours are labelled in whole numbers at three foot intervals and arrows are plotted at five degree latitude and longitude intervals to indicate the direction in which the waves are moving. Upon completion of this editing process, the chart is taken to 'Communications' for transmission. Map 3 (*see* page 69) is an example of an edited chart which is ready for broadcast.



Map 3. Shows the 12 hour forecast on top and the 36 hour forecast on the bottom after editing. This map was broadcast at 0848 z/19 December.

Compare the contours of Map 1 with the contours on the top chart in Map 3. Notice that the forecaster has increased the isoheights in the 'max' centres in the Norwegian Sea and off the Iberian Peninsula. He has done this on the basis of analysed ship reports which showed greater wave heights than had been computed and to reduce the flattening effect that the closeness to the European Coast had introduced.

Meteorological or oceanographic analyses must be based on a situation that has already occurred and cannot be delivered to the customer until long after the event has happened. Prognostications, on the other hand, can be delivered prior to the fact. Since the 12 hour prognostic chart can be put into the hands of the consumer by verification time, it and the 36 hour prognostic chart have been chosen for transmission on the NSS Facsimile Broadcast. These charts are put on the air twice daily at a regular time as specified by the broadcast schedule. Schedule changes are held to a minimum. When they do occur they are published in H.O. 118[4] (by printed change and by *Notice to Mariners*) and on the broadcast itself. A full broadcast schedule is transmitted on the facsimile circuit every Monday at 1400Z.

The NSS Facsimile Broadcast from Washington is emitted simultaneously on six carrier frequencies: 3357, 4975, 8080, 10865, 16410, and 20015 kc/s. The circuit is multiplexed with the NSS Radioteletype Weather Broadcast on the same frequency. There is a 2 kc separation between the two modulations. Total output is limited to 25 kw which means that the facsimile side is transmitted at about 12 kw (except for the 3357 kc/s emission which is only 5 kw). Best reception should be on the high frequencies in the daytime and on the low frequencies at night excluding the low-powered 3357 kc/s. It may be mentioned that the facsimile wave height map is the basis for the North Atlantic High Seas Warnings which are published every 12 hours in the MERCAST sections of the Washington (NSS) and Rota (AOK) General Broadcasts.

Questions have arisen as to the best methods for a ship's master to interpret and utilize sea height charts. A foundation for development is the system derived by the Navy's Optimum Track Ship Routing (OTSR) Sections of the Fleet Weather Activities in Norfolk, Virginia, and Alameda, California. The mission of these units is to recommend tracks for ships to cross the ocean in the least time and/or with the minimum storm damage.

OTSR route selection begins with a 15 day forecast of storm tracks. In general westbound ships are routed north of the storms and eastbound ships south of the storms so that they will have following seas. The first approximation to the desired track is a great circle. This is then modified to give following seas, if possible, or to minimize heights of head waves. Next, this route is adjusted to balance the time lost through slowing against the time lost through steaming an added distance to avoid slowing. Finally, areas of 50 kt winds, 20 ft waves, and areas within 100 miles of ice are avoided.

It is considered that rudimentary ship routing can be performed in the vessel herself, if she is provided with a facsimile receiver, by applying the above system and referring to maps of average storm tracks for the current month and the sea height charts described herein. Long range forecasting of wave heights can be done in the manner of Pierson-Neumann-James mentioned at the beginning of this article. Basic principles which apply to the forecast are: all ocean waves and surface currents are wind driven and must come after the winds; the highest wind waves are located where the highest winds are, i.e., where the isobars have packed on the surface weather map; and swell waves maintain a fixed direction after they have left the fetch area. These principles can be applied to delineate roughly, future areas of high seas.

It can be expected that the future will bring improved capabilities to the numerical wave height programmes and that the present deficiencies in the FNWF empirical relationships will be overcome. Along with improvements in the accuracy of the short range forecasts will come a capability to produce long range forecasts.

The time should not be far distant when the mariner can rely upon instantly available, reliable forecasts of sea height conditions for anywhere in space or time that his sailing orders may direct his course.

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Some Wave and Wind Data from Trawlers

By J. A. EWING, B.SC., and N. HOGBEN, B.SC., PH.D.

(Ship Division of the National Physical Laboratory)

Introduction

The data to be presented have been collected by trawler skippers and White Fish Authority staff under a scheme organized by the Ship Division in collaboration with the White Fish Authority and the Ministry of Agriculture Fisheries and Food. The purpose is to provide information needed for research into the seagoing qualities of trawlers. This information comprises visual estimates of the height, period, and direction of the waves and of the force and direction of the wind, records of which are being coded on to punched cards by the Combined Tabulating Installation of the Stationery Office. Thus statistical pictures of the sea conditions in which trawlers operate are readily computed.

In January 1964, an analysis of some 1100 observations then available was reported (reference 1). In the present paper a second analysis, covering the 4,000 observations now accumulated, is described.

Before considering these more recent results in detail, the question of the reliability and interpretation of such visual observations should be briefly mentioned.

Reliability of Visual Estimates

None of the estimates in the present paper has been compared with measurements. Thus, as far as these particular observers are concerned, the plausibility and consistency of the statistical picture revealed by the overall analysis is the only concrete evidence of reliability. Investigations have however been made of the reliability of visual estimates in general (reference 2) and in (references 3 and 4) some special observer trials carried out in association with the present work are described. In these special trials, the estimates of six independent observers aboard a research trawler were compared with measurements by a wave recorder. The broad conclusion was that for each comparison there were often one or occasionally two estimates with gross error but the rest were usually in reasonable agreement and the average of the six compared quite well with measurement. This emphasizes the importance of sample size in achieving adequate reliability.

In an appendix to (reference 2), Cartwright studied some 900 observations in comparison with measurements with a wave recorder in a weather ship and found that estimates of wave height correlated well with the measurements (correlation coefficient* of 0·86) and corresponded roughly to the mean of the half highest waves, which may be taken as approximately 1·256 × the root mean square† height (reference 2). This is rather less than the mean of the third highest waves (1·416 × root mean square height) sometimes known as the significant height. He also found that the period estimates showed rather poor agreement with the measurements, the correlation coefficient being only 0·48.

Editor's note. * A correlation coefficient is the degree of statistical association between two sets of observations. If there is a perfectly linear mathematical relation between them, the correlation coefficient is + 1; if there is a perfectly inverse relation, it is − 1 and if they are unrelated the correlation coefficient is zero. The formula for a correlation coefficient is

$$\frac{1}{N}\sum\frac{(x_n - \bar{x})(y_n - \bar{y})}{\sigma_x\sigma_y}$$

where x_n is the nth value of x
y_n is the nth value of y
$\bar{x},\bar{y}$ are average values
σ_x and σ_y are the standard deviations of x and y
N is the total number of observations
Σ means 'the sum of'

† The root mean square of a single set of observations is best defined mathematically i.e.

$$\sqrt{\frac{\Sigma x_n^2}{N}}$$

The Analysis

1. The Observations

The trawler skippers and White Fish Authority staff who have kindly agreed to cooperate in this research have been supplied with guidance notes and accessories, such as stop watches, to help them in making the observations. The guidance notes and procedure recommended have been based on a study of *The Marine Observer's Handbook* and on the experience gained from the special visual observation trials (reference 3). The observations are recorded on data sheets using a 'ticking' principle for ease of subsequent coding on to punched cards.

The data sheets have numerous columns for recording wave heights in feet, wave periods, length and direction and wind direction and Beaufort force. For instance there are twelve columns for recording wave height at 2 ft intervals. A sample of this data sheet was shown in *The Marine Observer* in July 1963.

2. Data Processing

The punching of the cards is being carried out by the Combined Tabulating Installation of the Stationery Office and each set of observations is punched on one card; the cards are sorted using a machine in the Mathematics Division, National Physical Laboratory.

3. Choice of Season and Area

Each card bears the date, time and geographical position of observation. As a first step the cards were sorted into the four seasons of the year and classified according to the Marsden system of numbered 10 degree squares of sea area. From this sorting operation only Marsden Squares with more than 200 observations per year were chosen for subsequent analysis—the resulting 9 Marsden Squares were then grouped into three areas shown in Fig. 1 and tabulated below.

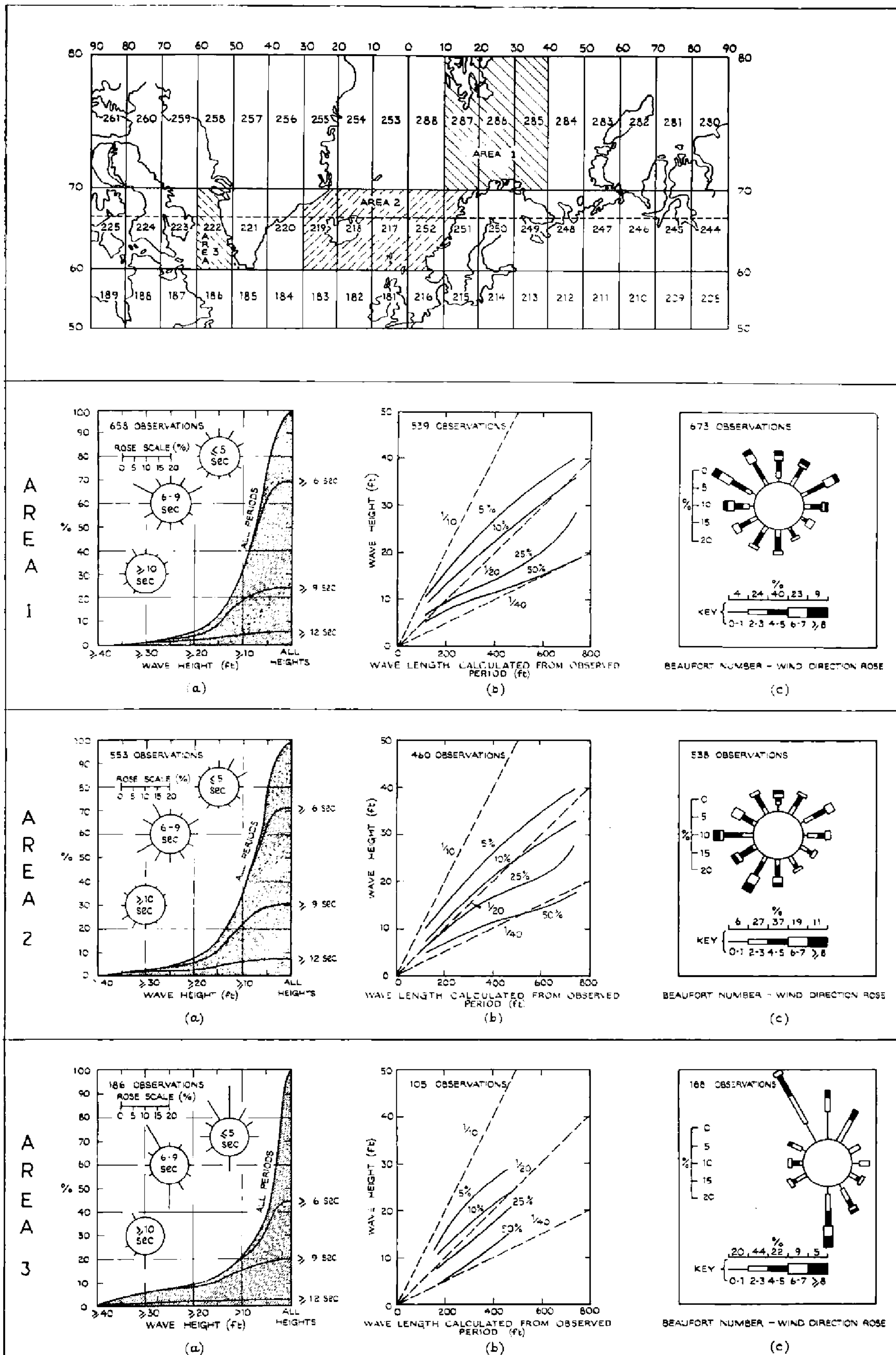


Fig. 1. Wave and Wind Conditions. September–February

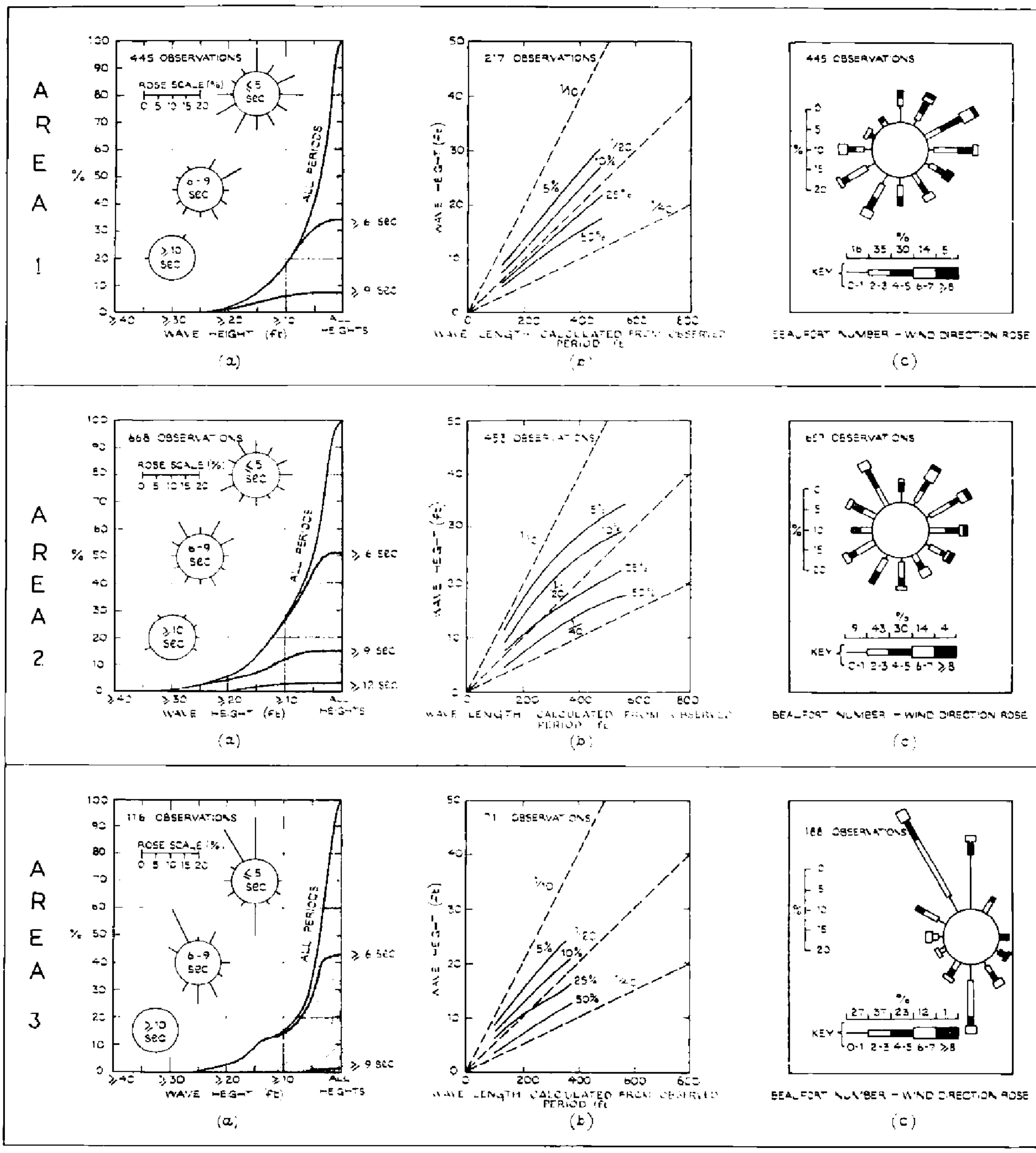


Fig. 2. Wave and Wind Conditions. March–August

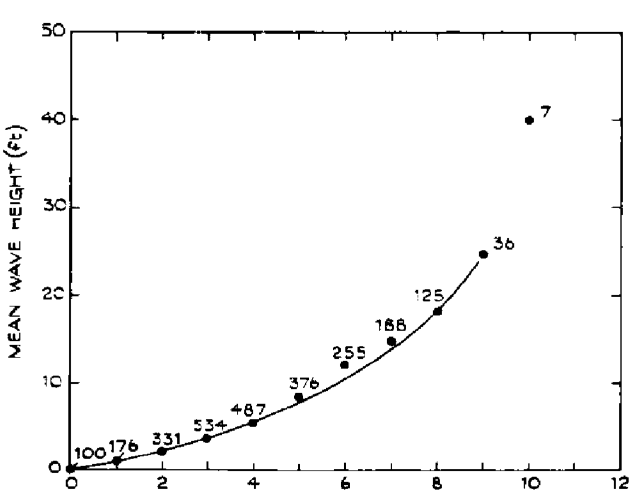


Fig. 3.

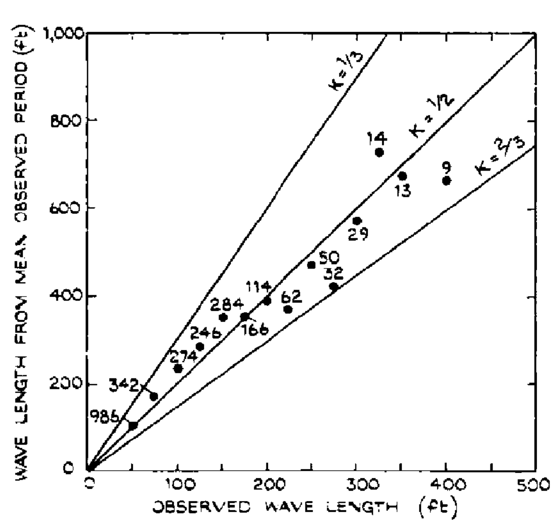


Fig. 4.

Table 1

Composition of Areas

Area	Marsden Squares	Total Number of Observations
1	285, 286, 287	1143
2	217, 218, 219, 251, 252	1240
3	222	316

In view of the small number of observations in Area 3 compared with Areas 1 and 2 it was decided to divide the year into only two periods of six months each (September/February and March/August) and to carry out the analysis on this basis.

4. Tabular Presentation of Results

Tables 2, 3 and 4 show the distributions of wave height/wave period, wave direction/wave period and wind direction/Beaufort Number respectively. These tables represent the basis of construction for Figs. 1 and 2. For each area the total number of observations in the above tables may vary; this is because some entries on the data sheets did not have an observation of one of the variables concerned.

In almost all cases the wave direction and wind direction given in each entry of the data sheets were found to be the same. It was therefore not considered necessary to give tables of wave height/wave direction since the table of Beaufort Number/wind direction was available and also there was found to be good correlation between wave height and Beaufort Number (*see* Fig. 3).

5. Graphical Presentation of Results

In addition to tables of the results it is desirable to have a picture of wave and wind conditions occurring in the three areas. Figs. 1 and 2 have been constructed with this in mind.

The small graphs labelled (a), (b) and (c) in Figs. 1 and 2 have been drawn using the information given in the tables. Graph (a) shows the 2-way cumulative frequency curves for wave height and wave period together with three wave period/wave direction roses. Graph (b) gives information on the steepness of waves—the curves show the probability of exceeding a given wave height when the wave length is specified. Graph (c) shows the Beaufort Number/wind direction rose. Below the rose is a small table giving the frequency of occurrence of various Beaufort Numbers for all wave directions.

6. Study of the Relations Between Wave Height/Beaufort Number and Observed Wave Length/Wave Length Calculated from Wave Period

A separate study was carried out to investigate the relationship between wave height/Beaufort Number and wave length/wave length calculated from wave period. The cards from all three areas were used and sorting operations were carried out. Tables 5 and 6 show the results.

6.1. *Wave height/Beaufort Number*

From Table 5 the mean wave height for each Beaufort Number was calculated and the results plotted in Fig. 3. The number adjacent to each point in Fig. 3 gives the number of observations at that Beaufort Number. A curve has been drawn through the points up to Beaufort 9.

AREA 1

SEPTEMBER-FEBRUARY

WAVE PERIOD - SEC

WAVE HEIGHT - FEET	0-4	5	6	7	8	9	10	12	14	
0	24			1						25
1	24	5	1	3		2				35
3	50	25	19	7	2	1	3			108
5	10	38	42	19	33	1	10		1	154
7	2	13	15	16	12	13	5	2		80
9		4	19	19	6	8	11	2		69
11	2	5	9	7	17	7	11	3	1	60
13			1	5	6	6	14	5	1	38
15		1	6	7	5	4	12	3		38
17				2		2	4			8
19				2	4	2	1			9
21				2	5	1	1			9
23					3		1	1		5
25								3		3
27					1		2			3
29					1					1
33						1		2		3
35						1	2	1		4
37								1		1
39									1	1
40								1	2	3
45									1	1
	112	90	112	92	95	49	77	24	7	658

MARCH-AUGUST

WAVE PERIOD - SEC

WAVE HEIGHT - FEET	0-4	5	6	7	8	9	10	12	14	
0	89									89
1	79	3								82
3	48	32	10	2		1				93
5	10	23	12	5						50
7		10	19	2	5	2				38
9			5	16	2	3	1			29
11			1	10	2	2	1			16
13				2	8	2				12
15				2	9	6	1	2		20
17					4	4	3			11
21						1				1
25						1	1			2
27							2			2
	226	68	47	41	30	22	9	2		445

AREA 2

SEPTEMBER-FEBRUARY

WAVE PERIOD - SEC

WAVE HEIGHT - FEET	0-4	5	6	7	8	9	10	12	14	
0	20									20
1	8	9	3	4	1					24
3	32	26	14	11	5		1	1		90
5	19	34	19	14	14	9	9			118
7	2	7	23	17	10	7	6			72
9			11	17	13	8	17	2	2	70
10						1				1
11				7	8	8	8	5	2	38
13				1	6	6	5	2		20
15	3		1	3	7	9	7	5	1	36
17				1	4		2	3	1	11
19				1	4	5	2	2	1	15
21		1			4	3		2		10
23					2		3	1		6
25						1	2			3
27							2	1		3
29				1		2				3
31						1	1			2
35							1	6		7
37							1	1		2
39									2	2
	84	76	71	77	76	60	67	31	9	553

MARCH-AUGUST

WAVE PERIOD - SEC

WAVE HEIGHT - FEET	0-4	5	6	7	8	9	10	12	14	
0	56									56
1	84	14	6		1	1				106
3	59	52	26	5	4		3			149
5	5	31	36	7	5		3	1		96
7	1	5	22	12	12		5		2	59
9		7	8	9	11	7	9	1		52
11		2	2	12	5		6	1		28
13	1		5	1	11		5			23
15			5	5	14	6	6	4	3	43
17				1	2	4	3	1		11
19		2		1	2	1	2	3	1	12
21			1	2	1		4		1	9
23					1	1	1			3
25				1	1	1	2		1	6
27					1	2	1			4
29	1						2			3
31						1	1	1		3
35						1	1			2
37							1			1
39								2		2
	207	117	109	55	75	25	55	14	8	668

AREA 3

SEPTEMBER-FEBRUARY

WAVE PERIOD - SEC

WAVE HEIGHT - FEET	0-4	5	6	7	8	9	10	12	14	
0	38									38
1	26	3	5	1	1					36
3	12	11	6	5	2	1	2			39
5		7	2	6	1	4	1			21
7		3		2	1					6
9		2	6		2	5				15
11			1	1	1					3
13						2				2
15						3	2			5
17						1				1
19							1			1
21								1		1
23					1					1
25				1		1				2
27					1	2				3
29					1					1
31							2	1		3
33						1				1
37							2		1	3
39							2			2
50								1		1
55								1		1
	76	26	20	16	11	20	12	4	1	166

MARCH-AUGUST

WAVE PERIOD - SEC

WAVE HEIGHT - FEET	0-4	5	6	7	8	9	10	12	14	
0	26									26
1	16	5			1					22
3	1	13	16							30
5		4	3	4	2					15
7		2		1	2					5
9			1			1				2
11		1	2		1					4
13			1	2	2					5
15				3						3
17				1	1					2
19					2					2
21					2					2
	45	21	25	11	13	1				116

Table 2. Wave height/wave period

AREA 1

SEPTEMBER-FEBRUARY

WAVE PERIOD - SEC

WAVE DIRECTION - DEG	0-4	5	6	7	8	9	10	12	14	
000	19	4	5	5	7	5	9	2		56
030	8	17	8	14		3	5	1	2	58
060	11	7	7	11	20	6	11	3		76
090	9	6	8	11	8	9	7			53
120	7	7	5	6	5		1	1		32
150	2	8	10	2	2	1				25
180	5	9	4	6	11	1	2			38
210	9	5	11	3	9	6	9	2		54
240	10	4	8	5	4	6	9	2	1	49
270	5	4	13	7	8	6	5	6	2	56
300	7	10	15	17	13	4	5	4		81
330	14	8	16	4	4	5	13	3	2	69
	106	69	110	91	95	49	76	24	7	647

MARCH-AUGUST

WAVE PERIOD - SEC

WAVE DIRECTION - DEG	0-4	5	6	7	8	9	10	12	14	
000	33	5	1			1		1		39
030	10	7	5	4	7		4			37
060	21	10	9	12	10	8				70
090	32	4	5	2		2	1			44
120	11	6		2	2	4				27
150	16	8	7	4	3	2	1			41
180	16	6	4	3	2					31
210	26	8	7	6	2					49
240	31	5	4	5	3			1		45
270	19	7	2	2	2	2	3			37
300	6		2		1	2				11
330	4	4	3	1		1				13
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	444

AREA 2

SEPTEMBER-FEBRUARY

WAVE PERIOD - SEC

WAVE DIRECTION - DEG	0-4	5	6	7	8	9	10	12	14	
000	16	2	2	4	4	3	4	2		37
030	14	10	2	2	[illegible]	4	1	3		40
060	15	12	3	10	5	5	4	1		60
090	6	7	10	5	5	1	1	1		36
120	6	6	7	5	1			2		25
150	2	3	7	6	2	5	4	[illegible]		31
180	4	3	4	5	7	3	4	4		42
210	6	6	3	6	11	9	7	5	3	55
240	4	3	9	5	12	9	11	5	2	63
270	3	8	8	9	14	3	6	3	2	56
300	1	6	2	4	10	6	8	1	2	40
330	1	4	10	7	4	9	5	2		42
	78	70	67	77	77	57	66	31	9	532

MARCH-AUGUST

WAVE PERIOD - SEC

WAVE DIRECTION - DEG	0-4	5	6	7	8	9	10	12	14	
000	31	5	5	3	4			1		49
030	17	9	17	7	16	3	6	1	2	78
060	23	10	13	10	6	3	5	1		71
090	20	13	5	7	4		7	1		57
120	15	4	7		2	3	10	3		44
150	8	7	5	3	11	4	1	1	1	41
180	14	13	4	2	1	3	5	1		43
210	16	7	9	1	6	2	6		1	48
240	30	8	6	6	4		7	1	2	64
270	8	7	10	1	5	2	1	2		36
300	6	13	11	5	3	2	1		1	42
330	14	17	15	12	10	3	6	2	1	80
	202	113	107	57	74	25	55	14	6	655

AREA 3

SEPTEMBER-FEBRUARY

WAVE PERIOD - SEC

WAVE DIRECTION - DEG	0-4	5	6	7	8	9	10	12	14	
000	19	7		2						28
030	4	8	2	2						16
060	7			1						8
090	6		2	1						11
120	4		1			2				7
150	6		1	2	2					11
180	8	3	6	1	4	9	6	2	2	41
210							1	1		2
240	5			1		1	2			9
270		1	3			1				5
300	4	1	2			1				8
330	12	6	3	6	5	6	3	1		42
	77	26	20	16	11	20	12	4	2	188

MARCH-AUGUST

WAVE PERIOD - SEC

WAVE DIRECTION - DEG	0-4	5	6	7	8	9	10	12	14	
000	13	5		1						19
030			4	1						5
090	1		1	2						4
120	1	1			1					3
150	1	1	2	2	3					9
180	12	2	4	1	3					22
210	1		1		3					5
240	1	2								3
270	3									3
300	1	1	2	1	1	1				7
330	7	9	11	3	2					32
	41	21	25	11	13	1				112

Table 3. Wave direction/wave period

AREA 1

SEPTEMBER-FEBRUARY

BEAUFORT NUMBER

WIND DIRECTION - DEG	0	1	2	3	4	5	6	7	8	9	10	
000	4	6	6	9	12	11	1	6	6			61
030		2	3	15	15	7	8	2	4	2	1	59
060		1	1	15	27	9	6	14	7	1	1	82
090			4	13	13	6	6	3	5	1		51
120		1	4	2	6	1	6	9	3			34
150			5	5	10	3	3	1				27
180			4	10	15	9	5	1	1			45
210		3	2	10	12	15	7	2	2			53
240			3	8	8	9	13	3				44
270		4	7	7	5	11	7	9	5	2		57
300		5	11	5	13	12	10	15	11	3		85
330			5	10	17	14	11	10	5	1		75
	4	22	55	109	157	107	63	72	49	10	2	675

MARCH-AUGUST

BEAUFORT NUMBER

WIND DIRECTION - DEG	0	1	2	3	4	5	6	7	8	9	10	
000	17		3	4	9	1	2					36
030		3	8	2	7	8	2	3	5			38
060		1	8	11	11	15	6	5	5			62
090		3	6	19	13	3	4	3	1			52
120		4	6	1	5	5	1	1	4		3	30
150		2	3	11	12	2	8	1	1			41
180	4	4	2	11	5	4	1					31
210	1	11	5	12	9	4	5	4			1	52
240	1	8	7	15	7	1	2	1		1		43
270		7	4	6	5	6	4	4	1			37
300		1	2	4			2	1				10
330		2	2	2	2	3	1	1				13
	23	46	57	98	85	52	40	24	17	1	4	445

AREA 2

SEPTEMBER-FEBRUARY

BEAUFORT NUMBER

WIND DIRECTION - DEG	0	1	2	3	4	5	6	7	8	9	10	
000	7	4	1	4	2	4	4	3	3	5		37
030	1		7	10	6	9	2	4	3			42
060		5	5	13	11	11	6	4	2			57
090		6	4	13	7	3	5	2	1			41
120			3	7	10	3	4	2	1			30
150			6	10	2	7	2	2	1			30
180		2	3	8	6	8	5	7	3	2		44
210		2	7	6	7	14	8	9	6	3	1	63
240		2	2	6	9	12	5	6	6	2		50
270		2	5	10	14	13	6	2	8	4		64
300			3	2	11	7	7	5	2	2		39
330			5	7	10	14	1	2	2			41
	8	23	51	96	95	105	55	46	36	18	1	538

MARCH-AUGUST

BEAUFORT NUMBER

WIND DIRECTION - DEG	0	1	2	3	4	5	6	7	8	9	10	
000	16	5	6	7	3	3	1					41
030		7	3	15	12	11	12	5	6			71
060		8	14	23	5	11	7	4		1	3	76
090		2	9	16	15	4	7	2	2	1	2	60
120		4	7	12	7	2	4	5	3	1		45
150		1	5	8	5	8	7	3	1			38
180	1	4	10	16	12	4	6	1				54
210		4	16	9	14	6	2		1		1	53
240		2	22	12	8	7	3	3	2			59
270			5	12	7	7	1				1	33
300		1	8	14	14	4	1	4	1			47
330		3	9	23	18	12	7	8	1	1		82
	17	41	114	157	118	61	58	35	17	4	7	659

AREA 3

SEPTEMBER-FEBRUARY

BEAUFORT NUMBER

WIND DIRECTION - DEG	0	1	2	3	4	5	6	7	8	9	10	
000	15		5	2		4						26
030			8	6	3	2						19
060			3	3								6
090		4	3	3								10
120		1	3			1		2				7
150		1	6	2	1	3		2		2		17
180		4	3	6	5	3	6	1	4	1	1	34
210											1	1
240			3	3		1	1					8
270			2		2	1	2					7
300	2	1	2	3	1							9
330	1	10	7	10	8	6	1	1				44
	18	21	45	38	20	21	10	6	4	3	2	188

MARCH-AUGUST

BEAUFORT NUMBER

WIND DIRECTION - DEG	0	1	2	3	4	5	6	7	8	9	10	
000	15	1			4		2					22
030				4	1							5
090					3	1						4
120		1			1	1			1			4
150		1		2	1	2	2					8
180	2	3	6	5	2	1	2					21
210			1	1	1	1	1					5
240				1			1					2
270		3	1				1					5
300		2	1	4	1	2						10
330		5	2	17	2	4	4					34
	17	16	11	34	16	12	13		1			120

Table 4. Wind direction/Beaufort Number

Beaufort Number

Wave Height (Feet)	0	1	2	3	4	5	6	7	8	9	10	Totals
0	90	81	46	31	5	1						254
1	6	62	125	60	53	5						311
3	2	27	123	246	71	25	6	1				501
5	1	4	28	142	188	58	17	9	1			448
7	1	1	4	31	93	78	28	11	5			252
9			1	10	50	80	58	28	7			236
11			3	6	19	58	24	27	11	1		147
13				2	2	39	24	17	15	1		100
15			1	3	2	25	40	39	29	5		144
17		1		2		4	21	5	11			44
19				1	3	1	17	4	6	7		39
21					1	2	12	5	7	4	1	32
23							2	7	3	3		15
25							2	10	3	1		16
27							2	12	1			15
29							1	4	2	1		8
31								4	2	1	1	8
33								2	2			4
35									11	2		13
37									6	1		7
39										5	2	7
40										3		3
45											1	1
50											1	1
55											1	1
Totals	100	176	331	534	487	376	254	185	122	35	7	2,607
Mean Wave Height	0	1·1	2·2	3·8	5·4	8·7	12·2	15·1	18·6	22·5	40·0	

Table 5. Wave height/Beaufort Number

Wave Period (Sec)

Wave Length (Feet)	0–4	5	6	7	8	9	10	12	14	Totals	Mean Period
50	693	184	74	19	9	2	5			986	4·5
75	36	118	120	32	18	7	10	1		342	5·8
100	14	29	79	69	56	14	11		2	274	6·8
125	5	29	43	40	56	42	28		3	246	7·5
150	2	21	35	46	56	35	74	1	14	284	8·3
175		9	28	45	28	10	24	7	15	166	8·3
200		2	3	25	36	19	16	5	8	114	8·7
225	1	2		13	24	9	7	2	4	62	8·5
250		1		2	13	16	10		8	50	9·6
275				1	8	14	8		1	32	9·1
300			1			6	15		7	29	10·6
325						1	6		7	14	11·9
350				1		1	3	4	4	13	11·5
400						1	3	3	2	9	11·4
500								2		2	12·0
Totals	751	395	383	293	304	177	220	25	75	2,623	

Table 6. Wave length/wave length calculated from wave period

6.2. *Wave length/wave length calculated from wave period*

Table 6 was used to determine the mean wave period corresponding to each observed wave length. The wave length corresponding to the mean wave period was then calculated using the classical formula.

$$\lambda = \frac{gT^2}{2\pi} \qquad \text{where } \lambda = \text{wave length}, \quad T = \text{wave period}$$

Fig. 4 shows the graph of wave length calculated from mean wave period against (observed) wave length. Also drawn are straight lines corresponding to the ratios of

$$K = \frac{\text{observed wave length}}{\text{wave length from mean wave period}} = 1/3,\ 1/2 \text{ and } 2/3$$

7. Discussion of Results

7.1. *Tables* 2, 3, 4 *and Figs.* 1, 2

From Figs. 1 and 2 it is seen that Areas 1 and 2 have almost identical wave height distributions (Graph (a)). The percentage occurrence of various Beaufort Numbers is also very similar for these two areas. It is considered that results for Areas 1 and 2 are reliable and represent a true picture of wave and wind conditions for the two six-monthly periods given.

No firm conclusions can be drawn from the data of Area 3 in view of the small number of observations available. The general impression from Graph (a) is that the wave heights are significantly lower than wave heights in Areas 1 and 2 for both six-monthly periods. The percentage occurrence of various Beaufort Numbers confirms this. The importance of Area 3 as a new fishing ground was considered sufficient reason to include it in the analysis.

7.2. *Relations between wave height and Beaufort Number*

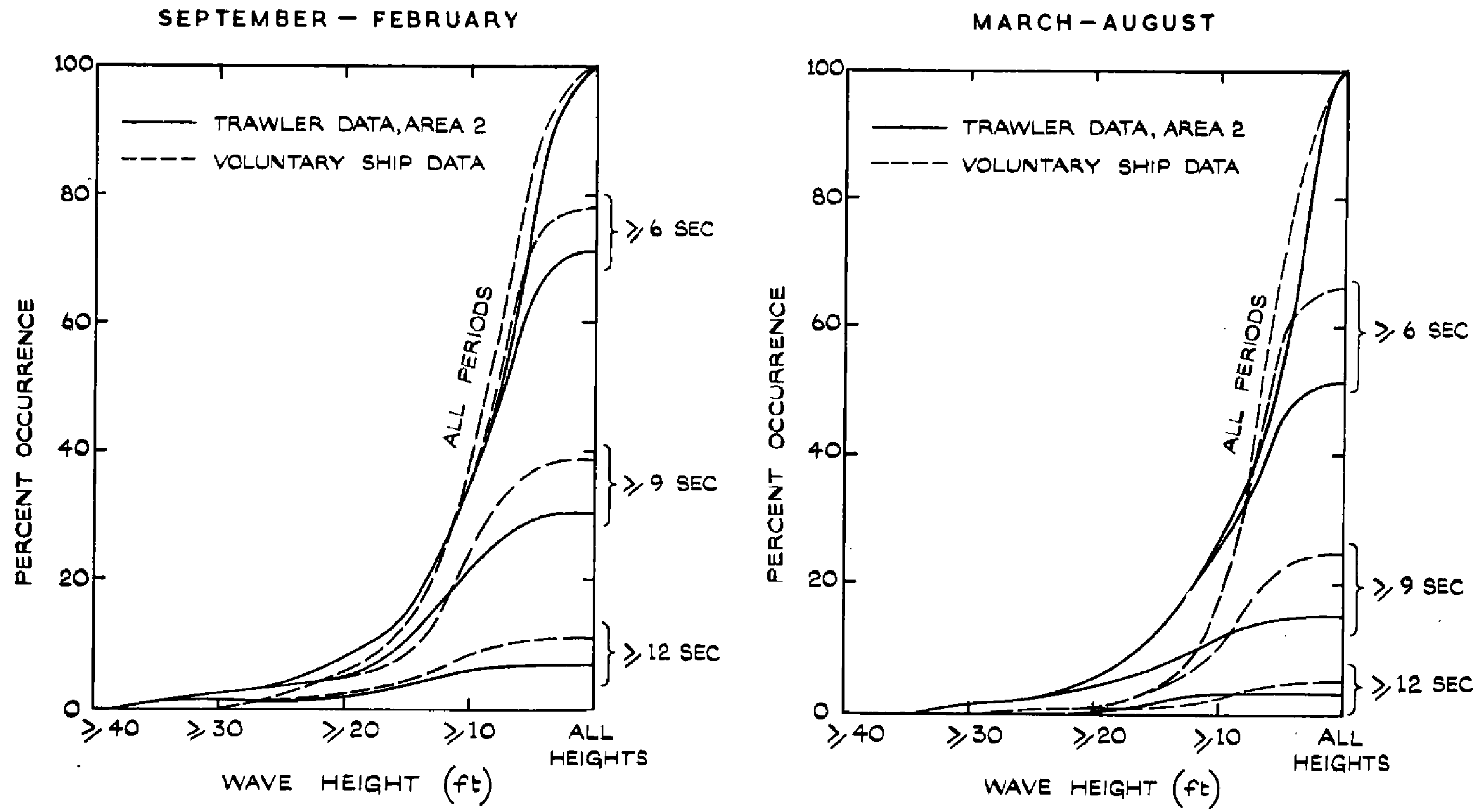
The curve in Fig. 3 is in agreement with an earlier calculation (reference 1). This figure can be used to estimate the probable wave height which may be expected in a given area if the wind force is known.

Table 5 shows the scatter of the observations on which Fig. 3 is based. Much of this scatter must reflect genuine variability due to such changing factors as the fetch and duration of the wind and the presence of swell not locally generated. It must however be partly due to the inevitable inaccuracies of visual observations. Some of the entries such as that indicating waves less than a foot high in Beaufort 5 conditions may be regarded with some suspicion though this situation could arise if the fetch or duration of the wind was very short. From the authors' own experience as already remarked, a few such doubtful results are to be expected but they do not seriously affect the mean line as shown in Fig. 3 and have not therefore been excluded. From the user point of view it is the mean line which is important but it is felt that, in fairness to readers, the actual variability of the observations should be shown. In these observations the observer did not differentiate between sea and swell; he merely recorded the height etc. of the waves that he actually saw.

7.3. *Relation between wave length and wave length calculated from wave period*

Fig. 4 shows that all the points lie between the two lines K=1/3 and K=2/3 and that at short wave lengths the points lie close to the line K=1/3. This finding is in agreement with previous results (reference 1).

The value of K depends on the nature of the wave spectrum. When the spectrum contains only a narrow band of frequencies and is also long-crested the K is close to unity. The theoretical value of K for a Neumann spectrum (modified by a factor $\cos^2\theta$ to give the angular dispersion of the waves) has been given (reference 5) as K=2/3.



SEPTEMBER — FEBRUARY
TRAWLER DATA, AREA 2
VOLUNTARY SHIP DATA
ALL PERIODS
≥ 6 SEC
≥ 9 SEC
≥ 12 SEC
PERCENT OCCURRENCE
0
20
40
60
80
100
≥ 40
≥ 30
≥ 20
≥ 10
ALL HEIGHTS
WAVE HEIGHT (ft)
MARCH — AUGUST
TRAWLER DATA, AREA 2
VOLUNTARY SHIP DATA
ALL PERIODS
≥ 6 SEC
≥ 9 SEC
≥ 12 SEC
PERCENT OCCURRENCE
0
20
40
60
80
100
≥ 40
≥ 30
≥ 20
≥ 10
ALL HEIGHTS
WAVE HEIGHT (ft)

Fig. 5.

7.4. *Comparison with Voluntary Observing Ship Data*

Fig. 5 shows a comparison of the cumulative distribution of wave height for Area 2 with corresponding results for the nearest area for which voluntary observing ship data have also been analysed (reference 2) which covers Marsden Square Nos. 182 and 183 and the north west corner of 181. The voluntary observing ship data consist of about 16,000 observations for each six-monthly period. The agreement is very encouraging.

Concluding Remarks

It is hoped that the data presented in this paper may be of interest not only for the intended application to seakeeping research but also to trawler owners and those actively engaged in fishing these northern waters. It may be of interest to mention that it is planned to incorporate some of the present results into the econometric model of fishing vessel performance now being formulated in Ship Division in collaboration with the White Fish Authority. Meanwhile the work of collecting data is still proceeding and in addition observations coupled with measurements are being received from 3 research trawlers fitted with wave recorders.

Acknowledgements

This article is published by permission of the Acting Director of the National Physical Laboratory. Grateful acknowledgement is made for the cooperation of the White Fish Authority, the Ministry of Agriculture Fisheries and Food and the Combined Tabulating Installation of the Stationery Office.

The authors wish to express particular appreciation to all members of the above organizations who have contributed to this work and also to the trawler skippers Captain W. March *Portia*, Captain Wood *Arctic Vandal*, Captain W. G. Hardie *Arsenal*, Captain J. Gower *Cape Adair* and Captain E. A. Binnington *Ernest Holt* for their patient efforts in collecting the data.

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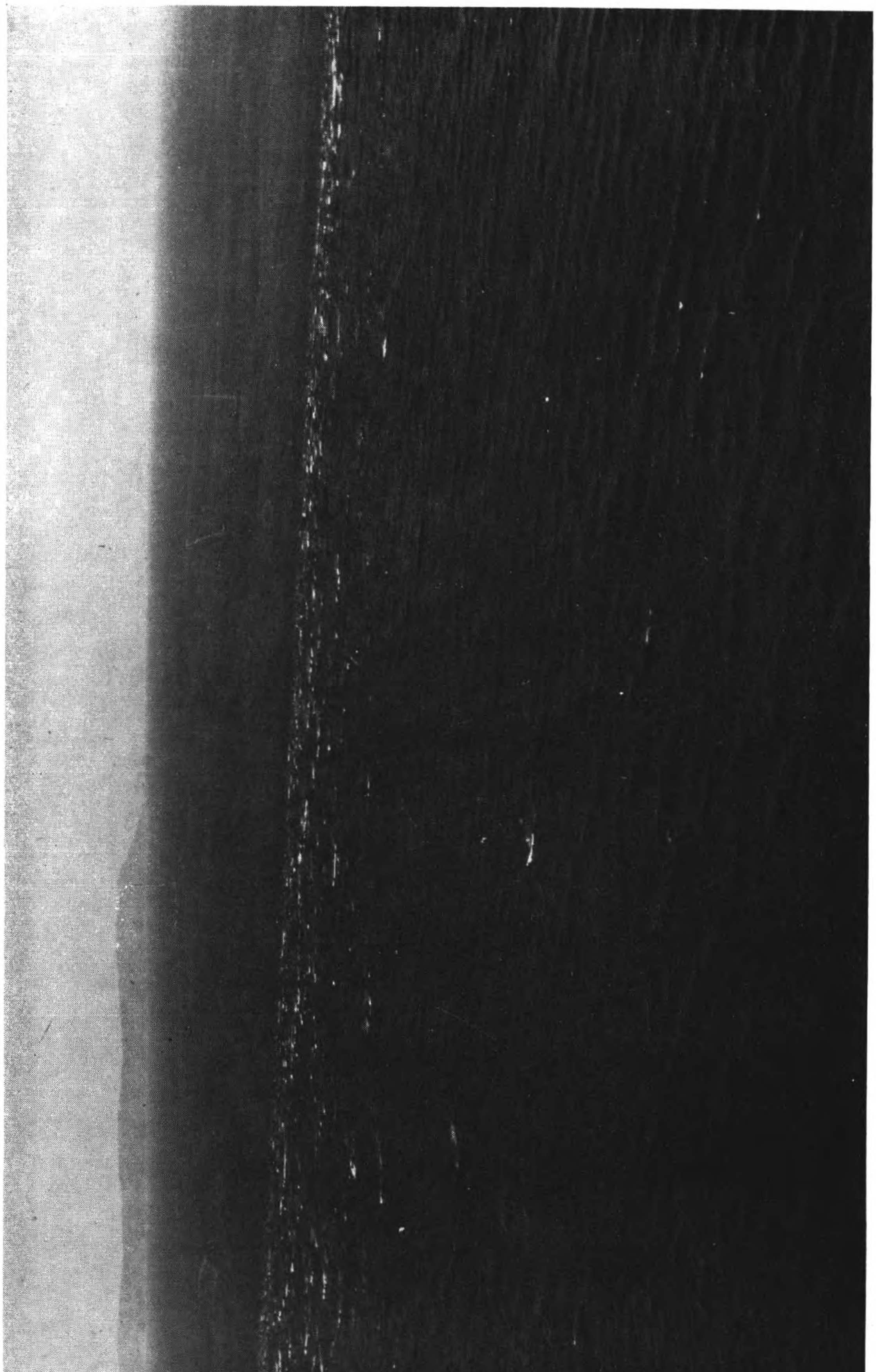
551.465.558

Line of Rough Water

By M. R. DUNN
(Meteorological Office, Royal Air Force, Gibraltar)

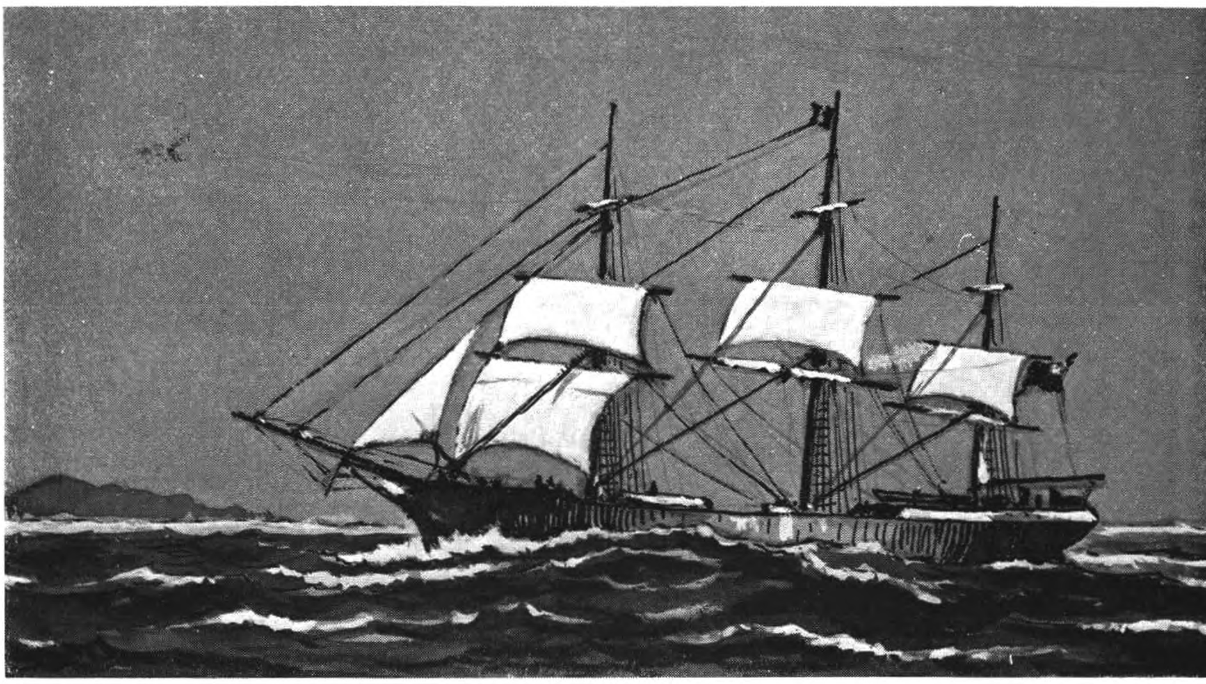
A line of rough water in an otherwise almost calm sea was observed by the crew of a Royal Air Force Shackleton of 224 Squadron at 0900 GMT on 29th April 1965 in the Straits of Gibraltar. The weather at the time was fine with excellent visibility. The surface wind west of 6°W was light and variable but to the east it was W'ly 12 kt. The photograph was taken from a height of 300 ft looking south-southwest towards Cape Spartel on the northwest coast of Morocco. (*See* opposite.)

(*Opposite page* 80)

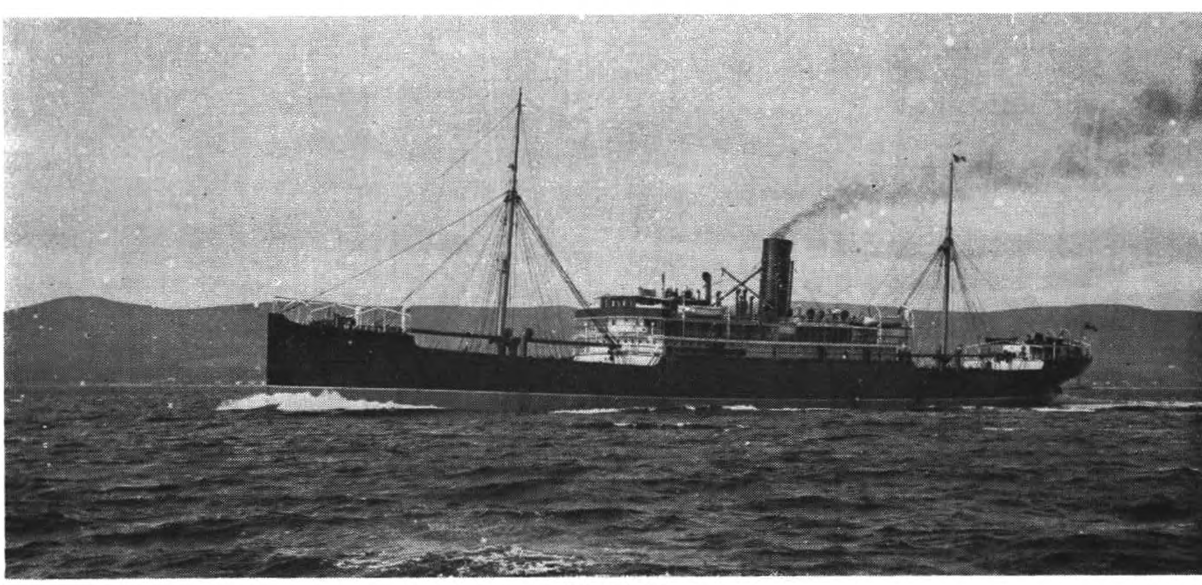


A line of rough water. The photograph was taken from a height of 300 ft looking SSW towards Cape Spartel (*see* page 80)

(*Opposite page* 81)



Robert Henderson



Chindwin

Pegu *Photograph by W. Ralston Ltd., Glasgow*

THREE SHIPS OWNED BY P. HENDERSON & CO. (*see* page 87)

The rough water, a line about 5 n. miles long and ¼ n. mile wide, was orientated approximately north-south about 10 n. miles west of Tarifa Point, the southern tip of Spain, and appeared to be stationary. Similar phenomena have been observed many times around and to the east of this position and have been given a variety of names such as 'current-rip', and 'tide-rip'.

It is thought that the phenomenon is caused by some kind of 'standing wave' in opposing currents, set up by an uneven sea-bed ridge across the Straits at about 6°W[1]. There is also a second lesser ridge about 10 n. miles farther east towards Tarifa. 'The Ridge' rises to a central peak about 200 ft below the surface, with cols to north and south, the depth of the southerly col forming a channel below 1,000 ft along which an east to west current flows more or less constantly. This W going flow is of small thickness here, and is overlaid by a deep E going Atlantic current. However from this point for 5 to 15 n. miles eastwards along the Straits the lower W going Mediterranean water deepens and is met nearer and nearer to the surface by the upper E going Atlantic water which becomes correspondingly shallower. There is thus formed a generally sloping zone of obviously considerable turbulent mixing, with the W going salty water sinking below the fresher, E going Atlantic current.

In the vicinity of the submarine ridges it is probable that there is large scale vertical motion with turbulent water carried upwards. This shows on the surface as a band of rough water which is more evident when the wind is light and there are otherwise few 'white horses'.

Areas of marked calm water have been noted much farther east where it is supposed a mass of water is descending[2].

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Note. Dr. J. N. Carruthers of the National Institute of Oceanography writes:

"There seems to be significance in the stated time when the line of rough water was seen and photographed, for on 29th April 1965 low water at Cadiz would have been at 0700 GMT within a little. In April, when the surface inflow of Atlantic water is at its weakest, and the underlying outflow of Mediterranean water at its strongest, the tidal stream curve shows that the direction of movement of the surface water changes from E going to W going two hours after Cadiz L.W. Though the surface water in the middle of the Straits moves westwards and only very weakly for no more than two hours or so during a whole tidal period, it does so least weakly at 2 hours after Cadiz L.W. following upon the decay of easterly movement which is strong three hours earlier, and progressively weaker until the onset of slack water which would have been just before the time (0900 on 29th April 1965) when the line was observed. Within a couple of hours E going flow would have been re-established. The fact that the line appeared to be stationary accords with the foregoing remarks, and makes it appear that the feature was the manifestation of a surface convergence normal to the axis of the Strait, i.e. to the flow. Unless the observers are able to state that the phenomenon, said to have been observed many times, has been seen at tidal states other than about Cadiz L.W. + 2 hours, there seems no reason to seek other explanations involving vertical turbulence."

INTERNATIONAL ICE PATROL, 1965

(The following account has been received from the Commander, U.S. Coast Guard)

In accordance with the terms of the International Convention on Safety of Life at Sea, London, 1960, the International Ice Patrol was conducted in 1965 by the United States Coast Guard and was the 46th such patrol since 1913. An estimated 76 bergs drifted south of 48°N compared with the annual average of 378 since 1900.

The Ice Patrol operated from 1st March to 6th June 1965 in the vicinity of the Grand Banks of Newfoundland from its base at the U.S. Naval Station, Argentia, Newfoundland. Operating forces included the U.S. Coast Guard Air Station, Argentia, Newfoundland; U.S. Coast Guard Radio Station NIK, Argentia; U.S. Coast Guard Cutter *Evergreen*, oceanographic vessel; and the U.S. Coast Guard Cutters, *Acushnet* and *Tamaroa*, standby patrol vessels. For the sixth consecutive season the standby patrol vessels were not required.

The International Ice Patrol is operated as a nucleus unit permanently stationed in Argentia, Newfoundland. Prior to 1964 the International Ice Patrol's offices were at Woods Hole, Massachusetts, and each season just before the beginning of the active ice patrol, personnel were temporarily transferred to Argentia, the geographical centre of its activities. Personnel, aircraft and ships were temporarily assigned as ice conditions appeared to warrant. Effective as this arrangement was, it was felt that there would be closer control and better knowledge of ice conditions would prevail if the Ice Patrol office was permanently stationed at Argentia; this was duly organized and the Ice Patrol office became a part of the Coast Guard Air Station already at Argentia. The Commanding Officer, Coast Guard Air Station was designated Commander, International Ice Patrol and the Ice Patrol Oceanographer became part of his staff. This organization has proved its effectiveness with an increase in knowledge in ice conditions, meteorology and climatology as they affect ice in the Grand Banks area. While the Ice Patrol now retains its unit identity on an annual basis it does continue, as before, to commence its ice observation flights and dissemination of ice information to shipping on or about 1st March when ice threats to shipping traversing the transatlantic route lanes commence. The end of the active ice patrol season is when the ice threat to these lanes is no longer considered dangerous. This occurs as a rule in early July.

The forces assigned to the Commander, International Ice Patrol are those considered consistent with the magnitude of the ice threat to the transatlantic route lanes and of the cost of operating these forces. Aerial ice reconnaissance flights are performed using Lockheed HC-130B four engined turbo-prop, long-range, land-based monoplanes. These flights, weather permitting, are scheduled at two to three day intervals to cover those areas immediate to the shipping lanes and at four to five day intervals for the areas northward. A 180 ft Coast Guard Oceanographic Cutter conducts oceanographic surveys on the eastern and southeastern areas of the Grand Banks to determine the velocity, temperature structure, and volume flows of the currents in these areas. Surface patrol vessels, two oceangoing tugs, the *Acushnet* and *Tamoroa*, are available in the event of a serious ice threat developing to southern tracks. These vessels have not been required very often in the past 15 years.

Techniques developed to assist the Ice Patrol in ice detection, iceberg drift and deterioration have steadily progressed over the years. For the forthcoming 1966 ice patrol season the aircraft will be equipped with a microwave radiometer designed to identify bergs. This item is important as it permits aerial ice observation flights to be performed during periods of bad visibility. Better navigational facilities aboard the aircraft will permit the accumulation of statistical information on berg drift. Lastly an airborne infra-red radiation thermometer, usable only during periods of good visibility, will provide the ice patrol with additional sea surface temperatures. The oceanographic investigations, conducted by the Coast Guard Oceanographic Unit, Washington, D.C., are directed at finding scientific explanations of the berg environment and ocean current structure of the Grand Banks area, and hence provide shipping with safer transit in this berg infested area.

Northern ice observation flights conducted along the coast of Labrador and Baffin Island to the area just south of Thule, Greenland, in October and December 1964 showed that the number of bergs to be expected in 1965 would be well below normal. In fact the total bergs observed south of 48°N by the end of the season totalled 76—the average total (1900–61) being 378 and maximum 1,000. Of the many factors which contributed to this light ice year and which affected the drift and deterioration during the migration of bergs to the Grand Banks area were, the blockage of western Melville Bay, Greenland, in September 1965 by heavier than usual ice concentrations, an early and long period of warm weather causing an early thaw along the Newfoundland and Labrador coasts in early March, and generally consistent on-shore winds over the coastal waters of Newfoundland and Labrador. These factors prevented the vast number of bergs usually present in Melville Bay from travelling westward with the prevailing currents towards Ellesmere Island, Canada, and thence southward and caused early melting and break-up of sea ice along the Labrador and Newfoundland Coasts thus permitting the sea water to become warmer and remove a protective insulator and sea roughness barrier from the icebergs drifting south. Also the onshore winds drifted the bergs westward out of the southflowing currents north of Hudson Straits and the Labrador Current along the Labrador Coast, trapping them in the many bays and inlets of Baffin Island, Labrador and northern Newfoundland, and imposed a generally unfavourable wind driven current pattern and unfavourable berg drift. Within the area of immediate interest, the Grand Banks, two periods of strong SE'ly winds in late March and mid April drifted the bergs northward against the south flowing current and built up large seas that destroyed the sea ice and greatly deteriorated the bergs. Only one berg penetrated the Tail of the Banks, causing little or no worry to shipping.

Aerial ice observation flights on the 27th and 28th May showed that little or no field-ice or bergs existed south of 53°N. Twenty-two small to medium bergs were observed along the Newfoundland coast from Cape Race to well west of Fogo Island. As these bergs were well inshore, and hence out of the Labrador Current, they only posed a minor threat to vessels traversing Track F. The sea temperatures were well above normal for this time of the year indicating that berg deterioration would be rapid. Based on these observations and on the forecast of berg drift and deterioration it was concluded that no ice threat existed or could develop for Track C and that only a minor ice threat existed or could develop for Track F. The 1965 International Ice Patrol was ended on 6th June.

The operations of the Ice Patrol from 1st March to 6th June are summarized as follows:

1. Ice Patrol aircraft conducted 9 pre-season ice reconnaissance flights to track and plot ice conditions and prepare for the forthcoming patrol season.

2. Ice Patrol aircraft conducted 31 in-season ice reconnaissance flights for the main purpose of guarding the limits of ice and determining ice conditions in the vicinity of the Grand Banks.

3. Ice Patrol aircraft conducted 4 northern ice reconnaissance flights covering the area as far north as Hudson Straits to determine the in-season berg potential.

4. Ice reports were collected from ships, aircraft, and other ice observation agencies.

5. Pertinent ice information was plotted and analysed.

6. Ice conditions in the vicinity of the Grand Banks were forecast twice daily during periods between observed ice conditions.

7. Ice advisory bulletins were broadcast twice daily to shipping and were passed twice daily to other interested agencies via teletype.

8. Special ice information was provided to ships on request.

9. Weather reports including sea temperatures were collected by radio from ships traversing the area for the purpose of evaluating ice location, drift and deterioration.

10. Position plots were maintained of all reporting ships in the Ice Patrol area.

11. Three oceanographic surveys were conducted between 30th March and 25th May for the purpose of collecting oceanographic information affecting the drift and deterioration of ice in the Grand Banks area.

12. A special iceberg drift and deterioration project was conducted by the oceanographic vessel from 23rd April to 6th May.

Ice Bulletins from the Canadian Department of Transport, Ice Central Office, Halifax, Nova Scotia, were closely monitored. The information received on the Cabot Straits area was included in the twice daily ice broadcasts and teletyped ice bulletins.

A lead developed through Cabot Strait to the St. Lawrence seaway in early April, and by 15th April Cabot Strait and St. Lawrence seaway approaches were open with only a few widely separated belts of ice to be found. Sea ice persisted along Cape Breton until mid May. North of this area ice persisted in Belle Isle Straits through May and early June. On 15th June, Ice Central, Halifax, announced that no further sea ice persisted in the Strait of Belle Isle and it was declared open to shipping. However, bergs continued to persist in numbers throughout early July. A few bergs were present in or near the Strait of Belle Isle throughout the year.

Ship reports of ice and weather in the Grand Banks area were an indispensable source of ice, oceanographic and meteorological data which assisted International Ice Patrol in determining ice conditions and in advising shipping. When reporting icebergs, ships are requested to include the shape and an estimate of size. The berg description is required to identify and track individual bergs and to estimate their deterioration.

Annually after termination of the International Ice Patrol and until commencement the following year, ships are requested to transmit ice reports to the U.S. Naval Oceanographic Office, Washington, D.C., for further dissemination. U.S. Coast Guard Radio Station NJN, Argentia, will be available for relay of ice reports and also for transmission of safety broadcasts when unseasonable ice threatens shipping lanes near the Grand Banks. The International Ice Patrol Office will perform ice observation as advisable after ice patrol terminates and prior to the commencement of the next year's ice season. A plot of ice reports on the Grand Banks and vicinity will be maintained all the year round and ship requests for ice information will be answered via NJN.

In addition to ice reports, all ships are urged to make regular four-hourly reports to Radio Station NIK during the ice season between latitudes 39°N and 49°N and longitudes 42°W and 60°W, including ship's position, course, speed, visibility, sea temperature and wind. The visibility reports are used in planning ice observation flights and sea temperatures assist in estimating ice deterioration and detecting shifts in the branches of the Labrador Current. Wind data are used for estimating set and drift of ice and forecasting the weather for ice observation flights. An up-to-date plot is maintained for all reporting ships. These ships can be warned directly when approaching dangerous ice.

The International Ice Patrol will again begin full service about 1st March 1966, depending on ice conditions at the time. Ice bulletins will be broadcast twice daily, at 0048 and 1248 GMT by U.S. Coast Guard Radio Argentia NIK. Details are given in *Admiralty List of Radio Signals, vol. V*. The ice bulletin will generally include the limits of all known ice, the areas and limits of heavy concentrations, and the positions of individual bergs and growlers; the ice conditions will be as observed or reported during the date of the broadcast or estimated up to the broadcast time.

Ice conditions will also be transmitted daily by facsimile at 1330 GMT on 5320, 8502, and 12880·5 kc/s at a drum speed of 60 rev/min. Facsimile ice charts were broadcast during the 1963–65 seasons as a regular daily service. Indications are that several ships with facsimile received these ice charts when off the United States east coast and as far as 1,200 miles east of Newfoundland. The facsimile ice charts are reliable because human transmission and reception errors are eliminated and much more information can be transmitted as compared with CW in a given amount of time. Also time is saved aboard the ship by the elimination of plotting the chart.

Merchant ships may call NIK on 500 kc/s and 8 and 12 mc/s maritime calling band at any time. The surface patrol vessel, radio call sign NIDK, when on station, will relay between NIK and ships when necessary. There is no charge for these services.

Ships approaching Cabot Strait from January to June should contact Canadian Ice Operations Office, Sydney VCO. Details of these services are available in *Guidance to Merchant Ships Navigating in the Gulf of St. Lawrence.*

OBSERVATIONS OF LOCUSTS AT SEA

In past years, many Selected and Supplementary ships have recorded in their meteorological logbooks the sighting of locusts at sea. Many of the sightings have also been reported by radio. Whether reported by radio or not, the narratives have always been extracted and forwarded to the Anti-Locust Research Centre in London. Articles referring to the need for such reports appeared in *The Marine Observer* of January 1951, April 1955 and July 1961. In the January 1960 number, Miss Z. Waloff, the Principal Scientific Officer at the Centre, mentioned that these reports had added to their knowledge of swarm movements and had often helped in the assessment of current plague situations. They had also raised some interesting problems relating to locust migrations.

The Centre started a more ambitious locust and weather plotting project in 1961 in which ships of many nationalities co-operated. All ships operating in the seas around Africa, Arabia, India and Pakistan are asked to continue their valuable help.

Whenever, therefore, locusts are sighted, whether singly or in a swarm and whether alive or dead, ships are asked to report the occurrence by radio giving the following particulars:

(*a*) Date and time (specifying GMT or zone time) when locusts were first seen.
(*b*) Latitude and longitude, if possible to nearest minute, when locusts were first seen.
(*c*) Time and position at which locusts were last seen.
(*d*) Whether isolated locusts (seen in flight singly), locust group or groups (flying locusts seen intermittently in numbers), swarm (flying locusts seen continuously in numbers, over a period of at least a minute), dense swarm (obscuring part of horizon or other background), locusts appearing on board or floating dead locusts (isolated, groups or swarms).
(*e*) Colour of locusts (yellow, pink, grey).
(*f*) Wind direction and speed.

The radio message should be addressed to:

TELEX 24364 = ANTILOCUST LONDON

and passed through Portishead.

No further address or preamble is necessary and the cost of the message will be borne by the Desert Locust Information Service, Anti-Locust Research Centre, College House, Wright Lane, London W.8.

Specimen messages could read:

TELEX 24364. ANTILOCUST LONDON. 12th 1030 GMT, 1°,05′N, 39° 33′E to 1215, 18° 32′N, 39° 18′E. Thin swarm yellow locusts, wind NW 15 kt.

TELEX 24364. ANTILOCUST LONDON. 7th 0310 GMT, 28° 47′N, 50° 31′E to 0335, 28° 55′N, 50° 27′E. Many floating dead red locusts, wind variable, 5 kt.

All cases of a locust sighting should be recorded in the additional remarks pages of the meteorological logbook even when it has not been possible to send a radio message. The report should state whether such a message was sent or not.

A drawing or photograph materially increases the value of a narrative but *whenever practicable, a specimen should be collected* and posted as soon as possible to the Desert Locust Information Service (address as above).

An adult desert locust is about 2½ in long with a wing span of about 5 in. It is rosy-red or brownish-red when immature and bright yellow when ready to breed.

Locusts occur in swarms sometimes of several millions and have been known to extend over more than a hundred square miles. They are capable of hundreds of miles of continuous flight and have repeatedly been seen in flight at sea off the north western coast of Africa, over the Arabian Sea, the Red Sea, the Gulf of Aden and the Persian Gulf. In October and November 1954 no fewer than ten voluntary observing ships reported the invasion of the Canary Islands by locusts, from which a few stragglers reached the Irish coasts and the Scilly Islands (*The Marine Observer* of October 1955).

ROYAL NAVAL BIRDWATCHING SOCIETY

The Annual General Meeting of the Royal Naval Birdwatching Society is always held on the Friday next before Christmas at 3 p.m. in the Admiralty Cinema, Whitehall.

The 1965 Annual General Meeting was therefore held on Friday 10th December 1965 and, for the first time in the thirteen years that we have been associated with the Society, the Chairman, Captain G. S. Tuck, D.S.O., R.N., to whom we send all ornithological observations extracted from ships meteorological logbooks and who has contributed occasional notes and articles to *The Marine Observer* (e.g. *see* page 59 of this issue) was absent through illness. He was, however, unanimously re-elected (with his consent) to serve for a further year.

The Society was formed shortly after the end of the Second World War with the modest ambition of stimulating interest in birdwatching in the Royal Navy and of producing lists and maps containing information about birds likely to be encountered on passage to and from and at Naval stations abroad. It was soon realized that the ornithological narratives which were often recorded in merchant ships meteorological logbooks would make a very substantial contribution to these records; moreover such observations would cover a much wider area than would those from H.M. ships. We therefore started extracting all bird observations from ships' meteorological logbooks and sending them to the Society who, apart from plotting them and adding them to their records which, in turn, they deposited with the Natural History Museum and thus made them available to anyone interested, would then send us their comments, some of which we published in *The Marine Observer* and all of which were, in any case, sent back to the observer. Thus did the interest grow and it was not long before the Society, recognizing the service which it was thus receiving, threw open its membership to all Masters, Officers and Ratings of all departments of the Merchant Navy and Fishing Fleets who might be interested in birdwatching at sea.

A little later, the Master of the Honourable Company of Master Mariners was invited to become a Vice-President of the Society, to represent the Merchant Navy, whilst Captain P. P. O. Harrison of the New Zealand Shipping Company, one of the first officers whom we introduced to the Society and who subsequently recorded his ornithological experiences in his book *Sea Birds of the South Pacific*, was invited to sit on their Editorial and Advisory Board as a seagoing shipmaster.

Of the Society's present total of 286 members, 77 come from the Merchant Navy (including two from the Fishing Fleets) and of the 18 new members who joined in 1965, 9 were from the Merchant Navy: two shipmasters, two deck officers, two navigating apprentices, one able seaman and two meteorologists from our ocean weather service. The attendance at the 1965 Annual General Meeting included two shipmasters and one merchant navy engineer officer.

At the meeting it was reported that Captain P. P. O. Harrison, now retired from the sea, has been succeeded on the Board by Captain E. F. Aikman of the Canadian Pacific Steamships, an experienced birdwatcher over the Western Ocean.

The meeting concluded with a showing of the film *Birds of Speyside*, made for the Royal Society for the Protection of Birds. One of these RSPB films, which when shown to the general public will almost invariably fill the Festival Hall, is yet another feature which makes our annual contact with the RNBWS a very pleasurable occasion.

The work of the Society is likely now to become more widely known in the Merchant Navy, for we understand that a copy of their annual *Sea Swallow*, which is distributed free to members, is now being added to all ships' libraries supplied by the Seafarers Education Service.

Membership costs a very modest sum and the Honorary Secretary, Lieutenant Commander E. S. W. Maclure, R.N., 23 St. David's Road, Southsea, Hants, will be glad to hear from anyone who is interested.

L. B. P.

A CENTURY OF VOLUNTARY OBSERVING—P. HENDERSON & CO LTD

Our annual pictorial series of ships of one ownership covering a centry of voluntary observing for us is continued opposite page 81 with pictures of three observing ships belonging to Messrs P. Henderson & Co of Glasgow, one of the oldest shipping companies on our registers.

Their first observing ship and the subject of our first picture was the *Robert Henderson*, a full rigged ship of 586 tons and the first ship which 'Paddy Henderson' had built especially for the New Zealand trade. She was one of the fastest ships of her time on that run and made her maiden passage from Glasgow to Dunedin in 79 days. Our old registers show that our Agent in Glasgow supplied her with instruments on 10th November 1857 but we have recorded only one meteorological logbook from her: it contained observations made over the period 4th June to 31st August 1860 whilst she was making her second outward passage to Dunedin which took 93 days.

No contemporary picture of the *Robert Henderson* appears to be available but the drawing opposite page 81 has been made for us by Commander C. H. Williams, who was for many years Port Meteorological Officer in London and is also responsible for the various illustrated headings in this journal. He made the drawing from a picture of the ship which was published in the *Auckland Star* about 40 years ago and which subsequently appeared in the book *White Wings—50 years of Sail in the New Zealand trade* published in New Zealand in 1926 and kindly loaned to us by Messrs Henderson.

Our second picture is of the *Chindwin*. She was a steel steamer of 6284 gross tons, built in 1910 by Denny of Dumbarton. She joined the voluntary observing fleet in 1919 and her first meteorological logbook covered the period 9th January 1920 to 23rd March 1920, a voyage from Glasgow to Rangoon (Paddy Henderson's interest in the New Zealand trade had ceased in 1882 when their Albion Line was merged with Shaw Savill's). The *Chindwin* remained in their service until 1938 when she was sold to an Egyptian shipping company. She met her end in the disastrous Bombay Dock explosion towards the end of the second world war.

Their latest recruit to the voluntary observing fleet is the m.v. *Pegu*, the subject of our third picture. Of 5,764 gross tons she was built in 1961 by Lithgows of Glasgow and joined the voluntary observing fleet in March 1963.

We take this opportunity of expressing our appreciation of the voluntary services which the masters and officers of 'Paddy Hendersons' ships have given us during almost the whole of our existence. In our first ten years, in addition to the *Robert Henderson*, we had also on our voluntary observing list the *Lady Douglas* and the *Jane Henderson* and, though our contact with the company's ships has been mostly concerned with the Burma trade, it was their Albion Line, now merged into Shaw Savill's, which produced our very first records from the New Zealand run. Today, three of their five ships are observing for us.

L. B. P.

NOTES ON ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM OCTOBER TO DECEMBER 1965

OCTOBER

Canadian Arctic Archipelago. Although winter cooling was about a week ahead of normal the ice situation was, except in the extreme south where there was slightly more cover than usual, roughly normal.

Baffin Bay. This area has never really recovered from the exceptionally slow thaw of the summer and so there was very much more ice than usual. Off Baffin Island the edge was 150–200 miles east of normal while in the extreme north there was practically no open water as there usually is in October. Some icebergs were reported from Greenland shore stations.

Davis Strait. Along the west coast of Greenland ice conditions were about normal though there were signs at the end of the period of somewhat lower than usual sea temperatures. To the west however especially near Frobisher Bay and Resolution Island with both sea and air temperatures below normal, pack-ice was reported to be far more extensive than usual.

Hudson Bay. The extreme southwest was one of the few areas warmer than usual. In the south east, however, cooling was about two weeks ahead of the normal. No ice was reported nevertheless from either of these. Along the northern coasts the ice development was one to two weeks ahead for the time of year.

Foxe Basin and Hudson Strait. Under the influence of a persistent and fairly strong north westerly wind air temperatures fell to about 3°C below average and with the sea also cool, Foxe Basin, quite exceptionally for October, was completely covered with ice. Much ice drifted too into the Hudson Strait where freezing along the coasts was also proceeding briskly.

Labrador Sea, Grand Bank, South Newfoundland and Gulf of St. Lawrence. Over the whole of this area, with the exception of those waters south of about 47°N, both sea and air temperatures were from 2–3°C below normal and cooling was about a fortnight ahead of schedule particularly close to the Labrador coast and along the north bank of the St. Lawrence River. Conditions, however, were not yet wintry enough for there to have been any ice reported.

Greenland Sea and Denmark Strait. In the extreme south below approximately latitude 62°N, the sea was relatively warm, being 2–3°C above normal, but even here icebergs were reported from south eastern stations of Greenland. In all other parts of the area however under the persistent cooling north easterlies, the ice situation was well ahead of normal, in some places the ice field extending up to 150 miles further out from the coast than usually reported. Curiously enough, in spite of this overall picture, and possibly because of the mixing that has been going on in this restricted area, there was some opening up in the pack to the north west of Iceland and the ice edge actually receded. Two largish icebergs however were grounded just off this coast.

Spitsbergen and Barents Sea. Again a story of cooling well advanced, in some places up to as much as four weeks ahead, and much more ice than usual. To the south west of Spitsbergen with sea temperatures 3–4°C below normal there was much open pack in an area usually free in October and to the east of King Carls Land the ice edge was 30–50 miles south of normal.

White Sea. This area had been relatively warm throughout the summer but now rather more than usually rapid cooling set in although no ice was actually reported.

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

(This does not include growlers or radar targets)

Limits of Latitude		Degrees North								
		64	62	60	58	56	54	52	50	48
Number of bergs reported south of limit	October				None Reported					
	November		11	8	6	1	0	0	0	0
	December	*	*	*	*	*	3	0	0	0
	Total	*	*	*	*	*	3	0	0	0
Limits of Longitude		**Degrees West**								
Number of bergs reported east of limit	October				None Reported					
	November	11	7	5	1	1	1	0	0	0
	December	*	*	*	*	*	*	3	2	0
	Total	*	*	*	*	*	*	3	2	0
Extreme southern limit	October	None Reported								
	November	54° 11′N 52° 22′W on 27.11.65								
	December	52° 24′N 51° 04′W on 4.12.65								
Extreme eastern limit	October	None Reported								
	November	54° 11′N 52° 22′W on 27.11.65								
	December	52° 44′N 49°30′W on 7.12.65								

* Probably large numbers, but none sighted in excess of these reported in further south positions or in further east positions.
Extreme limits during the 3-month period are underlined.

November

Canadian Arctic Archipelago. Notwithstanding the fact that the whole of this area experienced relatively mild conditions during the month—temperatures in some places in the second half of the period being as much as 16°C above average—the ice situation remained roughly as normal.

Baffin Bay. In spite of the abnormally high air temperatures reported here, the picture, probably due to the unusual persistence of ice during last summer, at the end of the month was not far from average; on the east coast of Baffin Island, in fact, there was still more ice than usual.

Davis Strait. Air temperatures here, too, were well above normal with the result that there was more mobility in the field ice than usual. In places the pack-ice was as much as 150 to 300 miles further south than usual for the time of year. Off the west coast of Greenland, similarly, more icebergs were reported on the move than in any November for the past six years.

Hudson Bay. Although it was cool at the beginning of the month temperatures rose steadily and finished well above normal. Nevertheless there appeared to be generally more ice than usual, close pack covering most of the area.

Foxe Basin and Hudson Strait. These seas, too, experienced the marked transistion from cool to relatively warm—some parts of Foxe Basin, indeed, reported at the end of the period temperatures up to 15°C above normal—but again, instead of only narrow strips of coastal new ice, both areas appeared to be mostly covered by close pack. It seems that the slow thaw of last summer was still having its affect.

Labrador Sea. With both air and sea temperatures a degree or so below normal (a sharp rise of the air temperature at the end hardly affected this generalization) fast ice formed in the inlets somewhat earlier than usual. Late in the period the ice was 10 in thick in Goose Bay.

Grand Banks, South Newfoundland Sea, Gulf of St. Lawrence and St. Lawrence River. Both air and sea were 2–4°C cooler than usual. Small amounts of ice formed slightly ahead of normal along the northern north coast of the Gulf of St. Lawrence. There were a few icebergs still on the Grand Banks.

Table 2. Baltic Ice Summary: October–December, 1965

No ice was reported at any of the stations during October

Station	November 1965									December 1965								
	Length of Season		Ice Days			Navigation Conditions			Accumulated Degree Days	Length of Season		Ice Days			Navigation Conditions			Accumulated Degree Days
	A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I
Keil	0	0	0	0	0	0	0	0	—	0	0	0	0	0	0	0	0	—
Tonning	24	30	7	0	7	7	0	0	—	1	2	2	0	2	1	0	0	—
Husum	23	26	4	0	4	0	0	0	—	0	0	0	0	0	0	0	0	—
Emden	0	0	0	0	0	0	0	0	—	0	0	0	0	0	0	0	0	—
Lubeck	0	0	0	0	0	0	0	0	—	0	0	0	0	0	0	0	0	—
Gluckstadt	23	24	2	0	0	2	0	0	—	0	0	0	0	0	0	0	0	—
Bremerhaven	0	0	0	0	0	0	0	0	—	0	0	0	0	0	0	0	0	—
Flensburg	0	0	0	0	0	0	0	0	—	0	0	0	0	0	0	0	0	—
Leningrad	16	30	15	13	2	8	13	0	195	1	31	31	31	0	0	31	0	309
Riga	16	25	10	3	0	3	0	0	132	17	31	6	0	0	0	0	0	184
Pyarnu	16	30	15	11	0	11	0	0	135	1	31	31	31	0	31	0	0	211
Viborg	16	30	15	15	0	8	7	0	—	1	31	31	31	0	0	31	0	—
Stettin	23	25	3	0	0	0	0	0	49	8	20	5	0	0	5	0	0	0
Gdansk	0	0	0	0	0	0	0	0	69	0	0	0	0	0	0	0	0	44
Klaipeda	16	27	10	0	0	5	0	0	122	1	26	5	0	0	0	0	0	144
Ventspils	16	27	6	0	0	0	0	0	—	1	19	5	0	0	1	0	0	—
Tallin	0	0	0	0	0	0	0	0	—	0	0	0	0	0	0	0	0	—
Helsinki	30	30	1	0	0	1	0	0	165	1	31	22	15	0	16	0	0	273
Mariehamn	0	0	0	0	0	0	0	0	85	0	0	0	0	0	0	0	0	167
W. Norrskar	0	0	0	0	0	0	0	0	—	15	31	11	0	4	5	0	0	—
Turku	0	0	0	0	0	0	0	0	172	13	31	19	0	0	8	0	0	314
Mantyluoto	0	0	0	0	0	0	0	0	—	14	31	5	0	0	2	0	0	—
Vaasa	19	30	12	10	0	7	4	0	214	1	31	31	31	0	12	19	0	460
Oulu	15	30	16	15	0	3	12	0	252	1	31	31	31	0	0	31	0	563
Roytaa	15	30	16	16	0	11	3	2	—	1	31	31	31	0	0	0	31	—
Lulea	15	30	13	6	0	13	0	0	252	1	31	31	31	0	1	30	0	656
Bredskar	17	30	14	0	0	14	0	0	—	1	31	30	4	0	27	1	0	—
Alnosund	16	30	15	0	0	12	0	0	156	1	31	28	19	0	9	12	0	424
Stockholm	0	0	0	0	0	0	0	0	108	15	31	17	3	0	17	0	0	234
Kalmar	0	0	0	0	0	0	0	0	57	17	31	15	0	10	3	0	0	115
Visby	0	0	0	0	0	0	0	0	48	0	0	0	0	0	0	0	0	58
Goteborg	0	0	0	0	0	0	0	0	65	0	0	0	0	0	0	0	0	118
Skelleftea	22	30	9	0	1	9	0	0	—	1	31	31	19	3	3	26	0	—
Aarhus	0	0	0	0	0	0	0	0	—	0	0	0	0	0	0	0	0	—
Copenhagen	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0
Oslo	0	0	0	0	0	0	0	0	101	0	0	0	0	0	0	0	0	309
Kristiansandsfjord	0	0	0	0	0	0	0	0	—	0	0	0	0	0	0	0	0	—

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

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

Greenland Sea. Air and sea temperatures were generally a few degrees above normal but nevertheless the ice situation in this area remained more severe probably than in any November in this century. At about 75°N the ice field continued to extend 150 miles further out to sea than average and although there was some opening up in the Denmark Strait the 30 miles gap between the pack-ice and the northern coast of Iceland was very narrow for this time of year. A notable event was recorded when on the 25th a German trawler, the *Burgermeister Schmidt,* hit an iceberg near Cape Farewell and had to be abandoned.

Spitsbergen. Conditions around Spitsbergen returned to normal but ice near Bear Island appeared earlier than usual.

Barents Sea. Except in the extreme east where, with sub-normal temperatures, ice was forming rather ahead of the normal timetable, conditions were much as usual.

White Sea. Freezing started late but during the month, with temperatures falling very rapidly, ice formation was accelerated and by the end of the period there was, in fact, more than usual.

Baltic. A warm start to the month was soon negatived by a long cool spell—up to 12°C below normal—and ice formed in northern inlets as early as the 11th November—the earliest for at least six years. Generally speaking freezing was a fortnight ahead with sea temperatures 2–4°C below normal (in a few places even more than this).

North Sea. Extremely early formation of new ice was reported near Husum on the 16th and close pack was evident for a few days. There was soon some opening up, however, and by the end of the period many of the inlets were clear again.

DECEMBER

Canadian Arctic Archipelago. Weather here returned to normal during the month and the ice situation remained very much as usual.

Baffin Bay and Davis Strait. Over the eastern half of these areas temperatures were slightly above average and there was, if anything, rather less ice than usual. To the west, however, temperatures were normal but there was a tendency for more than the usual amount of ice.

Hudson Bay, Foxe Basin and Hudson Strait. Generally speaking temperatures returned to normal and there was very little change in the ice situation, all parts being covered by close pack.

Labrador Sea. Although air temperatures varied greatly during the month overall it was not far from normal with the amount of ice as much as usual except that, with persistent north-easterly winds, pack-ice consolidated close to the coasts, especially in the Goose Bay area.

Grand Banks and South Newfoundland Sea. Near the coasts sea temperatures were one or two degrees below average but no ice was reported.

Gulf of St. Lawrence. Under the influence of a strong northerly wind freezing was slightly ahead of usual.

River St. Lawrence. As water coming from the Great Lakes was several degrees higher than average, icing was, over most of the month, delayed. However in the last few days rapid freezing took place.

Greenland Sea. Over the whole of this area air temperatures were well below average but curiously enough sea temperatures, especially in the Denmark Strait and southwards, were above average. North of latitude 70°N pack-ice extended about 50 miles further seawards than usual for the time of year but nevertheless there was a tendency for it to retreat as the strong north-easterly winds forced the pack against the coast. To the south, too, the ice belt narrowed as it consolidated. The sea passage north-west of Iceland was, in fact, more open than for at least a year.

Spitsbergen. Here ice development was roughly as usual with sea temperatures almost normal. Air temperatures towards the end of the month were, however, showing an alarming fall to over 10°C below seasonal mean.

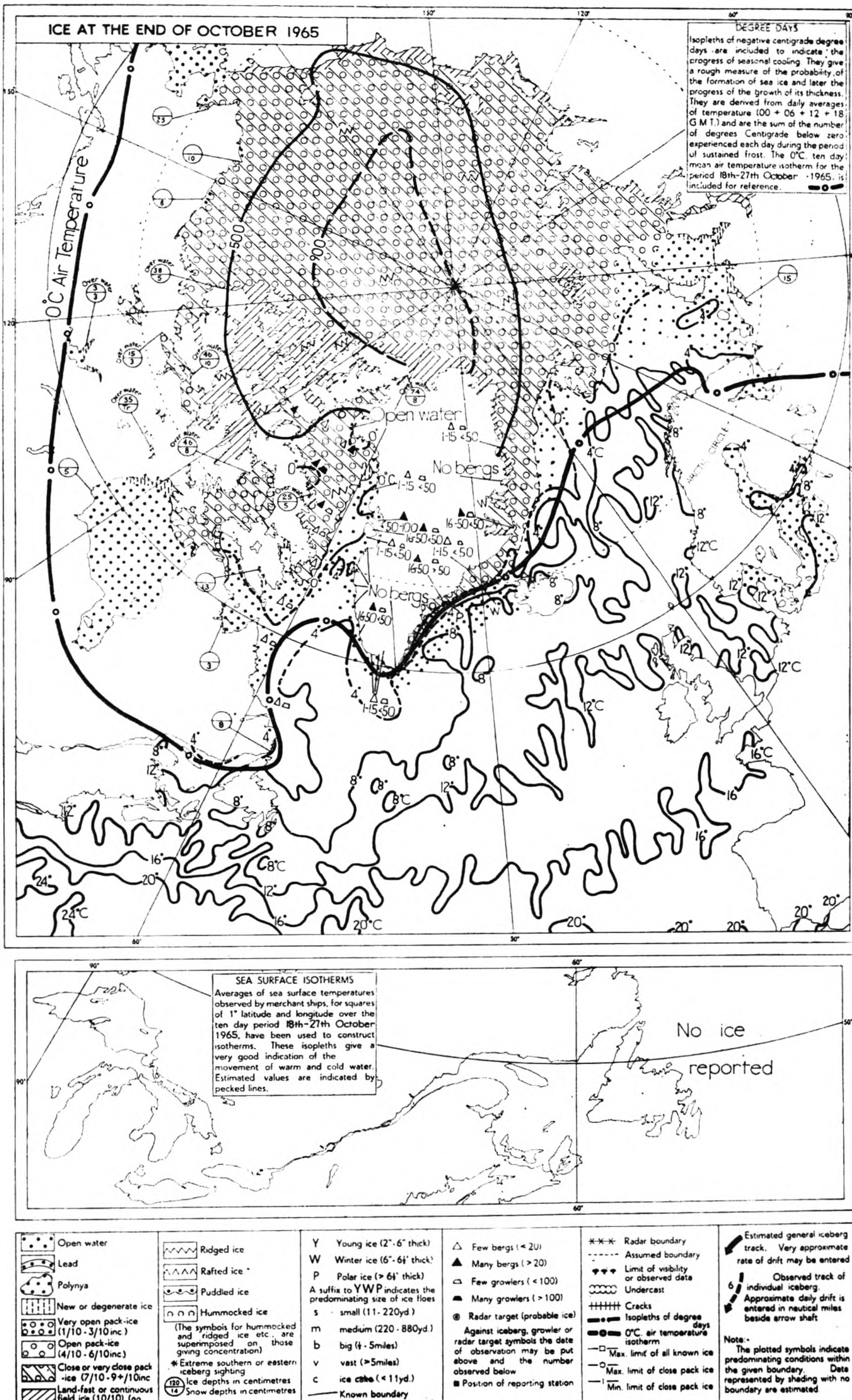
Barents Sea. Both air and sea being cool there was more ice than usual. In the north, indeed, the ice limit was 50 miles south of normal.

White Sea. Here freezing caught up, after a slow start, and by the end of the month there was generally more close pack than usual.

Baltic. With both air and sea temperatures as much as 4°C below normal, freezing was well ahead and there was, in fact, in the Gulf of Bothnia, more ice than for at least five years. In the extreme south, with rather violent fluctuations in temperature, ice formed and dispersed and the month closed with virtually none along the German and Polish coasts.

North Sea. In spite of the November freeze-up in some of the inlets no ice was reported in December although the sea, especially along the German and Danish coasts, was noticeably cooler than usual.

Note. The notes in this article are based on information plotted on ice charts each month, similar to the map shown, but on a much larger scale (39 in × 27 in). They 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.


ICE AT THE END OF OCTOBER 1965
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 (00 + 06 + 12 + 18 G.M.T.) 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 18th-27th October 1965 is included for reference.
0°C Air Temperature
Open water
No bergs
No bergs
ARCTIC CIRCLE
SEA SURFACE ISOTHERMS
Averages of sea surface temperatures observed by merchant ships, for squares of 1° latitude and longitude over the ten day period 18th-27th October 1965, 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.
No ice
reported
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
Ice depths in centimetres
Snow depths in centimetres
Y Young ice (2"-6" thick)
W Winter ice (6"-6½' thick)
P Polar ice (> 6½' thick)
A suffix to YWP indicates the predominating size of ice floes
s small (11-220yd.)
m medium (220-880yd.)
b big (½-5miles)
v vast (>5miles)
c ice cake (< 11yd.)
Known boundary
Few bergs (< 20)
Many bergs (> 20)
Few growlers (< 100)
Many growlers (> 100)
Radar target (probable ice)
Against iceberg, growler or radar target symbols the date of observation may be put above and the number observed below
Position of reporting station
Radar boundary
Assumed boundary
Limit of visibility or observed data
Undercast
Cracks
Isopleths of degree days
0°C. air temperature isotherm
Max. limit of all known ice
Max. limit of close pack ice
Min. limit of close pack ice
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

Book Review

Seamen and the Sea—a Collection of New Sea Stories by Merchant Seamen. Edited by Ronald Hope, O.B.E., M.A., D.Phil. 5½ in × 8 in, pp. 223, *illus.*, George G. Harrap & Co. Ltd., 182 High Holborn, London W.C.1, in co-operation with the Seafarer's Education Service. 1965. Price: 18*s*.

This is a collection of twenty-four stories, essays and articles, all previously unpublished, which arose from a competition organized by the Seafarer's Education Service. None of the authors, therefore, is a professional writer, for many of them their entry will probably have been a maiden attempt, but each story deals with what he regards as an unusual or exciting personal experience at sea.

The geographical range of the stories is large, from the Weddell Sea of Shackleton's day and his 5 month drift on an ice floe, to getting supplies through by sea to DEW-line stations in the high Arctic at the present time, and from the wreck of a barque on a Pacific coral atoll to the bull which broke loose in the hold of a very small coaster in stormy weather on passage to Lundy Island.

Equally large is the range of experiences portrayed: the youngster making his first voyage, the seaman trapped in the chain locker when the cable started to run out ('the grimmest game of skipping rope anyone ever played') and the apprentice who found himself involved in political intrigue in Vladivostock in the 1920's.

We find, to our pleasure, that some of the authors are, or have been, members of the Corps of Voluntary Marine Observers and have, in consequence, personal record cards in this office. The senior of these, in point of voluntary service for us, is a radio officer, still playing his part in the work of a Selected Ship who has recalled his eighth birthday when his father sailed him down the Medway and he came face to face with King Edward VII at Sheerness. A senior shipmaster, likewise still observing, contributes the story of his passing for Second Mate before one of the old school of examiners whilst one of our present day deck officer observers has chosen for his theme a passage which he made through the Magellan Straits in an 'Empire-boat' just after the war.

These are plain tales, cleanly told without literary embellishment and quite charming to read. One cannot but feel that each experience recounted might well have happened to ones own self, though the ability to set it down in this way might not be forthcoming.

Indeed, Dr. Hope and his Seafarer's Education Service must be congratulated on bringing out so much of the latent literary talent which undoubtedly exists amongst seafarers today.

L. B. P.

Personalities

RETIREMENT.—CAPTAIN E. A. DIVERS, C.B.E., R.D., retired from the sea on 7th November 1965.

Son of a Norfolk schoolmaster, Eric Arthur Divers joined the Training Ship *Worcester* in 1920. After serving his apprenticeship in the Ellerman & Blue Funnel Lines and obtaining his Master's Certificate, he joined the Cunard Line as Junior Third Officer of the *Berengaria* in 1930.

During the second world war Captain Divers commanded Ocean Boarding and Headquarters ships and was present at the landings in Sicily and Salerno. Whilst off the Lizard in H.M.S. *Registan* in 1941, his ship was severely bombed. In 1942 he was mentioned in despatches and awarded the O.B.E.

Returning to the Cunard Line in 1945 he was given his first passenger liner command, the *Ascania*, in 1948. In 1957 he was appointed Commodore in the Royal Naval Reserve and shortly afterwards was appointed C.B.E.

In 1962 he had risen through the Cunard fleet to command the *Queen Mary*, his favourite ship, in which he had served in almost every rank from the time he first joined her as a Junior Officer in 1936, a few months after her maiden voyage.

Captain Divers sent us the first of his 87 voluntary meteorological logbooks in 1930 when he was in the *Berengaria*. During his 17 years of observations he received three Excellent Awards, in 1934, 1937 and 1960.

We wish him health and happiness in his retirement. D. M. MacL.

RETIREMENT.—COMMODORE F. G. WATTS, R.D., retired from active service in the Cunard Line on 11th December 1965, his 63rd birthday.

Frederick George Watts went to sea as a cadet in the Brocklebank Line in 1919 and joined the small Cunard freighter *Virgilia* as 3rd Officer in 1925.

When war broke out in 1939 he was 2nd Officer of the *Queen Mary* but, as an officer of the permanent Royal Naval Reserve, he was soon called up to serve in the Royal Navy. He saw active service at Dunkirk, Crete and Greece and commanded H.M.S. *Minna* in special operations in Norwegian waters.

Returning to the Cunard Line after the war, he received his first command, the *Assyria* in 1951; since then he has commanded many ships of the Cunard fleet. In January 1963 he was appointed Commodore of the Company and joined the flagship *Queen Elizabeth*.

In October 1962 he docked the *Queen Mary* in New York without the aid of tugs, during the tugboat strike and during the winter of 1963–64 he docked the *Queen Elizabeth* in New York without the aid of the usual six tugs on four separate occasions whilst a tug strike almost paralysed shipping on the American coast.

Commodore Watts, who has been a voluntary observer for 23 years, sent us his first meteorological logbook from the *Vasconia* in 1926; out of the 54 logbooks which he subsequently sent us, 28 were classed 'Excellent'. In 1958 he gained the special award of a barograph.

We wish him health and happiness in his retirement. D. M. MacL.

Notice to Mariners

'LINK' CALLS TO THE METEOROLOGICAL OFFICE, BRACKNELL

Mariners whose ships are equipped with radio telephone are advised that for the cost of a 'link' call to Bracknell they can talk direct to the Deputy Forecaster on duty in the Meteorological Office, and obtain from him a weather forecast for any specified period up to 24 hours from the time of issue, with a further outlook for 24 hours if required. This service relates to areas within the regions contained by the parallels of 65°N and 35°N, and between the meridian of 40°W and the coasts of the continent of Europe. This service is available at any time of the day or night. The telephone number is Bracknell 20242 extension 508. This is obviously very much quicker and more satisfactory than obtaining the information by W/T.

Notice to Marine Observers

RADIO WEATHER MESSAGES IN THE GUAM AREA

As from 12th November 1965, facilities for reception of ships' radio weather messages in the Guam area have been augmented as follows:

Station NPN-Guam has been replaced by station NRV in the same position and keeps a 24 hour watch on 500 kc/s, 8 mc/s, 12 mc/s and 16 mc/s. Ships' radio weather messages should now be addressed METEO Guam.

ERRATUM

The Marine Observer, January 1966, page 40. The late CAPTAIN G. RAMAGE died whilst in command of the *Sicilia*, not *Cilicia*.

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