M.O. 717

The Marine Observer

A quarterly journal of Maritime Meteorology

Volume XXXII No. 198

October 1962

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State of Sea Card

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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

The leading article in the *Financial Times* of 21st June was headed "Potatoes for the Chancellor" and discussed the adverse affect on the cost of living due to increased cost of "seasonally sensitive food stuffs", which includes meat, fruit, vegetables, potatoes and eggs. It emphasised the big effect that the price of potatoes has upon the cost of living index, and suggested that an appreciable fall in cost might not take place till August, "since crops are exceptionally late". In the same paper was another article, by the Commodities Editor, in which he suggested that what happened about many commodity prices "depends almost entirely on the weather". He pointed out that meat prices were affected by the weather, because in this instance supplies of domestic lamb were held up by the effect of poor spring weather on pasturage. Also, looking further afield, he reminded us that the price of pears at that date was due to shipments being delayed by poor weather in Australia and that the size of the home crop of fruit would "of course owe much to the weather".

It is not perhaps surprising that the *Financial Times*, which has to be businesslike and practical in its approach, should discuss the weather in relation to food stuffs. It is fairly obvious that all agricultural produce, whether it be a plant or animal product, is largely dependent upon the weather and that the cost of living is intimately affected thereby.

In the United Kingdom and Europe generally, even though freak seasons do occur when there are short-term shortages of certain commodities, we are blessed with such a variable climate that these shortages rarely assume very serious proportions. We have a lot to thank the North Atlantic for—and the Gulf Stream.

In parts of the Far East and Middle East they are not so lucky. Adverse weather conditions may very easily and surprisingly quickly cause serious losses to crops and consequent distress and even famine, instead of merely causing a slight increase in the cost of living. A lot of money and effort is expended by the meteorological departments of various countries nowadays in providing weather bulletins and forecasts and climatological advice to anybody who needs it. These activities are ably co-ordinated by the World Meteorological Organisation. But the meteorologist has no control over the weather—all he can hope to do is to give the most useful and practical advice that he can so that agriculturists and others whose job it is to provide food for the world, and to organise its distribution, can be forewarned and take whatever precautions are practicable or necessary. The meteorological advice can be a combination of forecast and of climatological study.

The produce we obtain from the sea is similarly affected, directly or indirectly, by the weather. The surface currents are induced by the winds and are affected by variations of surface temperature and these may in turn affect the deeper currents and influence the movement or growth of plankton or of fish themselves. The direct effect of wind and waves upon the business of catching the fish and upon the time taken to get to the market is evident, and there is the added possibility of climatological factors making a long haul necessary from the fishing ground to the port and the allied risk of deterioration of the catch due to variations in temperature.

Thus meteorology and oceanography are inter-dependent. And the meteorologists and the oceanographers need to work together in order to learn more about what happens in their respective realms of atmosphere and hydrosphere. Some of the most important problems they need to study are those involved in the interaction between ocean and atmosphere. These are frequently fundamental to the whole machinery of weather and require the detailed study, in the first instance, primarily of sea temperature, wind and radiation.

The International Indian Ocean Expedition gives the meteorologists and oceanographers a chance of getting together and studying in some detail an ocean which is bordered by countries, the populations of which are seriously affected by weather conditions insofar as their food products are concerned. Voluntary observers serving in merchant ships can play a very useful part in this project. Oceanographical research ships from various countries will form the 'backbone' of the investigations, and the scientists aboard the ships will make numerous oceanographical and meteorological observations throughout the period of the expedition (primarily 1962 to 1964 inclusive). It is hoped that these ships will make upper-air as well as surface meteorological observations. H.M. Survey Ships *Cook*, *Dalrymple*, *Dampier*, *Owen* and *Vidal*, and the newly launched research ship *Discovery* belonging to the National Institute of Oceanography, will take part in this scheme. The general network of surface meteorological observations will need to be provided by the merchant ships and every effort is being made both to encourage all Selected Ships to send radio weather messages every 6 hours whenever they are in this ocean, and to recruit as many Auxiliary Ships as possible to assist in this work when in the Indian Ocean. The Auxiliary Ships will, as usual, only be asked to report the first five groups of the 'ship code' (F.M.23B).

When in the Indian Ocean the Selected Ships are being asked to be particularly conscientious about recording, in their logbook, the time of commencement and cessation of rainfall, and to include remarks about the intensity of rainfall, and the occurrences of hail and thunderstorms. The importance of rainfall observations in the Indian Ocean is fairly obvious.

All the observations made by voluntary observing ships in the Indian Ocean during the period of the expedition (including the precipitation observations) will be punched on to cards and will then be forwarded to the Netherlands Meteorological Service, which has accepted the responsibility of processing the data, and tabulating it in a suitable form for eventual scientific study by the India Meteorological Department and the meteorological departments of other countries which are particularly interested in this area.

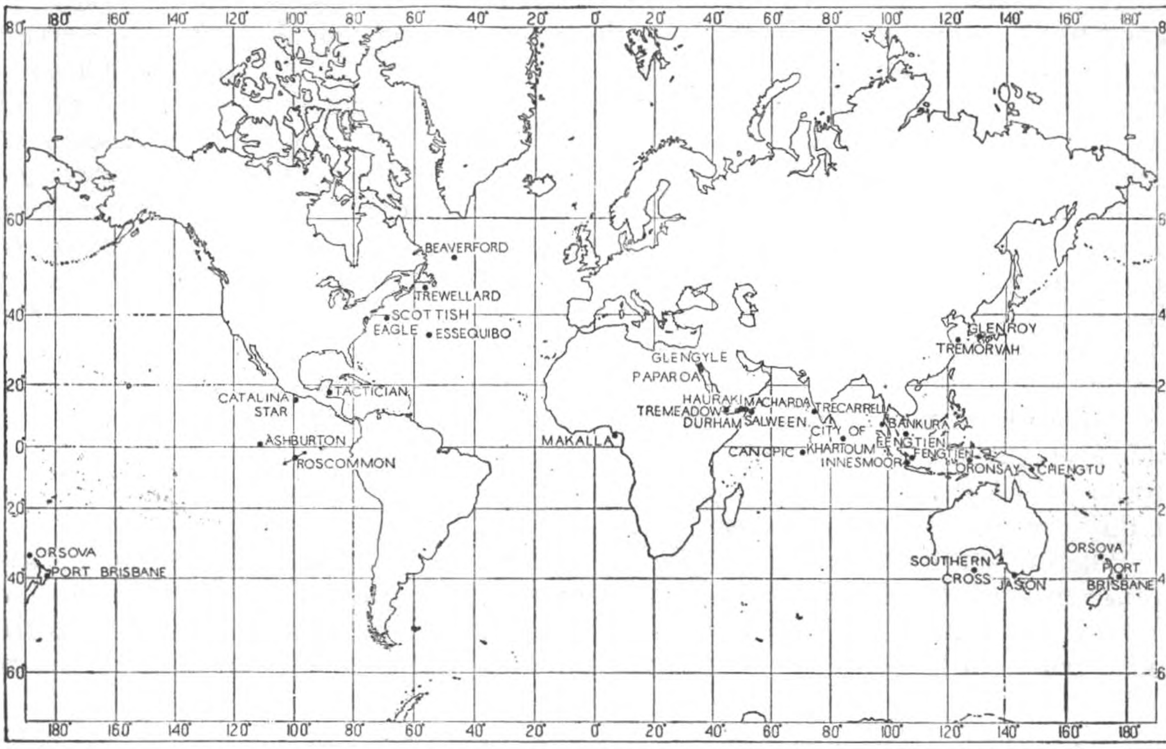
C. E. N. F.

THE MARINE OBSERVERS' LOG

October, November, December

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

It sometimes happens that we are unable to offer an explanation for phenomena reported (e.g., the observations from *Glengyle*, *City of Khartoum*, and *Canopic* on pages 183–6). In such cases we shall be very glad to hear from any reader who can put forward an authoritative or a possible explanation, which could be published in this journal. We should also be glad to hear from any reader who has witnessed a similar phenomenon in the past, but which has not previously been communicated to us.



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

HURRICANE 'HATTIE'

Caribbean Sea

m.v. *Tactician*. Captain W. S. Eustance. Observers, the Master, Mr. R. B. Simmons, Chief Officer, Mr. T. G. Oxley, 2nd Officer, Mr. G. Lumley-Jones, 3rd Officer and Mr. A. S. Broadbent, Radio Officer.

25th October 1961. When on passage from Tampico to Belize, there were clearly signs of a hurricane in the area. When rounding the Yucatan peninsula there was little, if any, current; the Trade winds were very light, weather fine; barometer was slightly below normal, with no diurnal variation. Washington and Miami weather reports were followed closely, and eventually a hurricane, 'Hattie', was located by reconnaissance aircraft. It did not constitute a danger to the Belize area, but developments were watched closely. [The subsequent track of 'Hattie' is shown in the map on page 198.]

29th October, ship at Stann Creek. 0800 local time—wind NW, force 3, blue sky and fine weather; barometer 29·80 in. (1009·1 mb.), steady. These conditions continued throughout the day, but there was no diurnal range. The ship returned that evening to Belize to finish loading. Hattie was moving N and NW in 18° 24'N, 82° 24'W, at 7 kt., with forecast wind speeds of 110 kt.

30th October. At 1000 local time (1600 GMT) Hattie was reported in 18° 18'N, 84° 54'W, moving WSW at 7 kt.—lowest pressure 924 mb. and highest winds 130 kt.—a threat to the Chetumal–Belize area. Heavy seas were reported breaking on the outer reefs, so it was decided to move to deeper water south of Grennel's Cay.

At 1600 the hurricane was located in 18° 06'N, 85° 48'W, moving WSW at 8 kt., highest winds estimated at 130 kt., gusting near to 175 kt. By this time the ship was anchored about 5 miles S of Grennel's Cay and all battened down ready. Barometer 29·70 in. (1005·7 mb.), steady; wind, W, force 5; cloud, nimbostratus, overcast with light showers. This position is about midway between Stann Creek and Belize, with depths of 9 to 11 fm., and would give a reasonable amount of shelter from the reefs.

At 2000 the barometer started to fall slowly, 29·65 in. (1004·0 mb.); wind WNW, force 6–7; sky heavily overcast, with moderate showers. Radar showed only light rain within 40 miles. Vessel, though in light condition, lying quietly with 90 fm. on the starboard anchor.

31st October. By 0200 the wind had increased to force 10 from WNW and a short sea was rising. Sky heavily overcast, with frequent showers, but still no rain concentrations visible on radar. (Shortly afterwards the scanner motor stopped owing to the high wind and list of the ship.) The port anchor had been dropped earlier and the ship was sheering about. This was easily corrected with a touch of 'dead slow' on the engines. The lights of Belize at 15 miles, also the lights of English Cay and Colson Point, were clearly visible.

At 0215 the wind had reached hurricane force from WNW and the ship started to drag, measured as 2 miles in 25 min., and lay beam on to the full fury of an increasing wind and a rising sea. Being in the lee of the land it was rather surprising that the sea was so high, as if the wind was blowing down, rather than horizontally. By going astern on the engines, as the ship would not come up into the wind, a reasonable 'course' would be made good, and the port quarter was coming up into the wind. During an easing of the wind to about force 9 attempts were made to head her into the wind but without success, and the resultant 'course' set her definitely towards the lee shore.

At 0300 the wind was stronger than I have ever before experienced in my life. Still maintaining a WNW direction, it was listing the ship over to an angle of 20°, with the short steep sea pushing her another 15 or 20°. Barometer 28·50 in. (965·1 mb.), falling rapidly. Sea, spray and rain everywhere.

At 0400, wind WNW estimated at 150 kt. The wind recorder at Belize airport was later reported to have collapsed when showing 175 m.p.h. (154 kt.). Heavy rain, but not so much as I would have thought with a barometer of 27·67 in. (937·0 mb.) and such a steep fall.

At 0500 the Chief Officer read the aneroid as 27·30 in. (924·5 mb.) and at 0515 the Radio Officer read it as 27·40 in. (927·9 mb.), at which time the wind dropped suddenly to a moderate breeze. The anchors were hove in for examination, as the drift had been so much that one would have thought that there were no anchors there at all. The ship was re-moored in a position well to windward, in anticipation of a complete reversal of wind direction and an increase of wind force.

During the lull, the moon (a very sickly one) and a few stars were seen among the flying scud which was coming from an ESE direction. Hundreds of birds, alive and dead, were clustered around the funnel, among them a few parrots who were probably speechless. A short confused sea and swell were running but the main swell direction was from SE and gradually increased until, at 0600, the wind had settled at SE force 5–6 and the barometer had risen to 27·60 in. (934·6 mb.).

At 0615 the wind had increased to hurricane force and the barometer stood at 27·72 in. (938·7 mb.). The sea was rising and seemed to have more force behind it, probably due to the rise in water level covering the reefs. The forecast rise was 15 ft. but I believe it rose about 10 ft. in Belize. The noise of the rising wind was incredible; spray and heavy rain everywhere.

The ship soon came beam on and, heeling over as before, refused to come up into the wind. Manœuvres as before were resorted to, i.e., going astern, canting the port quarter up to wind, and making a safe 'course' whilst dragging the anchors.

At 0700, barometer 28·10 in. (951·6 mb.), the wind reached its greatest velocity, ESE more than 150 kt. The sky was still heavy with cloud, but it seemed to be higher. Conditions were still very uncomfortable for everyone, but there was a feeling of relief that the centre had passed. The rain came in squalls, but still not so heavy as anticipated, and the barometer showed a steep climb.

At 0900 the wind had eased to about 65–70 kt.; the ship responded to the helm and engines and was brought head to wind, a position which could be maintained with frequent movements of 'slow ahead' and 'stop', keeping her comfortably between the anchors which had a good spread. Barometer 29·33 in. (993·2 mb.); wind ESE, force 12; visibility 3 miles.

By noon the wind had eased to force 9 and the ship was lying quietly. Definite cloud was forming and lifting. The cays could be seen at 4½ miles, though they looked strangely different with the tops off all the trees, where there were any left at all. Barometer 29·63 in. (1003·4 mb.), and the steep rise checked.

An hour later we returned to Belize with an easterly gale blowing, to find the city devastated. It was noticed that all channel beacons had been destroyed and shipping was informed by radio. The sea was a milky colour, littered with palm trees and many dead fish. On reaching the Belize anchorage, depths about 4 ft. more than usual were noted. From this point the ship's company were otherwise engaged and weather observations were subordinated to more urgent calls.

The weather reports from Washington and Miami were very informative and show the value of reconnaissance aircraft reports. That Hattie took a course different to that which was anticipated shows the value of frequent 'on the spot' reports. I quite believe their wind speed estimates as the wind blew very much stronger than I have ever before experienced, the ship being anchored, not giving those extra 'under way' noises.

I feel that had the ship been in a position to get out into the open sea, damage would have been more serious, with the higher sea and swell. As it was there was a little minor, almost insignificant, damage to deck fittings.

The weather was not really settled two days afterwards when *Tactician* left Belize at 1530 on 2nd November. The barometer had been steady at 29·78 in. (1008·4 mb.) throughout the two days, but showing no diurnal range.

Note 1. Mr. Gordon E. Dunn, chief district meteorologist of the United States Weather Bureau at Miami, comments:

"The several radio reports received from the *Tactician* during the passage of the hurricane were very helpful since, at the time, communications with Belize had broken down.

"The minimum pressure experienced by *Tactician* agrees exactly with that reported by the Navy reconnaissance plane at about the same time".

Note 2. *Tactician* was not a voluntary observing ship at the time this record was made, and so we are indebted to Captain Eustance for sending us this detailed account of 'Hattie'. (An article about the history of 'Hattie' appears on page 197.)

EMBRYO WATERSPOUT

Gulf of Guinea

s.s. *Makalla*. Captain G. J. Kenyon. Takoradi to Santa Isabel. Observers, Mr. H. R. Owen, 3rd Officer and Mr. P. L. Brown, Radio Officer.

29th November 1961. During a heavy rain squall at 1235 GMT, a circular patch of agitated water was sighted about 50 yd. away on the starboard bow. On closer inspection it was found to be approximately 60 ft. in diameter, the water within the circle being whipped round in an anticlockwise direction. At the centre, the disturbed water was apparently about 18 in. above the level of the surrounding sea. Air temp. 81°F, wet bulb 78°, sea 82°. Wind NE'ly, force 3.

Position of ship: 4° 00'N, 6° 25'E.

Note. The events reported by s.s. *Makalla* took place in warm moist unstable maritime tropical air over a very warm sea. Maritime air flowing into the Gulf of Guinea usually originates from the south. However, the NE'ly wind and the rain squall suggest that unstable conditions had brought high level (from more than 2,000 ft.) NE'ly air to the surface which would tend to suppress waterspouts.

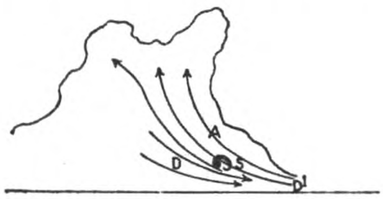
ROLL TYPE THUNDER CLOUD

Australian waters

s.s. *Jason*. Captain R. T. Harries. Adelaide to Melbourne. Observers, the Master and Mr. P. Dodge, 2nd Officer.

15th December 1961. At 0300 GMT, while on passage between Cape Nelson and

Cape Otway, a very unusual cloud formation was observed about 10 miles northward of the vessel—apparently it was the base of a towering Cb. cloud whose top



KEY: A—ascending air; D—descending air; D[1]—wind gust (squall); S—squall or roll cloud.

was not visible. As the cloud, moving in a southerly direction, neared the ship, it was seen that the centre, from which extremely heavy rain was falling, was surrounded by a 'roll-type' cloud: beyond this the rain cleared. The height of the base was estimated as being less than 1,000 ft. The vessel was under the main cloud from 0345 to 0355, and just passed under the edge of the rain. There was very heavy rain and occasional thunder and lightning. While the 'roll-type' cloud was above the ship, it seemed to be moving in a clockwise direction about the rain centre.

As the vessel cleared the cloud, radar showed that the cloud was about 20 miles in length, from N to S. Heavy rain and a moderate SE'ly breeze were experienced for some time after passing under the cloud. The barograph did not show any definite tendency during the period, but was merely unsteady.

Position of ship: 38° 44'S, 142° 32'E.

Note. The Director of the Australian Bureau of Meteorology, Sydney, comments:

"On 15th December there was a small depression over Western Bass Strait and some thunderstorm activity was reported in south western Victoria. Although the chart did not show any marked cold front, local thunderstorms and possibly an associated line squall would have been experienced within the low pressure area.

"Although normally the roll cloud and line squall would be accompanied by a squall on the surface there have been isolated cases in which this was not so. The roll cloud exhibiting considerable turbulence within itself passed overhead at 1,000 to 2,000 feet without rain or any marked surface change.

"A fully developed thunderstorm cloud has an initial wind squall and a squall or roll cloud in its advancing edge. However, in a good many cases either or both of those phenomena are ill defined."

CHANGES IN AIR TEMPERATURE

Australian Bight

s.s. *Southern Cross*. Captain L. H. Edmeads. Fremantle to Melbourne.

8th October 1961. Shortly after sunset at 0935 GMT, a deep red sky coloration was observed below the cloud base, which appeared almost solid. The air at the time was slightly sand laden. At 1015 the air suddenly felt very warm and the temperature was observed to rise from 60°F to 76° in about 5 min. The reading fell back to 62° five min. later.

During this time the wet bulb, which was about 57°, showed no appreciable change. The sky was partly cloudy; the air was very dusty and with a slight indefinable smell. Wind, N, force 5.

Position of ship: 37° 12'S, 129° 30'E.

Note. At this time pressure was high over southern Australia and to the west of Tasmania. Hot dry tropical continental air flowed a long way out to sea from the desert areas of western Australia. s.s. *Southern Cross* experienced frontal conditions where desert air after passage over the sea was flowing above air originating from colder regions to the south. It appears from the cloud that the desert air was probably only at about 1,000 to 3,000 ft. and during a vertical exchange some hot dusty air descended to the surface causing a rise in temperature, the dustiness and strange smell.

ELECTRIC DISCHARGE

Arabian Sea

m.v. *Trecarrell.* Captain I. M. Price. Cochin to Madras. Observer, Mr. W. G. Bothwell, 2nd Officer.

12th December 1961. At 2210 GMT there was a sudden sharp crack as an electric discharge was seen on the damp timber deck of the bridge wing. A fragment of metal was picked up at the spot where the flash occurred. About 20 min. previously a similar discharge had occurred, on the lower bridge deck. Occasional large cumulus clouds had been passing overhead, giving slight showers. Air temp. 80°F, wet bulb 75°, sea 80°.

Position of ship: 12° 10′N, 74° 50′E.

Note. Instances of ships at sea being struck by lightning are not frequent and this observation appears to be the first we have received of the strike being on the bridge. In February 1958 m.v. *Trelissick* was struck on the radar scanner (*The Marine Observer,* January 1959), but of the other 16 strikes published in this journal, 14 have been on the foremast and 2 on the mainmast.

SEA SMOKE

Japanese waters

m.v. *Glenroy.* Captain D. Stewart. Kobe to Tsingtao. Observers, the Master and all officers.

29th December 1961. As the vessel approached Shimoneseki Strait around 0700 SMT, a violent snowstorm was encountered which reduced visibility to about 400 ft. When the snow moved away, dense sea smoke was seen to be widespread. Rain and thick fog were experienced during the passage of the Strait, but sea smoke was again observed after the ship had cleared the area. It prevailed to a distance of approx. 3 miles from the shore. Air temp. 35°F. No sea temp. available (being a Supplementary Ship, *Glenroy* does not observe sea temperature).

Position of ship: 34° 00′N, 130° 30′E.

1st January 1962. Sea smoke was again encountered when the vessel departed from Tsingtao. It continued from the shore to a distance of approximately 6 miles out to sea. Air temp. 27°. No sea temp. available.

Note. m.v. *Glenroy* was very near the North Pacific mean polar front (see *The Marine Observer,* April 1960, p. 74). Outbreaks of continental polar air from the landmass of Asia towards the sea are frequent during December and January over Korea. The sea smoke and snow are typical of this situation, the air being very cold and the sea relatively warm.

Korean waters

m.v. *Tremorvah.* Captain E. D. Stewart. Inchon to Naha. Observers, Mr. A. J. Washbourne, 2nd Officer and Mr. F. A. Ryan, Radio Officer.

28th December 1961. The vessel passed through a bank of sea smoke at 1445 SMT. Ten min. later the sea smoke dispersed. Air temp. 34·8°F, wet bulb 34·5°, sea 58·2°. Wind NW′N, force 6. $\frac{6}{8}$ low Cu.

Position of ship: 33° 37′N, 125° 52′E.

Note. See Note to above observation. The sea smoke reported here arises in a similar example of an outbreak of continental polar air. The low air temperature and relatively high sea temperature again produced sea smoke.

ABNORMAL CURRENT SET

off St. Pierre Island, Newfoundland

m.v. *Trewellard.* Captain D. L. Lacey. London to Dalhousie.

18th–19th October 1961. During the $6\frac{1}{2}$ hour period from 2200–0430 GMT, while the vessel was stopped for engine repairs, a steady set, 052¾° for 11 miles, was experienced. The ship was light and the wind was SW, force 3–4. Initial bearings were checked by radar and subsequent bearings checked visually.

Position of ship at 1900: Pointe Plate Light bearing 089½° at 25·2 miles.

Position of ship at 0130: Pointe Plate Light bearing 111° at 18 miles.

Note. Sets in the direction indicated, i.e. onshore and therefore potentially dangerous, are frequently experienced off southern Newfoundland. In this case the ship's movement seems to have been a combination of current and drift due to wind and sea. Investigation of the movement of ocean weather ships when stopped has emphasised that drift due to wind and sea can be greatly in excess of that due to current.

CURRENT AND TIDE RIPS

Red Sea

s.s. *Paparoa.* Captain P. R. Moulton. Aden to Suez. Observers, Mr. R. C. Anderson, Chief Officer and Mr. C. H. J. Brownings, 4th Officer.

20th October 1961. At 0305 GMT when the vessel was abeam of Dædalus Reef Lighthouse a tide rip was sighted a short distance ahead, lying in an ESE–WNW direction. On encountering the rip, the ship's head was sharply deflected some 4° to port of course, which had been held quite steady for 5 min. previously. The effect did not last and course was resumed within a minute. Wind, NW, force 2–3. Sea 75°F. Depth approx. 240 fm.

Position of ship: 24° 55′N, 35° 46′E.

Note. s.s. *Paparoa* observed this current rip where the cold water in the north of the Red Sea moving south descends below the warm, more saline water of the southern and central parts of the Red Sea.

Manipa Strait

s.s. *Oronsay.* Captain R. W. Roberts, O.B.E., D.S.C. Manila to Sydney. Observers, Mr. J. L. Chapman, 2nd Officer and Mr. P. J. Quinn-Young, 4th Officer.

27th November 1961.

GMT

0530 Suanggi Lighthouse 119°–9·3 miles. Tide rips experienced. These were running in an ENE–WSW direction, were about a mile long and a few hundred feet—roughly a ship's length—in width. The steering was briefly affected in a minor way, the ship being deflected 2½° from her course.

0535 A brilliant white patch was sighted on the surface about a mile distant. The vessel passed this close to starboard and it was seen to be a patch of bubbling white foam quite intense and reminiscent of an advertisement for washing powder. Pear-shaped, with the more pointed tip to the south, the patch was about 15 ft. across on its longest axis, and was orientated in a NNW–SSE direction.

0540 Suanggi Lighthouse 097°–6·7 miles. More patches of white seen on the surface, less brilliant and smaller in extent, spread in a NW–SE direction.

0548 Suanggi Lighthouse 069°–5·9 miles. Further tide rips—these were more extensive, the limits not readily defined and affected the ship more (15° of port helm was required to maintain course). Sea temp. 83°F; wind N'W, force 2. Course 157°, speed 21·4 kt. By calculation the tide in Manipa Strait was setting in a NW'ly direction—about half flood. Current was likely to have been setting in a SE'ly direction and in fact a favourable set of about ¼ kt. was experienced while approaching and negotiating the Strait.

Position of ship: 3° 21′S, 127° 23′E.

Note. This is an area of fairly strong tidal movement and strong currents (frequently the current reaches 2 kt). There are exchanges of water between the north and south Pacific and the Pacific and Indian Ocean across the Moluccas and Banda Sea. Rips, vortices, and other phenomena associated with strong vertical exchanges within the sea must be frequently experienced in this area. This type of report is of interest to the biological as well as physical oceanographers.

DISTURBED WATER

vicinity of Salang Island, Malaya

m.v. *Bankura.* Captain D. C. Murison. Penang to Rangoon. Observers, the Master, Mr. J. W. Cole, Chief Officer, Mr. T. E. Roderick, 2nd Officer and Mr. J. C. Taylor, 3rd Officer.

2nd November 1961. Between 0000 and 1200 GMT long patches of disturbed and rippled water were observed; the wind was only force 2 from NE'N or NNE, there was no swell and the weather was fine. The echo sounder was working at frequent intervals and, except for a sharp increase in depth in 7° 50'N, 97° 50'E, no other differences in depth were noted.

Position of ship at 0000: 6° 48'N, 98° 48'E.

Position of ship at 1200: 9° 24'N, 97° 24'E.

Note. Dr. L. H. N. Cooper, of the Marine Biological Association of the United Kingdom at Plymouth, comments:

"I have plotted the positions on Admiralty Chart No. 830 (Bassein River to Pulo Penang) The position 7°50'N, 97°50'E lies over the break of slope between the continental shelf of Salang Island, Malaya, and a deeper shelf at about 250 m. There may have been some differential water movement at the break of slope causing the disturbed surface water. Also on Chart 830 a tide rip is shown about 20 miles west of this position.

"Such an occurrence is likely to lead to enrichment of the surface water with nutrients from below which should encourage growth of planktonic plants, planktonic animals and finally of pelagic fish which could have economic value.

"Echo-soundings and photographs, such as were submitted [but not reproduced here], are of much value. The best possible estimate of position is always wanted and is not easy to get even on ships whose job it is to conduct research. The astronomical fixes before and after the event together with the navigator's own estimate of position at the time should always be given; best of all are fixes at the time by any of the aids to navigation such as Decca, Loran or radar. Officers may rest assured that the extra trouble brings its reward for the back-room boys, often many years after the observations have been made."

FALL OF SEA TEMPERATURE

North Atlantic Ocean

m.v. *Scottish Eagle.* Captain P. N. V. Rewell. Puerto La Cruz to Portsmouth (New Hampshire). Observer, Mr. G. Holder, 3rd Officer.

31st October–1st November 1961. The following changes in sea and air temperature were observed while the vessel was passing from the Gulf Stream into the Labrador Current. Course 358°. Speed 14 kt.

GMT	2300	2315	2330	0030	0100	0130	0200	0230	0240	0300
Position	39° 08'N 69° 02'W	—	—	—	—	—	39° 48'N 69° 04'W	39° 56'N 69° 04'W	—	40° 03'N 69° 05'W
Sea temp., °F	68	68	67·5	68	67	66·7	67	57	56·1	55·5
Air temp., °F	68	—	—	—	—	—	—	—	—	60

Note. This is an interesting example of the high rate of horizontal change of sea surface temperature at a well-known discontinuity. It is of interest because the track is almost exactly northwards and accurate positions are given locating the time and position of the most rapid changes.

Tasman Sea

s.s. *Orsova.* Captain R. J. Craddock, O.B.E. Sydney to Auckland. Observers, Mr. G. K. Harrison, Chief Officer, Mr. C. I. Free, Junior 2nd Officer and Cadet G. Stoke.

8th December 1961. The ship crossed the 100 fm. line at 1740 SMT and entered a current rip running SE–NW. There was a fall of sea temperature from 66°F to 58°, but later on the temperature rose to 65°. The dry bulb reading fell from 66° to 64°, and the wet bulb from 66° to 63°. Wind SE, force 6.

Position of ship: 34° 12'S, 171° 51'E.

Note. s.s. *Orsova* probably experienced a current rip and sea temperature fluctuation associated with the area of tropical convergence N and NW of New Zealand. It is where water flowing SW'wards, driven by the Trade winds, converges with NE'ly flowing recurving water from the East Australian Current.

DISCOLOURED WATER

(See Note beneath s.s. *Fengtien's* observation)

Gulf of Aden

m.v. *Hauraki.* Captain E. F. H. Allen. Aden to Fremantle. Observers, the Master, Mr. G. Martin, 3rd Officer and Mr. M. Keat, 4th Officer.

9th November 1961. At 1300 GMT, the sea over a considerable area was seen to be discoloured, owing to the presence of long streaks of an orange-coloured substance. The streaks were about 3–4 miles long in a N–S direction and they extended for about a mile in an E–W direction. No solid matter was seen in the substance causing the discoloration. Sea temp. 82°F. Wind NE'ly, force 3.

Position of ship: 12° 06'N, 49° 32'E.

s.s. *Macharda.* Captain J. Lyle. Trincomalee to Aden. Observers, Mr. D. Hammond, 3rd Officer and Mr. J. H. S. Watson, Chief Radio Officer.

28th October 1961. While steaming along the African coast at 1945 GMT, 12 miles NW of Cape Guardafui, large patches of discoloured water were encountered, accompanied by a strong smell similar to that of seaweed, though it was not possible to ascertain if any weed was present or not. There was a sharp drop in temperature of both air and sea. Air temp. fell from 79° to 73°F and sea temp. from 82° to 75°. Wind calm.

Position of ship: 12° 09'N, 50° 32'E.

Gasper Strait

m.v. *Innesmoor.* Captain R. R. Jordan. Hongkong to Geelong.

18th October 1961. On approaching the Gasper Strait from the north a sandy coloured substance was seen floating on the water. It was lying in straight lines extending from the land (Billiton Island) to as far as the eye could see, in a NW direction. The lines were about 10 ft. wide and evenly spaced, being about 300 ft. apart. They were absolutely parallel, diminishing in intensity towards Ondiepwater and were seen continuously for 50–60 miles until the vessel cleared the southern entrance to the Strait. Sea temp. 82°F. Wind ESE, force 3.

Position of ship at noon: 4° 18'S, 106° 54'E.

vicinity of Billiton Island

s.s. *Fengtien.* Captain M. W. Lewis. Singapore to Djakarta. Observer, Mr. W. F. Jeffrey, 2nd Officer.

24th October 1961. At about 0600 GMT it was noticed that the surface of the sea, and the water underneath, were becoming greenish khaki in colour. When a sample of the water was examined it was found that the discoloration was due to the presence of a chaff-like substance. This was very variable in amount; in some places it seemed to be in great quantity, while in others there was little or none. In the densest parts the water was the colour of sand and the disturbance caused by the passage of the ship showed that the discoloration extended well below the surface of the sea. The substance responsible seemed to have a damping effect on the surface, similar to that caused by oil. It continued to be visible in patches during the afternoon; seaweed, jellyfish and coral snakes were also seen. Throughout the period the sea temp. remained at 84°F. The wind varied between calm and force 3.

Position of ship at 0700 GMT: 3° 38′S, 107° 25′E.

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

"*Hauraki* and *Macharda* almost certainly saw a *Trichodesmium* bloom, whilst similar algal blooms, most probably of other species of the same genus *Trichodesmium*, probably caused the phenomena reported by *Innesmoor* and *Fengtien*. These two sets of paired observations, as it were, in the same vicinity, nine days apart in the case of *Hauraki* and *Macharda*, and six days apart in the case of *Innesmoor* and *Fengtien*, have some value in showing how blooms may persist for a considerable period when conditions are not too turbulent."

ECHO SOUNDINGS

Hawke Bay

m.v. *Port Brisbane*. Captain E. E. Roswell. Auckland to Napier. Observer, Mr. A. Rattray, 3rd Officer.

14th December 1961. At 1400 SMT in 39° 27′S, 177° 18′E, echo soundings gave good bottom definition of 35 fm. An unusual 'double echo' type of trace was observed at 22 fm. The temperature of a sample of sea water was 61°F and the specific gravity 1·027. At 1410 in 39° 27′S, 177° 15′E, the 'double echo' trace was found at 20 fm.; the depth of the water was 34 fm. Sea temp. 54°; specific gravity 0·998. At 1420 in 39° 27′S, 177° 12′E, the sounding was 28 fm.; the 'double echo' was visible at 15 fm. Sea temp. 49°; specific gravity 1·000. At 1430 in 39° 28′S, 177° 09′E, the depth was 25 fm. and the 'double echo' was no longer visible. Sea temp. 60°; specific gravity 1·025.

Note. Mr. J. W. Brodie, Director of the New Zealand Oceanographic Institute, comments:

"The observations by *Port Brisbane* in Hawke Bay are of the phenomenon known as 'scattering layer', here appearing 13–15 fathoms above the bottom. The scattering material in the water is generally presumed to be organic and may be composed of plankton. The layer may reflect sufficient sound to appear on the record as a continuous narrow echo similar in appearance to the bottom. However, it is customarily discontinuous and with diffuse edges. On echo sounder settings where the outgoing signal and bottom can both be seen there is little chance of confusion—the scattering layer is generally a roughly constant depth below the surface or at a more or less uniform distance (as in this case) above the bottom. In these cases true bottom is the deeper echo. The case of a second echo being obtained from a double reflection from the bottom has to be distinguished: here the sound leaving the echo sounder transmitter is reflected from the bottom back to the ship and recorded; as well, part is reflected again from the sea surface, back to the bottom and up to the ship and recorded. The second echo appears as a slightly fainter trace below the true bottom and at double the true depth."

FLOATING COCONUTS

Eastern North Pacific Ocean

m.v. *Catalina Star*. Captain G. Bowden. Los Angeles to Panama.

6th December 1961. From daylight to sunset the vessel passed through coconuts floating on the surface of the sea. During the morning they were widely spaced, but later they became more frequent, especially towards the end of the afternoon when the sea was littered with them. At 1600 SMT the ship had to alter course to avoid running across a thick patch of branches, tree trunks and coconuts. Course 117°, speed 13·7 kt.

Position of ship at noon: 15° 30′N, 99° 07′W.

Note. Mr. Boyd E. Olson, Director of the Marine Sciences Department of the U.S. Navy Hydrographic Office, comments:

"The coconuts and other plant debris observed off the Pacific coast of southern Mexico on 6th December 1961 undoubtedly were blown down and washed to sea by the wind and rain of the tropical storm (Hurricane Hattie) which passed over Central America during the period 1st–3rd November 1961. The east to northeast hurricane-force winds and river runoff would account for the seaward dispersal of the material.

"Information of this type is very important to this Office both in publicising hazards to navigation and in our studies of obstructions to various types of marine operations."

PHOSPHORESCENCE

Gulf of Aden

m.v. *Tremeadow*. Captain W. Phillips. Aden to Suez.

17th July 1961. Between 2235 and 2245 GMT the vessel passed through phosphorescence, patches of which, 20 ft. wide by 50–100 ft. long, moved away from the vessel's sides at great speed towards S and N. The patches were of various degrees of brightness, but it was seen that the most brilliant were the fastest moving. Nearby ships' lights became hazy and indistinct, but visibility remained at 10 miles. There was no change in air or sea temp.; the wind was W, force 2–3.

Position of ship: 12° 36′N, 44° 34′E.

South China Sea

s.s. *Fengtien*. Captain M. W. Lewis. Hong Kong to Singapore. Observer Mr. W. F. Jeffrey, 2nd Officer.

17th October 1961. At 1815 GMT scattered patches of phosphorescence were observed, which were roughly oval in shape and covered an area of about 8 sq. ft. They were lying beneath the sea surface and gave off rapid light pulsations which, when observed through binoculars, seemed to consist of numerous separate flashing particles. The patches themselves emitted a dull white glow of about 2 sec. duration at intervals of 2 sec. They increased in number until, at 1840, the whole sea seemed to be pulsating, producing the effect of distinct waves of light approaching from the south, and carrying on past the vessel to the north. As the ship passed through the area, the waves of light backed to the east and slowly decreased in intensity as the patches became more scattered. Towards 1900 they were only very infrequently seen. At the height of the display the Aldis lamp was shone on the water, which was observed to be an extremely vivid blue, but nothing of a solid nature could be seen. A sample of sea water obtained at this time was found to be perfectly clear. The whole of the phosphorescence seemed to be below the surface, for none was created by the ship's bow wave. Sea temp. 82·8°F. Wind variable, force 1. Sea calm. Course 218°. Speed 10½ kt.

Position of ship at 1830: 4° 14′N, 106° 18′E.

Solomon Sea

s.s. *Chengtu*. Captain J. A. McDonald. On passage to Lae. Observers, Mr. C. A. Flavell, 2nd Officer and the Watch.

19th October 1961. At 1730 GMT, while the vessel was between Cape Buienguim and Cape Arkona, an extensive area of phosphorescence was encountered. Except for occasional dark patches, the sea became a milky white with many areas of bright 'blinking' phosphorescence, which appeared simultaneously over large areas and pulsated at a rate of one in just under a second. These pulsations consisted of a rhythmic increase and decrease in the light, not an 'on-off' effect, and quite often two adjacent areas would be out of phase. At infrequent intervals, 'blobs' of brilliant light would occasionally be turned up in the ship's wake. A sample of sea water obtained showed no visible foreign bodies; however, when the surface was agitated, tiny specks of light flashed briefly. These seemed to have a very short life, for after a minute or two no further agitation would cause any visible reaction. Sea temp. 86°F; wind N'ly, force 1; sky cloudy. Course 277°; speed 14½ kt.

Position of ship: 6° 45′S, 147° 30′E.

Note 1. *Fengtien* and *Chengtu* are ships of the Hong Kong voluntary observing fleet. The above two observations were extracted from their meteorological logbooks and forwarded to us by the Marine Liaison Officer in Hong Kong.

Note 2. Prof. Dr. K. Kalle, of the German Hydrographic Institute, comments:

"The phenomenon in question obviously presents phosphorescent wheels which are only partly established. Whilst in the Borneo Sea such an observation is not unusual, but that made by *Chengtu* off the north-east coast of New Guinea is the first of its kind in that area. For interpreting the phenomenon of the phosphorescent wheel it would be particularly useful if, in future, special attention is paid to whether and to what extent striking atmospheric and oceanic variations are present in the neighbourhood of the ship. Taking place at one and the same time, these would indicate the presence of processes that are of the nature of submarine earthquakes."

PREDATORY BIRD

North Pacific Ocean

m.v. *Roscommon*. Captain H. G. Chafer. Balboa to Brisbane. Observers, the Master and all the ship's company.

22nd November 1961. During the morning when the ship was some 200 miles SW of Cape Mala, a predatory bird which seemed to be a goshawk was found on board. It stayed until about noon on 29th November when the ship was in 12°S, 117½°W, the nearest land being some 950 miles away. The bird usually perched on the foremast table and devoured its prey there—usually it killed between 6 and 15 small birds a day. Upon seeing its victim it would dive steeply from its perch to about 2 ft. above the surface of the sea. It would then overtake its quarry, snatching it out of the air as it did so. Upon returning to the mast table the aggressor would immediately start to pluck its prey and, as often as not, begin to feast upon it while it was still alive. The bird would usually devour its victims completely, including the bones. We found around the bottom of the mast a number of balls of feathers which it had apparently regurgitated.

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

"This report is yet another of several well authenticated cases of large birds of prey visiting ships well out at sea and immediately adapting themselves to their unusual surroundings whilst continuing to hunt and capture prey with no apparent desire to continue on their previous flight path.

"With the exception of two cases of the Gyr falcon in the North Atlantic, previous cases have all been related to the Peregrine falcon, and we have similar instances from the North Atlantic, Red Sea, Arabian Sea, off North Borneo, and one almost identical example reported by m.v. *Beaverbank*, Captain J. B. Mitchell, on passage from Capa Mala to the Tonga Islands in November 1956. *Beaverbank's* bird usually made eight sorties per day capturing storm petrels. It remained on board for eight days and so just holds the record! In all these reports the bird of prey has always used the foremast table as its perch and larder.

"It would be interesting to know whether *Roscommon's* bird was indeed a goshawk or a peregrine. The former has markedly rounded broad wings and a long barred tail, its hunting flight being usually a few rapid wing beats and long glides. The peregrine has long pointed wings and hunts by swooping on its prey at terrific speeds with nearly closed wings. It also has heavy black lobe-shaped 'moustaches' on its cheeks."

ABNORMAL REFRACTION

North Atlantic Ocean

s.s. *Beaverford*. Captain L. H. Johnston, M.B.E. Quebec to Rotterdam. Observer, Mr. M. J. Downie, 4th Officer.

28th October 1961. Between 2321 and 2326½ GMT, the rising moon, which was very red in colour, assumed the shapes shown in the sketches. The true time of moonrise was some 5 min. later, the moon then having an entirely normal appearance. Visibility earlier had been down to 1 mile due to mist and drizzle, but the

sky cleared to the east at 2000 and half an hour later visibility was perfect, a ship 20 miles away being plainly seen. Air temp. 45°F, sea 47°. Wind E'ly, force 3.

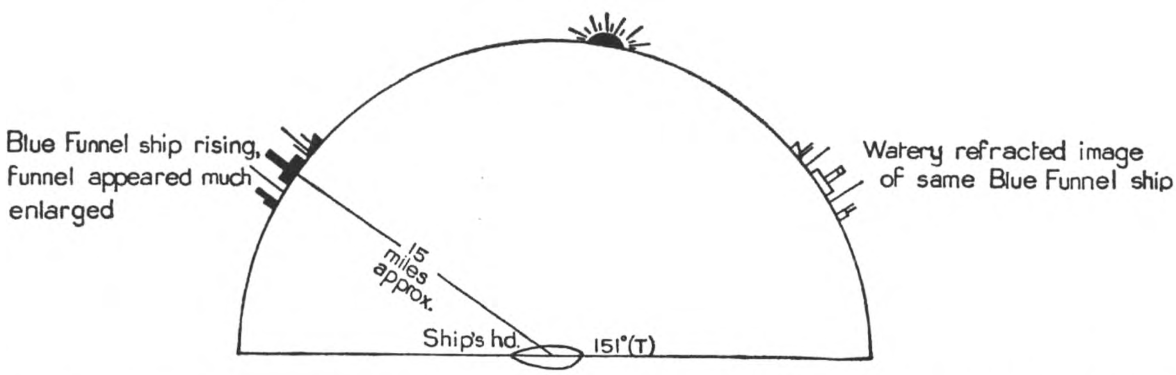
Position of ship: 52° 58'N, 46° 12'W.

Note. This observation is published because of the many and unusually strange images of the moon seen before moonrise. The appearance of objects below the horizon is usually the result of light passing through an atmosphere cooled by the sea. But in this case the report shows that locally the sea temperature was higher than that of the air. It is therefore possible that mirage phenomena helped to break up the images.

Red Sea

m.v. *Glengyle*. Captain R. Johnston. London to Port Said. Observer, Mr. A. J. Child, Extra 3rd Officer.

2nd December 1961. Between 1440 and 1445 GMT the unusual refraction effects



shown in the sketch were observed. A Blue Funnel ship was seen on the horizon towards the south at 1440, with the funnel much enlarged due to refraction: simultaneously a 'watery looking' image of the same vessel was seen on the horizon in the WNW. At 1443 the sun was obscured by hills some 63 miles distant and 3,000–7,000 ft. high. The vessel and its image now looked larger than they did 3 min. previously. The image disappeared at 1445, which was, by calculation, the time of sunset. Air temp. 77°F, sea 78°. Wind ESE'ly, force 2. Small amounts of C_M8 present. Occasional lightning seen from 1800–2200.

Position of ship: 24° 36'N, 35° 05'E.

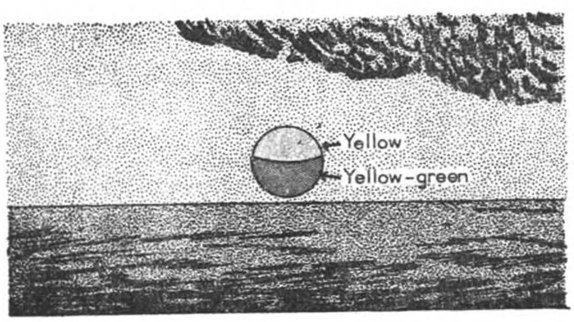
Note. We cannot explain this observation, except by suggesting that the 'watery looking' image was that of another ship well below the horizon (i.e., images of two similar ships were observed). (See para. 2 under "Marine Observers' Log" heading on page 171.)

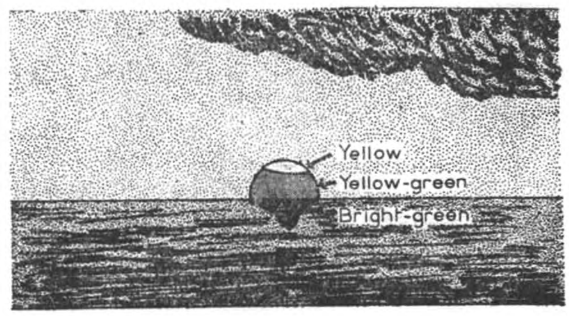
GREEN FLASH

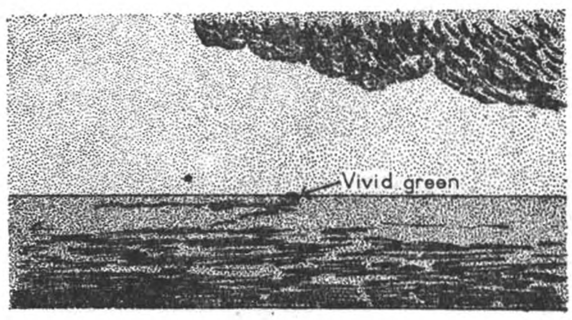
Eastern North Pacific Ocean

m.v. *Ashburton*. Captain N. Waiter. Suva to Balboa. Observer Mr. R. MacEwan, 2nd Officer.

25th October 1961. At sunset (0108 GMT) a text-book example of green flash was observed. The sky, which was free of cloud apart from some detached patches low on the horizon, had a faintly misty, humid appearance, and gave the impression that conditions of abnormal refraction might be present. In the direction of the setting sun, the low cumulus clouds stood out dark grey and solid looking. Below them, to the horizon, the sky was streaked with soft pastel shades of green and yellow, while the sun itself was a bright lemon yellow. As the sun sank down, the lemon yellow colour of its disc became greenish, the tint intensifying towards the lower







limb (Fig. 1). When the lower limb made contact with the horizon a bright green triangular reflection appeared on the sea and this persisted until three-quarters of the sun had passed below the horizon (Fig. 2). The moment the upper limb dipped there was a vivid flash of greenish blue which was so intensely brilliant that it seemed as though a small segment of the sun's upper limb was actually projecting rays through the sea from beneath the horizon (Fig. 3). It was the most spectacular flash I have ever seen. The sunset was also watched by Mr. L. H. Mills, A.B., who had remarked that it looked a likely evening for seeing the green flash. How right he was! Air temp. 72°F, wet bulb 69·5°, sea 72°. Wind SE, force 2. Sea smooth.

Position of ship: 0° 14′N, 110° 39′W.

Note. This very clear and most interesting description of the green flash suggests that although this phenomenon is produced by the passage of the sun's light through the whole atmosphere, some more local atmospheric abnormality caused this elaborate display. It is noted from the ship's log that relatively high sea temperatures had been experienced, which could have produced mirages. The appearance of green light early in the display, and the blueness of the final flash, indicate that the path of the green light was very complex.

ECHO EFFECT ON SHORT-WAVE SIGNALS

North Atlantic Ocean

m.v. *Essequibo*. Captain W. B. Avison. Coatzacoalcos (Mexico) to the U.K. Observers, Mr. A. Vaughan, Chief Radio Officer and Mr. J. F. King, 2nd Radio Officer.

8th December 1961. Between 1300 and 1330 GMT it was observed that on all except very near short-wave broadcast stations (i.e., U.S. transmitters) there was an 'echo' effect. The main signal was followed very closely by a secondary one in a slightly attenuated form, producing the kind of effect which is heard at a large railway station when an announcement is made through many separate speakers. This was observed on 15–22 mc/s. from transmitters in such places as Japan, India, Europe and the U.K. Presumably it was due to some distortion of the ionospheric layers reflecting the radio waves. The weather was overcast, with rain in the vicinity.

Position of ship: 34° 30′N, 53° 50′W.

Note. Mr. G. O. Evans, of the G.P.O. Engineering Department, comments:

"We have examined the ionospheric data for 8th December 1961, but can find nothing to account for the 'echo' effect as described. We have not received any other reports of unusual propagation conditions during that period."

TURQUOISE-GREEN FLASH

Gulf of Aden

(after sunset)

m.v. *Durham.* Captain R. G. Hollingdale. Fremantle to Aden. Observer, Mr. R. M. McNair, Apprentice.

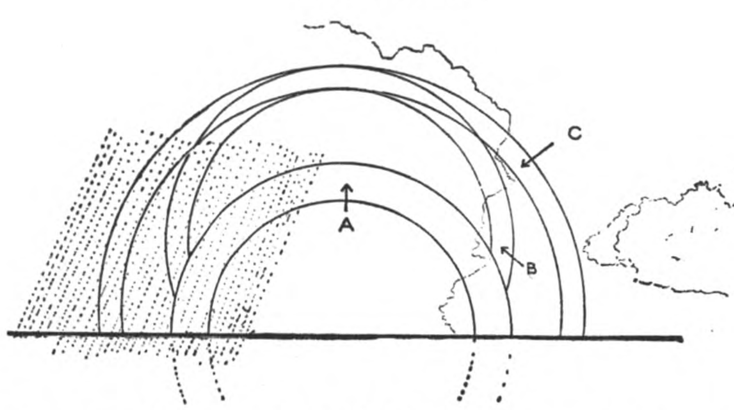
2nd November 1961. While I was watching the sun set at 1410 GMT, a turquoise-green 'cap' appeared on the top of the disc; as the sun sank below the horizon, the 'cap' continued to go with it. The green coloration first appeared when $\frac{7}{8}$ of the sun was above the horizon, and it remained visible for a few seconds after the actual setting. The phenomenon is shown in the accompanying sketch. Air temp. 80°F; cloud, $\frac{2}{8}$ Cs. Visibility very good.

Position of ship: 12° 10'N, 49° 40'E.

Note. This is an observation of the green image being completely separated from that of the remainder of the sun's light. The state of the atmosphere must have been particularly favourable for selectively bending and transmitting green light.

TRIPLE RAINBOW

Indian Ocean



m.v. *City of Khartoum.* Captain F. C. O'Neill, R.D. Brisbane to Aden. Observers, Mr. D. Hazelby, Chief Officer and Mr. P. Lester, 4th Officer.

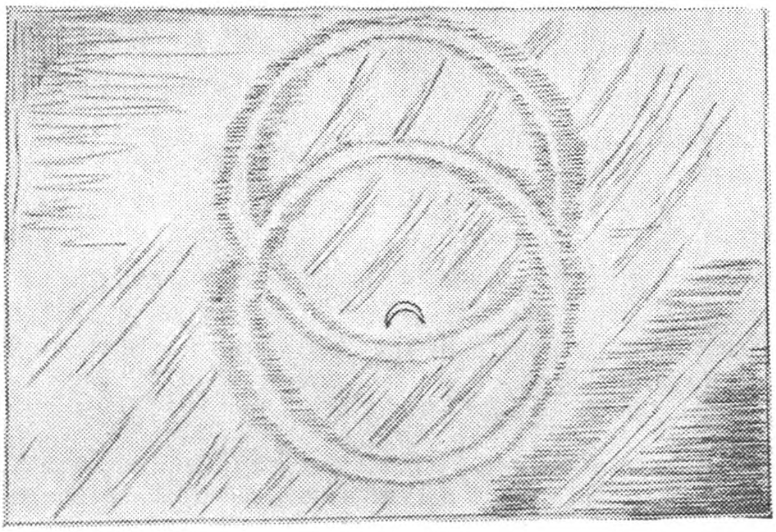
26th November 1961. At 0030 GMT a line squall was observed ahead of the vessel, moving approx. SE'S; a single rainbow was seen to form which very clearly showed the colours of the spectrum. Ten min. later as the vessel was passing through the line squall, then lying NE'N–SW'W, a triple rainbow was seen directly ahead. All three bows had the same order of colours—red on the outside and violet inside. The colours of the primary (A) were very clear, almost vivid: this was the broadest of the three bows and it curved down almost to the sea surface, on each side of the forward part of the vessel. This bow was reflected on the sea surface, but the other two were not. At 0045 there was a moderate shower which lasted for 3 min., after which the bows disappeared. There was no wind and the sea was like a mirror, but with a moderate swell from 150°. Air temp. 78°F, sea 83°; cloud, 6/8 C_L3.

Position of ship: 2° 20'N, 84° 17'E.

Note. m.v. *City of Khartoum* observed a most unusual rainbow phenomenon. Bow A in the diagram appears to be the primary bow. Bow B, covering more than a semi-circle, appears to have been caused by the reflection of the sun's light at the smooth sea surface before its being refracted by the raindrops. Bow C is similar to a secondary bow but with a reversed order of colours. We cannot explain this. Angular measurements would have made possible a closer investigation of this observation. (See para. 2 under "Marine Observers' Log" heading on page 171.)

LUNAR HALO COMPLEX

Indian Ocean



m.v. *Canopic*. Captain T. Davies. Aden to Fremantle. Observers, Mr. A. Newman, Chief Officer, Mr. L. G. Stewart, 3rd Officer and Mr. G. Hairsine, Junior 3rd Officer.

17th November 1961. At 1500 GMT a white halo was observed, centred round the moon. During the following hour, a second halo, separating from the original one, moved slowly into the position shown in the sketch. At 1600, when the upper part of the second halo was coming very close to the moon, the whole of this halo disappeared; a few min. later the original halo also vanished. The cloud in the vicinity of the moon consisted of parallel bands of cirrus, producing a great deal of light. Air temp. 82°F, wet bulb 76°, sea 86°.

Position of ship: 1° 25′S, 70° 38′E.

Note. We cannot explain this very interesting phenomenon. It is possible that there was a gradual change in the distribution, nature and behaviour of the ice particles within the cirrus cloud. The halo with the moon at its centre was probably normal, while the second displaced halo was a very interesting abnormality. Angular measurements would have made a more detailed explanation possible. (See para. 2 under "Marine Observers' Log" heading on page 171.)

AURORA

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

The following list summarises briefly the reports of aurora for the three months 1st October–31st December 1961, made in British ships and received at the Balfour Stewart Auroral Laboratory of the University of Edinburgh. We are most grateful to the Meteorological Office for extracting and forwarding logbook data and to those concerned in passing on the reports from the ocean weather ships.

The report from m.v. *Dunera* for the display of 30th September–1st October was referred to in the previous list, and m.v. *Cumberland* is the only additional British ship in the northern hemisphere to report so far on this display, but the three reports from ships in the southern hemisphere—in latitudes where aurora is visible only infrequently—bear witness to the fact that there was an extensive display of aurora australis at the same time as the display in the north.

There were several periods of geomagnetic disturbance during these months. During disturbance between 26th and 29th October the geomagnetic planetary index figure of 9− was reached, and reports from *Weather Reporter*, *Weather Adviser* and s.s. *Ceramic* helped to make available auroral information for all sectors from N. America to Finland.

Moderate disturbance between 5th and 8th November accompanied displays that were fully reported by *Weather Reporter*, *Weather Adviser*, *Weather Watcher* and s.s. *Beaverdell*. Reproduction in colour would be necessary to do justice to the sketch of the display at 0140 on 8th November from *Weather Watcher.*

Weather Watcher also reported in detail, and provided most effective sketches of, displays on 17th–18th and 18th–19th November. These would only have been seen by observers in high latitudes.

DATE (1961)	SHIP	GEOGRAPHIC POSITION	Λ	Φ	I	TIME (GMT)	FORMS
5th July	*Manchester Shipper*	53°20′N 40°21′W	040	63	+72	0100–0240	RB, R
1st Oct.	*Cumberland*	42°03′N 34°52′W	040	51	+64	2200 (30/9/61)–0400	G
	Northumberland	40°36′S 148°00′E	220	−49	−70	0935–0950	R
	Rakaia	46°40′S 168°00′W	270	−47	−68	0830–0935	R, P
	Gloucester	40°30′S 174°06′E	250	−45	−65	0910–0919	RB, R
3rd	*Rakaia*	44°13′S 153°52′E	230	−52	−73	1525–1530	HB
6th	*Tremorvah*	50°44′N 58°26′W	030	61	+76	0540–0830	HA, RA, R, G
8th	*Wendover*	47°45′N 60°35′W	010	59	+74	0600	HA
12th	*Camellia*	49°02′N 64°16′W	010	61	+75	0120	RA
15th	*Weather Reporter*	61°50′N 32°15′W	050	70	+76	0001–0400 2200–2248	G G
17th	*Sagamore*	57°18′N 36°18′W	050	66	+75	2200–2300	HA, G
	Andania	43°10′N 47°03′W	030	54	+69	0010–0035	HA
23rd	*Weather Reporter*	62°00′N 33°05′W	050	70	+76	2135–2305	HA, HB
26th	*Weather Reporter*	61°56′N 32°50′W	050	70	+76	2000–0120	RA, RB, HB, P, F, G
	Weather Adviser	58°56′N 18°52′W	070	65	+72	1952–2345	RA, R
27th	*Weather Reporter*	61°54′N 32°42′W	050	70	+76	2100–2220	RB, R, P, G
	Weather Adviser	58°56′N 18°53′W	070	65	+72	1940–2155	R, G
28th	*Ceramic*	47°23′N 13°28′W	070	53	+64	1845–1925	R, S, G
	Weather Reporter	62°00′N 32°45′W	050	70	+76	2030–2305	RA, HA, HB, R, S
1st Nov.	*Weather Reporter*	62°06′N 31°55′W	060	70	+76	2300–0200	R, C
4th	*Weather Reporter*	62°00′N 32°50′W	060	70	+76	2200–2350	HA, RA, RB, F
	Weather Watcher	63°50′N 23°00′W	070	70	+76	2345	RA
5th	*Weather Watcher*	64°12′N 22°18′W	070	70	+76	0540	S
	Weather Reporter	62°09′N 32°38′W	060	70	+76	0540–0700	R, C, G
6th	*Weather Adviser*	59°06′N 18°48′W	070	65	+72	0250–0450	RA
7th	*Beaverdell*	52°25′N 57°20′W	020	63	+76	0300–0700	RA, RB, R
	Weather Adviser	59°04′N 18°48′W	070	65	+72	1850–2330	RA, R
	Weather Watcher	61°50′N 33°20′W	060	70	+76	1945–0240	RA, HB, R. S, G
8th	*Weather Adviser*	58°55′N 18°50′W	070	65	+72	0040–0640	RA, R, F, G
	Weather Reporter	58°59′N 19°00′W	070	65	+72	0230–0630	R, G
9th	*Weather Watcher*	61°40′N 33°00′W	060	70	+76	0040–0535	RB, HA, S, G
	Weather Adviser	59°02′N 19°08′W	070	65	+72	0245 2245–0230	G G
11th	*Weather Watcher*	61°50′N 33°50′W	060	70	+76	2245	R
12th	*Weather Watcher*	61°50′N 33°50′W	060	70	+76	0140–0550	RA, RB, R, S
	Weather Monitor	58°44′N 19°32′W	070	65	+72	2038	G
15th	*Weather Watcher*	62°00′N 32°20′W	060	70	+76	2145–2335	RA, HA, R
17th	*Weather Watcher*	62°10′N 32°50′W	060	70	+76	2030–0345	RA, RB, HA, HB, R, S, G
18th	*Weather Watcher*	62°20′N 33°00′W	060	70	+76	1825–0445	RA, RB, HA, HB, R, S
28th	*Weather Watcher*	64°00′N 23°00′W	070	70	+76	1845–2145	HA, G
30th	*Weather Watcher*	60°10′N 23°30′W	070	67	+74	2045	L
1st Dec.	*Weather Monitor*	58°58′N 19°34′W	070	65	+72	2040–0200	C, G
	Camellia	50°10′N 43°00′W	040	64	+73	2330	HA
	Weather Watcher	58°08′N 16°08′W	070	63	+72	2340	R, G
2nd	*Toronto City*	52°47′N 18°18′W	060	59	+69	0135–0220	R, G
	Port Hobart	41°00′S 148°30′E	200	−50	−69	1500–1615	RA, HA, R, G
	Weather Watcher	57°30′N 14°30′W	070	63	+72	0600 2100	G G
	Weather Monitor	58°56′N 19°30′W	070	65	+72	1800–0430	RB, R, C, G
3rd	*Camellia*	55°24′N 35°40′W	050	64	+73	0020–0050	RA, HA, R
	Beaverglen	53°26′N 42°57′W	040	63	+72	0001	R
5th	*Weather Reporter*	56°24′N 10°52′W	080	61	+70	0245 and 0600	G
6th	*Weather Reporter*	57°17′N 13°52′W	070	60	+71	0001 and 0600	G
11th	*Weather Reporter*	59°00′N 19°20′W	070	65	+72	1815–1840	RA, RB, HA
12th	*Weather Reporter*	59°00′N 19°20′W	070	65	+72	0450	G
27th	*Weather Reporter*	58°48′N 18°30′W	070	65	+72	2300	G
28th	*Weather Reporter*	59°12′N 18°48′W	070	65	+72	2000–2400	G
29th	*Weather Reporter*	58°45′N 18°16′W	070	65	+72	2200–2400	G

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

The last period of greater activity occurred between 1st and 3rd December. m.v. *Camellia*, s.s. *Toronto City*, s.s. *Beaverglen*, *Weather Monitor* and *Weather Watcher* reported from well separated positions in the Atlantic, while m.v. *Port Hobart* reported from the southern hemisphere, so that, in spite of cloudy conditions at times over land in the British Isles, the auroral charts for these nights show good coverage from the western Atlantic to Poland.

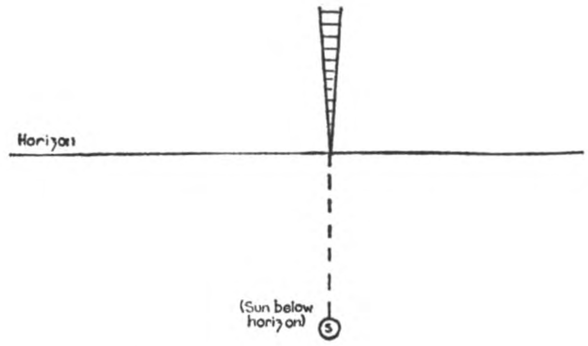
We thank all of you who make these observations, sketches and diagrams. Without your helpful co-operation there would be many blank spaces on our charts, and we hope you will continue to report as fully as possible whenever aurora is observed.

UNIDENTIFED PHENOMENON

Arabian Sea

s.s. *Salween*. Captain K. S. Marsh. Rangoon to Aden. Observers, Mr. R. J. Milmine, Chief Officer, Mr. H. Duncan, Chief Engineer and Mr. A. B. Ewing, 4th Officer.

31st October 1961, 1430 GMT. About 5 min. after sunset, a blue-green ray, much darker than the rest of the sky, was clearly visible on the same bearing as that on which the sun had set. It persisted until the end of twilight. The most feasible



explanation would seem to be that a mountain top in the African landmass, lying on the same line of bearing from the ship as the sun, was casting its shadow on the sky. Cloud $\frac{2}{8}$ small Cu. Visibility excellent.

Position of ship: 11° 39′N, 53° 14′E.

Note. When the sun is just below the horizon, the light received by an observer is that scattered by various layers of the atmosphere. It is therefore possible for some colours to predominate in specific directions. If a distant object is able to cut off some direct light from the sun it is possible under special conditions for the remaining scattered light to have a predominance of blue or green, rather than red or yellow.

551.46: 06

Oceanography in Canada

By Dr. W. M. Cameron

(Director of Oceanographic Research in the Department of Mines and Technical Surveys, Ottawa)

The study of oceanography in Canada had its early beginnings when Canadian biologists began to discover and describe marine life in the coastal waters of the eastern seaboard. Since its inception, biological interests have continued to foster its growth—from before the Canadian Fisheries Expedition of 1914–1915, to the present, in which the Fisheries Research Board of Canada in its various oceanographic groups and biological stations continues to maintain an increasing effort in the study of the sea.

In Canada, as elsewhere, the Second World War focused attention on the importance of oceanography in maritime warfare. At that time, the few experienced oceanographers of the Fisheries Research Board were augmented by young Naval officers and scientists of the National Research Council, provided with Naval manned research vessels, and charged with the task of describing the waters adjacent to Canada in terms pertinent to anti-submarine warfare.

At the end of the war the common interests of the Fisheries Research Board and the Royal Canadian Navy suggested a continuation of the wartime arrangement. Thereafter, the Navy continued to provide research vessels, the Fisheries Research Board laboratories and oceanographers; studies and surveys were extended on both east and west coasts to solve problems of interest both to the Navy and to fisheries.

To guide and monitor this venture, an informal body, the Joint Committee on Oceanography, was established. This Committee was almost unique in character. It reported to no senior body, it had no executive powers; perhaps because of these lacks, it was effective in fostering and strengthening the concept of co-ordinated effort in the field of oceanography. Its strength lay in the individual executive responsibility of the Committee members. Demands and resources were studied in Committee and adjusted by the action of individual members in their separate areas of responsibility.

At the time of its formation the Joint Committee included representatives from three government agencies, the Royal Canadian Navy, the National Research Council and the Fisheries Research Board. Its membership gradually grew to include representatives of the Defence Research Board, the Canadian Hydrographic Service, the Meteorological Service, and more recently the Royal Canadian Air Force and the Canadian Coast Guard. The gradual expansion of the Committee to involve representatives from a wider range of agencies reflected not only the increasing interest in, and demand for, oceanographic information, but the enlarging scope of the physical resources involved in the growing effort.

These developments faced the sole research agency, the Fisheries Research Board, with such an accelerating demand for expansion that it became apparent that another research agency must become involved. It was decided that the Department of Mines and Technical Surveys should enlarge its activities in the marine field. Up to that time these had been represented by the charting and tidal efforts of the Canadian Hydrographic Service. The Department embarked on an ambitious programme of laboratory and ship construction, and of recruitment of scientific personnel. Increased federal grants to certain universities were provided through the National Research Council to encourage the training of oceanographers. The importance of the universities in the total programme was recognised by the appointment of their academic representatives to the Committee, which also assumed the rôle of the National Committee for the Special Committee on Oceanography (SCOR), and that of an Associate Committee of the National Research Council. The broader representation and increased responsibilities were marked by its reconstitution as the Canadian Committee on Oceanography.

The total Canadian programme in oceanography is under the cognisance of this committee. It develops plans for the orderly growth and development of the science, anticipates the increasing demands for oceanographic information, and recommends the extent of the requisite facilities in laboratories, ships and personnel. It does not direct the research effort—this comes under the executive heads of the represented agencies, who are guided in their decisions by the deliberations of the Committee. Co-ordination of effort either in special problems or in local areas is carried on by Working Groups who reflect in their membership that of the more senior Committee.

This organisation of Canadian oceanography has produced an environment in which facilities are shared, programmes are integrated, personnel exchanged and co-operative efforts have been directed toward pressing problems. A striking example of this interchange is the developing programme for a study of the Gulf of St. Lawrence, particularly in regard to the problem of winter ice. This problem is of acute concern to the Canadian Coast Guard, responsible for ensuring winter navigation in this area of increasing importance in the Canadian economy.

The Meteorological Service is responsible for ice forecasting. Its research is augmented in oceanography by personnel of the Department of Mines and Technical Surveys and of the Fisheries Research Board working from Naval, Coast Guard and Hydrographic vessels (see photograph opposite page 192). The Geographical Branch of the former department flies synoptic surveys in R.C.A.F. planes. The Tidal Section of the Canadian Hydrographic Service concentrates on the measurement and prediction of tidal streams and provides the oceanographers with its conclusions on the direction and speed of non-tidal currents.

This co-operative approach has been extended toward international involvement. During the past season, under the aegis of the Defence Research Board and through the effectiveness of a Working Group of the Committee, Project TIREC, designed to aid in the interpretation of TIROS satellite photographs of ice cover in the Gulf, included not only the Canadian agencies noted above, but the U.S. Hydrographic Office, the U.S. Navy and the U.S. Weather Bureau. This project has undoubtedly provided the most intensive and complete photographic coverage of such a large area for such a purpose. The data yet remain to be analysed but it is already clear that this important phase will involve the activities of a wide group of specialised survey and research agencies, co-operating in areas of common interest and concern.

Another example of co-operation with mutual benefit has been the generous contribution of the Fisheries Research Board in the training of personnel for the Bedford Institute of Oceanography in Dartmouth, N.S. This new laboratory, built by the Department of Mines and Technical Surveys, will house not only the hydrographers and oceanographers of that Department but those of the Atlantic Oceanographic Group of the Fisheries Research Board. In preparation for its opening this summer, the oceanographic staff has been trained in the techniques of oceanography at the Fisheries Research Board laboratories; they have sailed in ships assigned to those Groups and taken a share in their programmes. This influx of vigorous young scientists and technicians into the Fisheries Research Board laboratories has helped them to maintain an accelerated pace in the interval before the newer organisation is able to assume its responsibilities.

In reviewing recent developments in Canadian oceanography it should be recognised that in its earlier years the Canadian effort tended to concentrate on descriptive aspects of the science. The areas of Canadian interest were so vast, oceanographic knowledge of them was so slight, that an extensive, wide-ranging programme of observation was required before effort could be turned to interpretative or dynamic studies.

Large-scale oceanographic surveys continue to typify Canadian effort. These are required and must be increased to more frequent intervals. However, significant developments have already emerged. Interpretative papers of the eastern North Pacific have been writen, based on extensive surveys by the Pacific Oceanographic Group in that area; for example, dynamic calculations have been made of wind-driven circulation, and these can be compared with the observed variation in physical properties over a wide expanse of the North Pacific ocean. This same Group has exploited the North Pacific ocean weather station 'P' (50°N, 145°W) manned by Canadian weather ships and the resulting detailed and continuous monitoring of local changes in an area of remarkable lateral homogeneity has provided valuable physical data on which to base empirical prediction techniques. The same monitoring facility has provided data for productivity studies which have been widely recognised. The Group's pioneering work on estuarine circulation has been extended by the Pacific Biological Station, who have applied their findings to the solution of pollution problems.

At Esquimalt, the Pacific Naval Laboratory of the Defence Research Board undertakes work in marine physics requiring oceanographic support, but which in turn contributes to a better understanding of oceanographic processes. Work done on oceanic turbulence has marked an advanced approach to a study of this intricate problem. Oceanographic observations in the Arctic in support of work already done on under-ice acoustics have contributed to our knowledge of that area.

Across the Strait of Georgia at Vancouver, the University of British Columbia Institute of Oceanography has sponsored a study of British Columbia inlets, an investigation into the problems of wave interaction with steady currents, and voluminous studies on marine algae. The efforts of the more recent staff members in the fields of marine zoology, physics, chemistry and geology are extending Canadian contributions into these divergent oceanographic specialties.

On the east coast, an extensive review has recently been completed of the oceanography of Canadian and adjacent waters. The Atlantic Oceanographic Group have studied Arctic problems, and studies of importance to fisheries are now being made of the total energy balance in a water body. Work is also being done on the prediction of physical oceanographic parameters off the east coast. A study of the Passamaquoddy estuary (N.B.) was prerequisite to the prediction of a change of an oceanographic state due to contemplated large-scale engineering installations. Oceanographic advice is being provided to the Fisheries Research Board at St. Andrews, N.B. Studies are being made of the Gulf of St. Lawrence, and of the derivation of circulation in coastal waters by the use of drift bottle techniques.

At the Dalhousie Institute of Oceanography, a study is being made of the marine biology, geology and geophysics of the Canadian coastal Atlantic and the Gulf of St. Lawrence. Like the Institute on the west coast at the University of British Columbia, Dalhousie has been greatly assisted by a federal grant; it has free use of federal ships assigned to oceanographic purposes and works closely with the Atlantic Oceanographic Group in problems of common interest.

The Naval Research Establishment of the Defence Research Board at Dartmouth, N.S., has had a long tradition of oceanographic study in support of its underwater acoustics programme. Although the studies are directed toward the correlation of acoustic propagation phenomena and the environment, the classification of regional areas on the basis of acoustic performance has depended on a careful assessment of oceanographic processes.

The most easterly station of the Fisheries Research Board, at St. John's, Newfoundland, has carried on, for some time, oceanographic observations in support of its fisheries investigations. Standard sections on the Bank and along the Labrador coast are occupied at regular intervals to monitor the changing conditions.

In the north, the Arctic unit of the Fisheries Research Board continues its survey of the marine biological resources of the Arctic. Oceanographic data are collected in support of the biological collecting programme. Canadian research along the shelf of the Canadian Archipelago, under the Polar Continental Shelf Project of the Department of Mines and Technical Surveys, has been concentrated on a study of the marine environment. Hydrographers have confirmed the existence of a submerged continental shelf of considerable width, cut by submarine troughs suggesting the effects of extensive glaciation. Oceanographic observations to date have suggested a relatively flat lateral gradient of physical properties across the shelf in agreement with the apparently slow drift of Arctic waters along its length.

Other agencies engaged in studies closely allied with oceanographic research are the Meteorological Service of the Department of Transport, and the National Research Council. The work of the latter, especially in the study of laminated flow and of ice formation, has contributed significantly to the area. The Defence Research Board has sponsored the McGill University Ice Research Project which has studied, among other subjects, the important problem of energy exchange at the ice–air interface over Arctic sea ice in winter.

Within the past two years, the Division of Oceanographic Research of the Department of Mines and Technical Surveys has begun to assume a growing share of the total oceanographic effort. Extensive summer surveys of the waters of the Arctic Archipelago, of Baffin Bay, Davis Strait, Hudson Strait and Hudson Bay have been undertaken by this agency in Canadian Coast Guard Ships and chartered vessels. Last winter, the Canadian Hydrographic Ship *Baffin* undertook a winter survey of the Gulf of St. Lawrence and of the area of the western Atlantic termed the North American Basin, to add considerably to a knowledge of conditions in these areas at this season of the year.

The Department's growing responsibility in marine survey and research has been recognised by the recent organisation of its Marine Sciences Branch. This Branch incorporates the Canadian Hydrographic Service, the Division of Oceanographic Research, and a new Division of Ships established to design, maintain and operate the growing fleet of marine survey vessels. The largest of these, the *Hudson* (see drawing on opposite page), now under construction, will be one of the most modern research vessels afloat, combining a capacity for both hydrographic survey and oceanographic research.

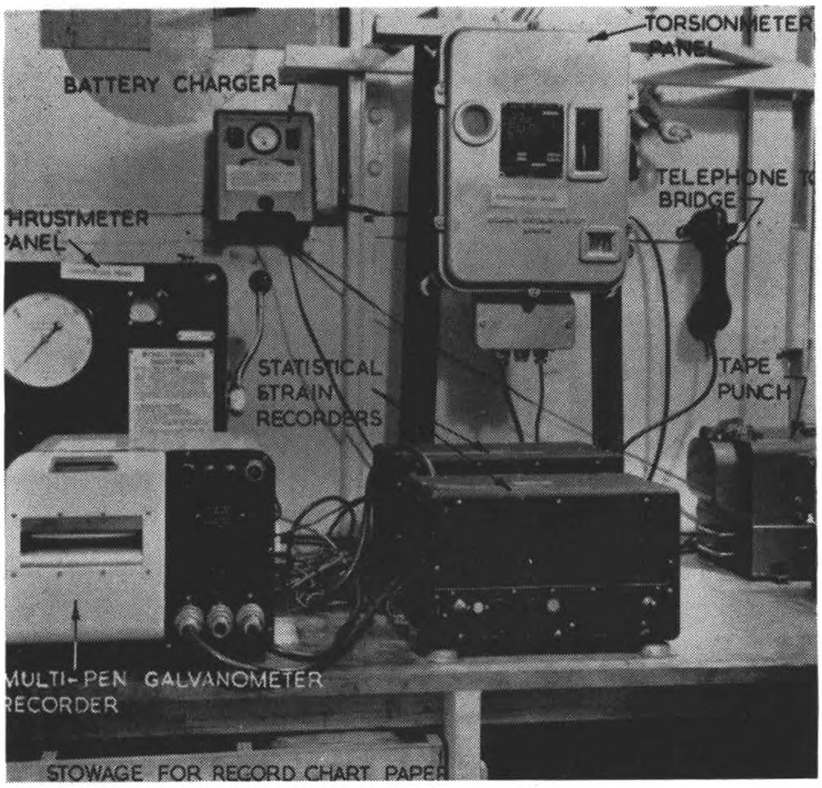
The eastern operational headquarters of this new Branch will be the Bedford Institute of Oceanography, being occupied in mid July 1962 by the hydrographers and oceanographers working out of Dartmouth, N.S. The new Institute, with a capacity for some three hundred personnel, will also house the oceanographers of the Fisheries Research Board Atlantic Oceanographic Group. Attached to the Institute also will be submarine geologists who will represent the growing effort of the Geological Survey of Canada in this field. [A drawing which accompanied this article, but which space precludes us from reproducing, shows that the research vessels will berth alongside these new headquarters.—*Ed.*]

The establishment of the Bedford Institute and the organisation of the Marine Sciences Branch forecasts a closer integration of hydrography and oceanography in Canada. Up to the present the heavy demand for navigational charts of Canadian waters has not allowed the Canadian Hydrographic Service to extend its activities into broader oceanographic fields. The establishment of a separate Division of Oceanographic Research and the extensive recruitment of scientists who will specialise in oceanography will strengthen the overall capability of the new Branch. The gradual integration of the activities and interests of the hydrographers and oceanographers in the new Institute cannot but lead to a more effective use of facilities and personnel. The staff of the Institute look forward with optimism to an environment which will encourage the development of both areas of marine activity.

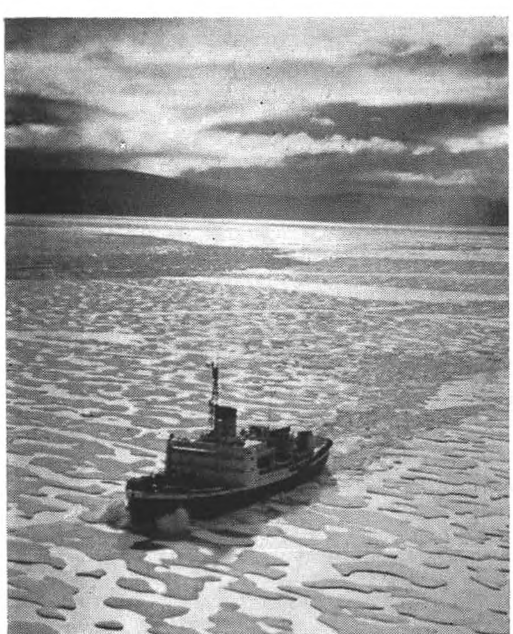
The marked acceleration of oceanographic activity in Canada and the increase of oceanographic agencies engaged in the field has led to the establishment of a Canadian Oceanographic Data Centre under the auspices of the Marine Sciences Branch of the Department of Mines and Technical Surveys. At this centre in Ottawa are being collected a record of all oceanographic data collected in waters of Canadian interest. A large bulk of these data are from Canadian sources and they are increasing rapidly. Exchange arrangements have been entered into with the National Oceanographic Data Centre in Washington, D.C., and the Canadian Centre will assume eventual responsibility for the exchange of data with other national data centres.

A summary of recent developments in Canadian oceanography would not be complete without reference to the growing programme of the Great Lakes Institute of the University of Toronto. This institute is attempting to cope with the expanding demands for information on the water characteristics and movements of the Great Lakes. It co-operates closely with the Meteorological Service of the Department of Transport, which Department operates a research vessel on the lakes. The Institute is sponsoring the research of many scientists interested in problems of the lakes. The methods of approach to the solution of these problems have many facets in common with those of oceanography. The inclusion of a representative of this Institute on the Canadian Committee of Oceanography represents a recognition of the growing area of common interest between those who study the lakes and those who study the oceans.

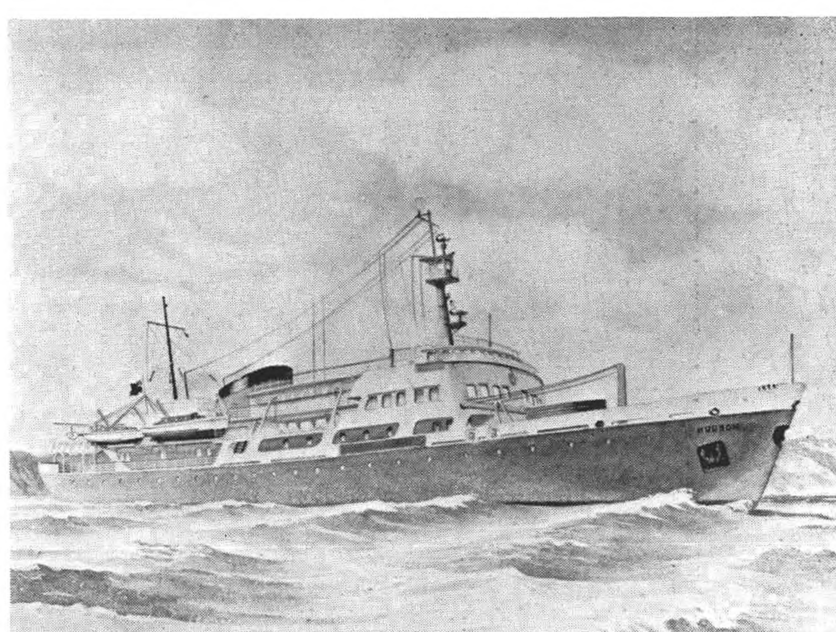
(*Opposite page 192*)



Some of the recording instruments carried aboard O.W.S. *Weather Reporter* during ship motion trials (see page 195).



National Film Board, Ottawa



Left-hand photo:

The Canadian Coast Guard Ship *d'Iberville* manœuvring through heavy polar ice in the Eureka Sound area, North West Territories (see page 190).

Right-hand photo:

Artist's impression of the Canadian Coast Guard Ship *Hudson* (see page 192).

(*Opposite page 193*)

Crown Copyright

The view from the south-west. From left to right are the Dines Wing, the Napier Shaw Building, and the FitzRoy Wing.

Crown Copyright

The facsimile room.

METEOROLOGICAL OFFICE, BRACKNELL (see page 199).

551.507.22

Ship Motion Trials on O.W.S. "Weather Reporter"

By H. J. S. Canham, M.R.I.N.A.

(British Ship Research Association)

Increasing attention is being given today to the way in which a ship behaves at sea with a view to reducing ship motions and loss of speed in waves. Most ships in service today were designed from experience gained over the years in operating over particular trade routes, but this does not necessarily mean that each design is the best for its purpose. There is a natural tendency in practice to avoid sweeping alterations in design unless backed by strong evidence in support of such changes. It has been the custom for many years to use models for experimenting with different hull forms but until quite recently these tests were usually carried out in calm water only. Several new tanks have now been built in Great Britain and abroad for testing models in waves, the principal ones in this country being located at Feltham, Middlesex, and Gosport, Hampshire. Before these tanks can be put to good use it must be established that the behaviour of a ship at sea can be deduced from model tests in waves. One way to achieve this is to record the actual behaviour of ships and their environmental wave conditions, then to test models of these ships in simulated wave conditions, and finally to compare the behaviour of each model with its corresponding ship. The main purpose of the special seakeeping trials conducted on O.W.S. *Weather Reporter* in the autumn of 1959 was to obtain the first set of ship data.

It was decided in 1958 that the work of comparing results of sea trials with model tests should be undertaken jointly by the British Ship Research Association (formerly the British Shipbuilding Research Association), the National Institute of Oceanography and the National Physical Laboratory, whose Ship Division controls the Ship Hydrodynamics Laboratory at Feltham. B.S.R.A. accepted responsibility for the ship trials, N.I.O. agreed to undertake wave measurements and N.P.L. made arrangements to analyse the ship data, to carry out the model tests, and to correlate the ship and model results. The Admiralty is engaged on similar work in connection with warships and this work is in the hands of the Admiralty Experiment Works at Haslar, Gosport.

There were two principal reasons why O.W.S. *Weather Reporter* was chosen for the first seakeeping trials. Firstly, it was essential to use the N.I.O. shipborne wave recorder in these trials and this instrument had already been installed for other purposes. Secondly, apart from the time spent in making weather observations the ship could be used for trials purposes whenever weather conditions were suitable. Permission was obtained from the Meteorological Office to conduct seakeeping trials during the course of a voyage to Station 'K'. The reason for choosing this Ocean Weather Station in preference to the other stations manned by British weather ships is explained below.

The actual wave system encountered at any position usually consists of a number of separate wave systems arriving simultaneously from the same or different directions. Wave systems coming from approximately the same direction produce long-crested seas, whilst waves coming from different directions form short-crested seas. A ship has six degrees of freedom and the corresponding modes of oscillation are shown in Fig. 1. The ship therefore responds to a wave system in a complicated way. Even when encountering a long-crested head sea, i.e. when roll, surge, sway and yaw are virtually absent, the heaving and pitching motions are still complex owing to the irregular nature of the waves. Consequently it is difficult to compare the responses of ship and model in the same modes of motion unless the wave system consists of a single train of regular waves moving in the same direction relative to ship and model. Such wave systems are rarely, if ever, encountered at sea. This difficulty can be overcome by relating each recorded ship motion to the encountered wave system in such a way as to produce what is known as the 'response operator' for each motion. This can also be done for the model, whereupon ship and model response operators can be compared without further difficulty.

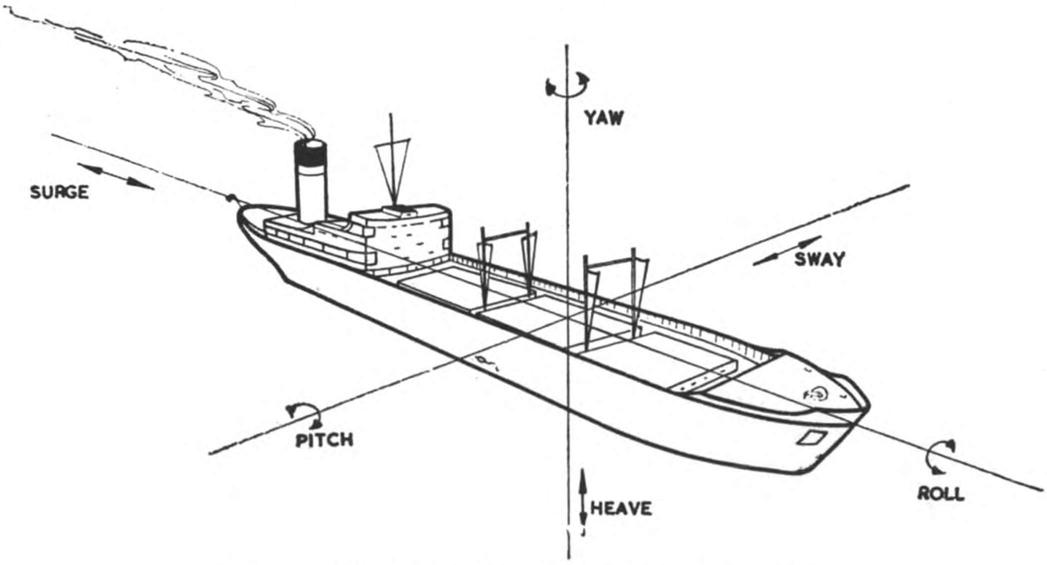


Fig. 1. The six modes of oscillation of a ship.

Some important assumptions have to be made in order to obtain response operators from motion and wave records taken in irregular seas. The sea is assumed to consist of a great many periodically recurring sine waves, each having a very small amplitude and a particular period of encounter relative to the ship. The ship is assumed to respond to each component sine wave in such a way that the complete motion in a particular mode is also composed of very many sine waves. Each motion or wave record is therefore sorted into its component sine waves by a kind of Fourier analysis. The result is usually given in the form of an 'energy spectrum', which is the diagram obtained by plotting the squares of the amplitudes of these sine waves against their respective frequencies of encounter. Each response operator is obtained by 'dividing' the appropriate motion spectrum by the wave spectrum, the result being a diagram which shows how the relationship between, say, pitch angle and wave height at a particular encounter frequency changes over the range

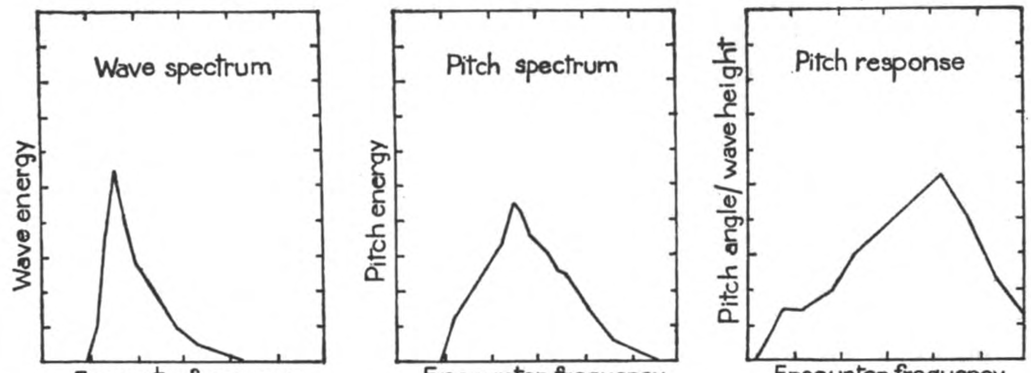


Fig. 2. Response operators.

of encounter frequency present in the original motion and wave records. A typical set of diagrams is shown in Fig. 2. It is essential for computational purposes to assume that the components are sine waves even though actual sea waves more closely resemble trochoidal waves. Fortunately this does not introduce any significant errors.

There is, however, a definite limitation on the kind of sea state in which ship motion records can be analysed in this way. A difficulty arises when the overall motion response of a ship at a given period of frequency is composed of responses to several wave components of different length and direction, but having effectively the same period of encounter. This is the kind of situation which occurs when the component wave systems arrive from a number of different directions or when a ship is steaming in a quartering or following long-crested sea. Consequently it is impossible at present to obtain results suitable for analysis unless the ship is steaming in ahead, bow or beam seas which are essentially long-crested in nature. The size of the waves also influences the choice of sea state in which useful records can be obtained. The method of analysing ship motion records assumes that the ship will respond linearly to the waves. This means that if the wave height is doubled at any particular period of encounter, the amplitudes of roll, pitch, etc., will also be doubled. This is true for small wave heights but in large waves the response may become non-linear.

It will be clear now why the sea trials had to be planned with careful thought to the kind of sea conditions likely to be encountered. N.I.O. made a special study of the wave statistics available for the sea areas containing Ocean Weather Stations 'A', 'I', 'J' and 'K'—these being the four stations manned at the time by British weather ships. It was decided that the best prospect of encountering long-crested seas was at 'K' (45°N, 16°W), since this station was furthest from the usual paths of depressions moving across the North Atlantic. Remembering that long waves travel faster than short waves, it is understandable that long waves generated by a distant storm will outrun smaller waves to an increasing extent as the distance from the storm centre increases. Although waves spread out in all directions round a depression, by the time the long waves reach a remote region they are virtually uni-directional in character. The long-crested seas produced by these swell waves are ideal for ship motion trials provided that local winds are in the same direction as the swell or, if in a significantly different direction, are sufficiently light not to generate large waves.

A trials programme was drawn up to meet the requirements of the ship motion research project and to suit the normal routine of O.W.S. *Weather Reporter*. Ship motion records were limited to heave, pitch and roll; these and wave height records constituted the principal data to be obtained, although they were supplemented by propulsion and hull strain records in order to take fullest advantage of the opportunities afforded by these trials. Permission was given by the master for the spare chart room on the bridge deck to be used exclusively by the trials record party during the voyage, and special recording instruments were installed in this space. Most of the recording equipment was of the type which provides a continuous ink-on-paper record during each trial, but a particular novelty of the system was the recording of wave height, heave, pitch and roll in digital form on punched tape. This kind of record can be used for feeding data into an electronic computer for analysis purposes. The complexity of the analysis programme made it essential to employ a digital computer, and it was established beforehand that the DEUCE computer at N.P.L. could be utilised for the purpose. Some of the recording equipment is shown in the photograph opposite page 192.

O.W.S. *Weather Reporter* sailed from Greenock on 11th September 1959 with a trials party of five persons drawn from B.S.R.A., N.I.O. and N.P.L. Shortly after departure, measured mile trials were carried out at Skelmorlie, in the Firth of Clyde, in perfect weather conditions for the purposes of calibrating the ship's speed log and establishing the propulsive performance in calm water. Various measurements were carried out during the passage to station 'K' in order to test the recording installation. While the vessel was on station a number of seakeeping trials was carried out. Each trial consisted of a special manœuvre during which the course of the ship was varied in a systematic manner while the same engine setting was maintained. The shape of the course is shown in Fig. 3. Each manœuvre usually took about five hours to complete, the length of time spent on each course being varied as shown. The reason for this variation is that a minimum of a hundred waves of the longest period present must be encountered by the ship on each course in order to obtain a reliable record for analysis. It was impossible to satisfy this requirement on the quartering and following sea courses, but these were included principally to obtain the corresponding propulsion and stress data.

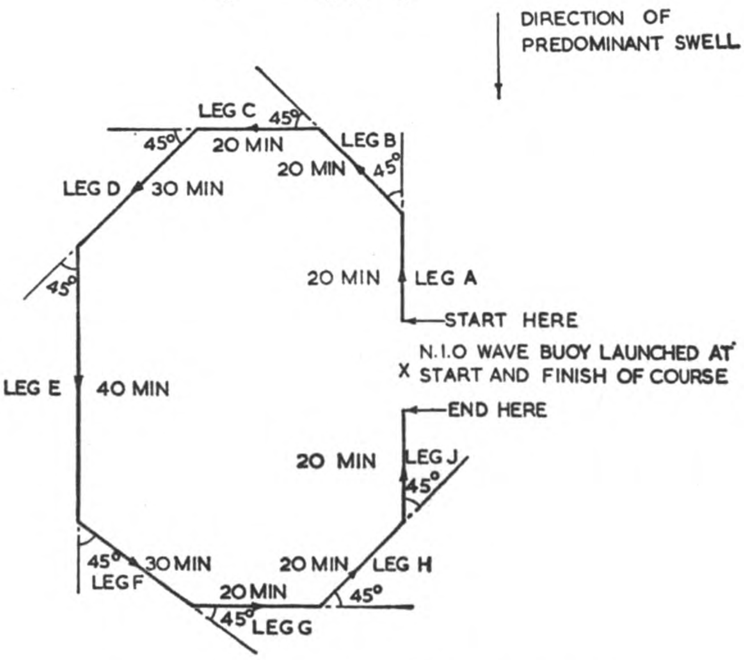


Fig. 3. Special seakeeping manœuvre.

Each seakeeping manœuvre was preceded by launching a special wave buoy provided by N.I.O. This buoy, a photograph of which appeared opposite page 125 in the last number of this journal, measured about 5 ft. 6 in. in diameter and 15 in. in depth. It contained a complete set of instruments for recording wave height and wave slope in two directions and weighed about 10 cwt. At first the buoy was recovered after completing the manœuvre, but later on the buoy was launched and recovered before the start of each manœuvre, and then launched and recovered again after completing the manœuvre. It was launched over the starboard side by means of a specially installed davit and when not in use was stowed near the davit. There was, of course, a special reason for using this wave buoy. The N.I.O. shipborne wave recorder gives a measure of the absolute heights of the waves actually encountered by the ship and is therefore an essential part of the recording system. The heights given by the wave recorder differ from the true wave heights due to exponential attenuation of pressure (known as the 'Smith' effect) at the pressure orifices of the recorder, and also due to the influence of the ship on the wave. The effect of these two factors is that the actual wave height is underestimated by the wave recorder. This error is negligible in long waves but becomes increasingly important with decreasing wavelength. From the records obtained during the trials it was found that the shipborne wave recorder in O.W.S. *Weather Reporter* behaved as if the pressure orifices were about 17 ft. below the surface when in fact they were only 7·1 ft. down. The success of each seakeeping trial depended on the sea state remaining substantially constant and the two separate buoy records were required to check this. Sometimes certain courses of a manœuvre had to be omitted to avoid interference with the ship's routine meteorological observations, but the final course of the manœuvre was always included as the results obtained on the two head sea courses made a valuable comparison.

During the first half of the period spent on station the wind was generally light, force 0–4, occasionally rising to force 5–6. The maximum wave height did not usually exceed about 5 ft. although 18 ft. waves were encountered one day. Afterwards the wind varied from force 3 to force 8, but on one occasion reached force 12. The maximum wave height during this period generally varied between 8 ft. and 25 ft., but waves 40 ft. in height were encountered during the storm. The manœuvres were sometimes repeated in approximately the same wave conditions but at different speeds in order to obtain a series of results covering a range of ship's speed and wave conditions. The weather conditions did not, however, remain stable for any appreciable length of time except during the period of good weather experienced during the first part of the voyage. Unfortunately there was an absence of swell waves at the time, so that advantage could not be taken of the favourable wind conditions existing locally. In half the manœuvres carried out there was a significant difference between the directions of wind and swell but some useful results were obtained. The voyage ended on 12th October 1959 with another measured mile trial at Skelmorlie to check the calibration of the ship's speed log and to obtain another datum of propulsive performance, the ship being in a much lighter condition on arrival than on departure.

Since these trials were completed, a considerable amount of analysis work and model testing has been carried out, and the first results were presented to the Royal Institution of Naval Architects earlier this year. These trials are regarded as a highly successful start to the joint research project, and this is due in no small way to the excellent co-operation which was received by all concerned from the captain and ship's personnel of O.W.S. *Weather Reporter*, and from the Marine Superintendent, Meteorological Office, and his staff in Greenock and London. R.A.F. Coastal Command also contributed to the success of these trials by flying spare recording equipment to the ship while on station during the course of an air–sea rescue exercise. This enabled the complete recording system to be kept in action throughout the trials in spite of the unexpected failure of certain components and their spares early on in the voyage.

551.507.22

HATTIE'S HISTORY

Disciples of the 'June too soon—October all over' theory of West Indian hurricanes, which even today is often quoted, will find very little support in the 1961 hurricane season for though, in agreement with the rhyme, it did not start until July (see *The Marine Observer*, July 1962), the last hurricane, 'Jenny', did not dissipate until 9th November.

Hurricane 'Hattie' was in being from 27th to 31st October and was, to quote the U.S. Monthly Weather Review, 'the killer storm of the 1961 hurricane season'.

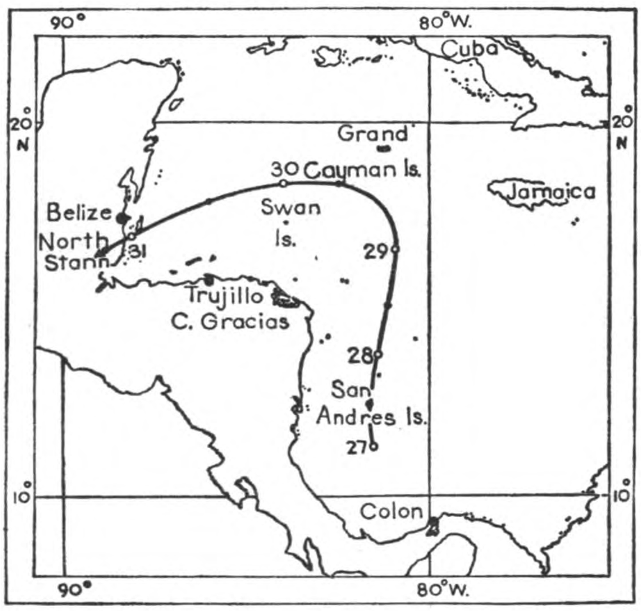
The first indication of its existence came in a report from the American s.s. *Marine Trader* about 120 miles SSE of San Andres Island at 0000 GMT on 27th October, reporting a 40 kt. southerly wind. By 1500 GMT the airport at San Andres was closed because of 40 to 50 kt. easterly winds, and the first hurricane advisory was issued by Miami estimating the centre of the disturbance as 12° 54′N, 82° 24′W., with wind speeds of 60 kt. Later the same day the wind in 'Hattie' reached hurricane force.

'Hattie' passed over, or just to the west of, San Andres Island in the late afternoon of 27th October, giving a pressure of 991 mb. at 0200 on the 28th (2100 local time on the 27th), and winds of 60 kt., gusting to 78 kt. One person was killed on the island, 15 were injured, and damage to property was in the region of £100,000. From this point 'Hattie' continued on a generally northerly course, deepening as it progressed with winds rapidly increasing to 108 kt. as the centre passed about 100 miles to the east of Cape Gracias on 28th October.

On 29th October 'Hattie', now located near 17°N, 81°W, and still intensifying, began to turn to the north-west and, later the same day, to the west. It passed between Swan and Grand Cayman Islands, but the winds on these two islands did not attain hurricane strength.

The hurricane finally settled on a WSW'ly course and intensified markedly on 30th October, with winds of 130 kt., gusting to 175 kt. During the morning its lowest pressure was estimated at 920 mb.

At 1230 GMT on 31st October the centre of 'Hattie' passed over the coast of British Honduras a short distance south of Belize. Its first unfriendly act on coming ashore seems to have been to destroy all the meteorological instruments at the port, with the result that all subsequent measurements of wind speed and pressure had to be estimated. Maximum winds were estimated at from 130 to 175 kt., and minimum pressures between 920 and 930 mb. Storm tides of 10 to 11 feet along the Belize waterfront were general and waves deposited mud on the third floor of some buildings. Other places near Belize reported storm tides of up to 14 feet.



Track of hurricane 'Hattie'.

In Belize, capital of British Honduras, a town with a population of about 31,000, it was later estimated that 'Hattie' completely destroyed about 40 per cent of the buildings whilst a further 25 to 35 per cent were severely damaged. Damage was, in fact, so great that plans for a complete re-siting of the city further inland are being considered. Some coastal settlements such as Stann Creek were almost completely erased. In British Honduras the death roll was estimated at 262, whilst the complete harvest crop of citrus fruit lying ready for shipment, and valued at about £700,000, was destroyed, to say nothing of the value of the cargoes of timber, cocoa and bananas which were awaiting loading. The total damage to property was estimated at £20,000,000.

After her disastrous passage through British Honduras 'Hattie' continued west-south-westward and south-westward through Guatemala where she was responsible for a further 11 deaths before she dissipated in the mountains of Guatemala. A curious side-effect was experienced by m.v. *Catalina Star* in the Pacific (see "Marine Observers' Log").

Belize had previously been ravaged by a hurricane; on 10th September 1931 a wind speed of 115 kt. was recorded before the anemometer was carried away, a wind speed considerably less than that recorded in 'Hattie'. Property damage in that hurricane was estimated at about £1,500,000, also considerably less than that of 'Hattie', even considering the changes in values over thirty years. But Hattie's death roll was a mere 262 compared with some 2,000 in the 1931 disaster and the fact that it was no higher is, to quote the U.S. Monthly Weather Review of March 1962, due to the excellent warnings which enabled the authorities in Belize to evacuate a large percentage of the population in time. At Stann Creek 3,500 of the 4,500 residents were evacuated.

In this journal it is not inappropriate to underline the fact that it was a ship's report which gave the first warning of the impending disaster.

'Hattie' produced a number of points of interest to the meteorologist, two of which are of particular interest to the mariner. Firstly, this is the first hurricane to have affected San Andres Island since 1908 and is only the fourth in recorded history. Secondly, whilst the most probable track for late season storms in the western Caribbean Sea is northerly, gradually turning to the north-east, 'Hattie' made an abrupt turn to the westward on 29th October and thereafter her course was west-south-westerly.

The volume of British shipping in the southwest Caribbean is not large and only one narrative of 'Hattie' has been received from a British ship, this being from m.v. *Tactician*. This is printed in the Marine Observers' Log on page 172. In a note beneath the narrative it is stated that *Tactician* was, for a time, the only radio link between Belize and the outside world. From her radio room went out the first calls for assistance, but this was not her only contribution to the re-habilitation of the port.

On her return to harbour she landed such stores as she had, together with medical supplies for immediate first aid, afterwards re-establishing marks in place of buoys which had been swept away. Four and five-gallon drums were used for this purpose, the positions being pointed out by a harbour pilot and checked by soundings. Marks had also to be established on shore to replace buildings and trees which had hitherto been used in navigation. For two days she was engaged on relief work. Medical supplies were flown in from Miami on 1st November and with the arrival of H.M.S. *Troubridge* and the U.S. Destroyers *Bristol* and *Corry* the next day, and the U.S. aircraft carrier *Antietam* with doctors, nurses and supplies on 3rd November, *Tactician*, her mercy mission completed, left the port for her next 'lawful occasion', a mixed cargo from Corpus Christi, Texas. L. B. P

METEOROLOGICAL OFFICE, BRACKNELL

Mention was made in the April 1960 number of *The Marine Observer* of the nomadic and divided life of the Meteorological Office headquarters during its first century of life, and of the laying of the foundation stone for its permanent and unified home at Bracknell, Berkshire.

On completion of the first year of operating from the new site, it is thought that voluntary observers at sea will be interested to know something of our first real home.

The move started in February 1961 and, as in 1854 the original Meteorological Office consisted solely of a marine division led by a seaman, Admiral FitzRoy, it seems appropriate that the first division to move to the new headquarters should be the Marine Division, still led by a seaman as it has been for 108 years, preceded only a few days before by a purely administrative branch. It is appropriate, too, that the part of the building which houses the Marine Division should be named the FitzRoy Wing, thus commemorating our first director.

The complete headquarters building consists of three main blocks arranged to form three sides of a square open to the south (see photograph opposite page 193). The tallest of these blocks, named the Napier Shaw building after the Director from 1900 to 1918, contains the successor to the Napier Shaw research laboratory at Dunstable, and rises to nine storeys. The top floor houses the central forecasting office, one of the eight master analysis centres of the northern hemisphere (see photograph opposite page 201).

The floor below is given over to the communications centre, which handles almost a million five-figure groups daily. It is here that the observations of the voluntary observing fleet incoming to the British office are received, either on the direct teleprinter line from Portishead, which is preferred, or over the G.P.O. network from other coastal radio stations, before they are passed topsides to the plotters and forecasters. (See photograph of the teleprinter room opposite page 201.) On this floor also are accommodated several facsimile recorders and transmitters (see photograph opposite page 193, and *The Marine Observer*, July 1961, page 138). From here, up-to-date weather charts, already drawn up, are transmitted to meteorological outstations, or to ships equipped with a suitable receiver, and similar charts are received from meteorological offices as far away as Tokyo, if required.

Below that again, is the electronic computer, 'Meteor'. Its best known use is the objective analysis and numerical prediction of weather charts. Such prediction, at present in the experimental stages, is a task which could not be undertaken in the normal way because of the number and length of the calculations involved, but the computer has many other daily uses involving complicated calculations. For example, the computations required to produce the basic grid for a gnomonic projection chart in plotting atmospherics due to thunderstorms used to take a man three months. 'Meteor' does the job in a few minutes.

On a lower floor of the Napier Shaw building is the laboratory of the high-atmosphere research branch. The functions of this, the newest, branch of the Meteorological Office is evident from its name. It is concerned with the meteorology of 'space'.

The FitzRoy Wing, already mentioned, on the eastern flank of the Napier Shaw building, contains, in addition to the Marine Division, the offices of the Director-General and other directing staff and the branches dealing with aviation services, climatological services, climatological research, special investigations and services to the public. The main entrance hall to the whole headquarters building is in the FitzRoy Wing and adjacent to the hall is the National Meteorological Library. This library, open to all bona-fide students and research workers, is probably the finest of its kind in the world and not only provides at ground level a large and airy room containing the main collection of books and documents for loan or study on the premises, but also stock rooms contained in a six-storey steel structure built within the hollow brick and masonry tower at the southern end of the FitzRoy Wing.

The Dines Wing, on the western side of the main building, is named after W. H. Dines, a meteorologist who designed many of the instruments in use today. Here are housed the many millions of punched cards, each representing an observation from a ship or a land-based meteorological station, and here the observations from the meteorological logbooks of voluntary observing ships and land-stations are transferred to punched cards soon after their arrival in the office. Tabulators and sorting machines enable these cards to be utilised to the best advantage for the purpose of scientific research and the production of atlases, etc.

The Dines Wing also houses the instrumental design and development laboratories and the branches responsible for control of the Observatories at Kew, Eskdalemuir and Lerwick and for micrometeorological studies.

The main meteorological instruments store and the Meteorological Office's archives are also both housed in Bracknell, though in a separate building not far away. The archives contain, with few exceptions, all the meteorological logbooks received from British voluntary observing ships going right back to 1854. The exceptions occur where books of especial or historic interest have been issued on permanent loan to such bodies as the National Maritime Museum, the Scott Polar Research Institute, or to shipowners who wish to display the first meteorological logbook from one of their ships in their board room or museum.

Occupation of the main buildings was completed in September 1961 with the arrival of the forecasting sections from Dunstable. On 1st November 1961 they were formally handed over to the Air Ministry, the administrative authority of the Meteorological Office, by the Ministry of Works.

On 25th June 1962, the Meteorological Office was honoured by the visit of Her Majesty Queen Elizabeth II and His Royal Highness the Duke of Edinburgh. (See photographs on opposite page.) In the central forecast office they were shown the existing weather situation and the current forecast which was at that moment being written out for transmission on the B.B.C. Home Service at 1255. Her Majesty was interested to see a meteorological logbook sent in by her grandfather,

(Opposite page 200)

Her Majesty the Queen and His Royal Highness the Duke of Edinburgh in the forecast office at Bracknell.

(Opposite page 201)

Crown Copyright

The forecast office.

Crown Copyright

The teleprinter room.

METEOROLOGICAL OFFICE, BRACKNELL (see page 199).

King George V, when as Lieut. H.R.H. Prince George of Wales he commanded H.M.S. *Thrush* in 1890–91 on the America and West Indies station. The Marine Division's registers show that this book received the assessment 'excellent' and that a special letter was sent to Prince George in April 1891. These special letters appear to be the forerunners of today's 'excellent awards' and during 1891 a hundred and two of them were written, covering the year's reception of 333 meteorological logbooks from ships.

While the royal party was in the communications centre on the floor below, a loyal greeting on behalf of all the meteorological outstations (including the ocean weather ships) was received by teleprinter from Lerwick, the station in the British Isles furthest away from Bracknell. Her Majesty's reply to the message was cleared to all stations before the party left the room.

Below, in the laboratory of the high-atmosphere research branch, the Duke of Edinburgh especially found much of interest in the new rocket sonde and satellite and the humidity instruments which will be used in the exploration of the outer atmosphere.

The tight schedule of the royal day did not allow of anything more being shown to the distinguished party, but the 35 minutes during which the Royal Standard flew from the flagstaff in the forecourt of the FitzRoy Wing were proud minutes in our life.

L. B. P.

INSTITUTE OF NAVIGATION—DUKE OF EDINBURGH'S LECTURE, 1961

The second "Duke of Edinburgh's lecture", entitled "Navigation and the Science of the Sea", was given by Dr. G. E. R. Deacon, C.B.E., F.R.S., Director of the National Institute of Oceanography, at the Annual General Meeting of the Institute of Navigation on 25th October 1961. Dr. Deacon is now President of the Institute of Navigation.

The general theme of Dr. Deacon's lecture was to show how modern scientific methods are increasing our knowledge of how the oceans work and that this new knowledge is likely to be of practical use to seamen and of benefit to the whole world.

In outlining the history of scientific work at sea the lecturer paid tribute to the wind and current charts prepared by Maury and others which led the way to some sailing ship voyages being shortened by as much as a third. As a result of Maury's work, systematic observations of winds and currents were organised on an international scale, but "it was not all plain sailing" for a captain submitting one of the first meteorological registers wrote, "I cannot get my officers to take any interest in the matter"! Since those days, much valuable information about wind, ocean currents and waves had been obtained as a result of visual observations by seamen, but more detailed and scientific observations were needed in order to supplement these. For example, the wave recorder as fitted in certain research ships provided very valuable information about the structure of waves. The highest wave actually recorded was one of nearly 70 ft., by an instrument aboard the British Weather Ship, *Weather Reporter*, when she experienced the relics of hurricane 'Betsy' in September 1961. Dr. Deacon explained that the new spectrum analysis of sea waves, as a result of instrumental observations, resulted in much improvement of the methods used for predicting waves from meteorological charts and forecasts. The U.S. Hydrographic Office had made use of this knowledge in connection with their optimum routing project whereby selected routes are picked out for the ships of the U.S. Military Sea Transportation Service when crossing the Atlantic. Recent research and experiment into behaviour of waves had encouraged the Director of the Ship Hydrodynamics Laboratory to say, "We are at the moment on the threshold of developments in the field of ship motions and seagoing qualities of ships that will have great influence on the ships of the future and the effort devoted to the subject is gathering momentum in all maritime countries." Research work was now being done into study of changes in waves as they approach the shore; it is hoped that this will lead to a better understanding of the factors that cause erosion or silting in coastal regions and sometimes dangerous currents in surf.

Dr. Deacon discussed the increased knowledge about the sea floor which had been gained by use of the echo sounder: "Not all scientists were enthusiastic about it to begin with because it did not bring up samples like the wire soundings, but the wealth of new information obtained from continuous profiles of the bottom roused much new interest, and bigger and better samples, under-water photographs and other techniques, have opened up a new field." He explained that mapping the deep ocean was necessarily a slow business and few navigators would be likely to admit that maps of the deep ocean floor could be of much practical use to them. Dr. Deacon mentioned that recent work had shown that sand and mud accumulating on the relatively steep continental slopes can sometimes run down the slopes "like an avalanche" and may be very destructive, able to break submarine cables! One of the striking features of marine science in our days was the expanding interest of geologists in the subject.

Recent experiments with cheaply made current floats designed to remain at a predetermined depth had shown that at all depths currents are faster and more variable than expected. In the eastern North Atlantic, deep and bottom waters had been found generally to move at about 1 to 5 miles a day, but on the western side they are about three or four times as fast, and near the equator in both Pacific and Atlantic sub-surface currents flowing at 2½ knots had recently been discovered. Oceanographers needed to find the cause of these large and variable deep water movements before they could understand the physics of the ocean and its surface current.

Dr. Deacon praised the surface current atlases prepared from observations made by seamen and mentioned the fact that these often emphasise variability of current. But to understand the day-to-day changes in currents "requires intensive theoretical and practical study much more difficult than the making and plotting of careful observations that has stood us in good stead so far". Active research into the direct effect of local winds and the more general influence of whole wind systems over the oceans had been carried out, but the problems are complex. The effect of the earth's rotation makes ocean currents faster on the western side of the oceans and is a basic factor in the physics of the newly discovered 2½ knot deeper currents near the equator and it comes into every problem involving transfer of water horizontally or vertically. The lecturer suggested that the future offers great scope for skilful observations at sea but there is probably an even greater need for advanced theoretical and experimental work.

After discussing the steps being taken to improve knowledge about tidal streams, both in coastal and oceanic areas and into the physics of the destructive waves produced by submarine earthquakes such as those which recently caused much damage in the Pacific Ocean, Dr. Deacon concluded by a reference to the necessity of gaining more knowledge about interaction between sea and air, which might perhaps help to improve long term weather forecasts.

C. E. N. F.

INTERACTION BETWEEN THE ATMOSPHERE AND THE OCEANS

An all day discussion took place at the Meteorological Office, Bracknell, on Tuesday, 16th January 1962, when meteorologists and oceanographers discussed the mutually important subject of the interaction between the atmosphere and the oceans. The Chairman was Professor P. A. Sheppard.

There were four main speakers: Dr. J. R. Rossiter, of the University of Liverpool Tidal Institute, on storm surges and meteorological disturbances of tides; Dr. O. M. Phillips, of the Department of Applied Mathematics and Theoretical

Physics, University of Cambridge, on recent developments in the theory of wave generation by wind; Mr. D. H. Johnson, of the Meteorological Office, on the exchange of energy across the ocean-atmosphere interface; and Mr. J. Crease, of the National Institute of Oceanography, on the general circulation of the oceans.

With such important topics there was much to discuss. The main points of interest to readers of this journal were as follows: the possibilities of improving the forecasting of storm surges as undertaken at present, for example, by the Admiralty Flood Warning Organisation, adjacent to the forecasting office at Bracknell, by the use of mathematical models now being developed in an attempt to solve the hydrodynamical equations directly using an electronic computer; the importance of recent theoretical work on wave generation to the study of the problem of practical wave forecasting in terms of meteorological data; and the need both for more climatological studies on existing oceanic data and on new data not yet available, particularly on solar radiation (other than that obtained at present solely by the British ocean weather ships).

The Chairman summarised the day's discussion by stating how useful it had been for the oceanographers and meteorologists to come together to consider the various problems which had been outlined; the present formal meeting should lead to many future informal meetings.

A full account of this meeting is being published in the Meteorological Magazine.

L. J.

551.326.7

NOTES ON ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM APRIL TO JUNE 1962

Relevant Weather Factors

April. Early in April depressions formed over Baffin Island, the Davis Strait, and south of Denmark Strait and moved eastwards towards the British Isles and then north-eastwards towards the Barents Sea. In the latter half of the month the depression activity was centred south of Iceland affecting the Davis Strait and the north-western North Atlantic, while a blocking high pressure area became established over north-west Europe. Air masses were colder than normal over the whole of eastern Canada and the Russian Arctic east of Spitzbergen. Air temperatures were above normal over Baffin Bay and most of Europe including the south-eastern Barents Sea.

May. The Azores and polar anticyclones were normally active with depression activity continuing south of Greenland and Iceland. The outstanding anomaly was the frequent shallow depressions over north-west Scandinavia. Abnormally cold air masses extended over most of the polar and adjacent regions. Only north-west Russia and sea areas west of Norway experienced above normal surface air temperatures.

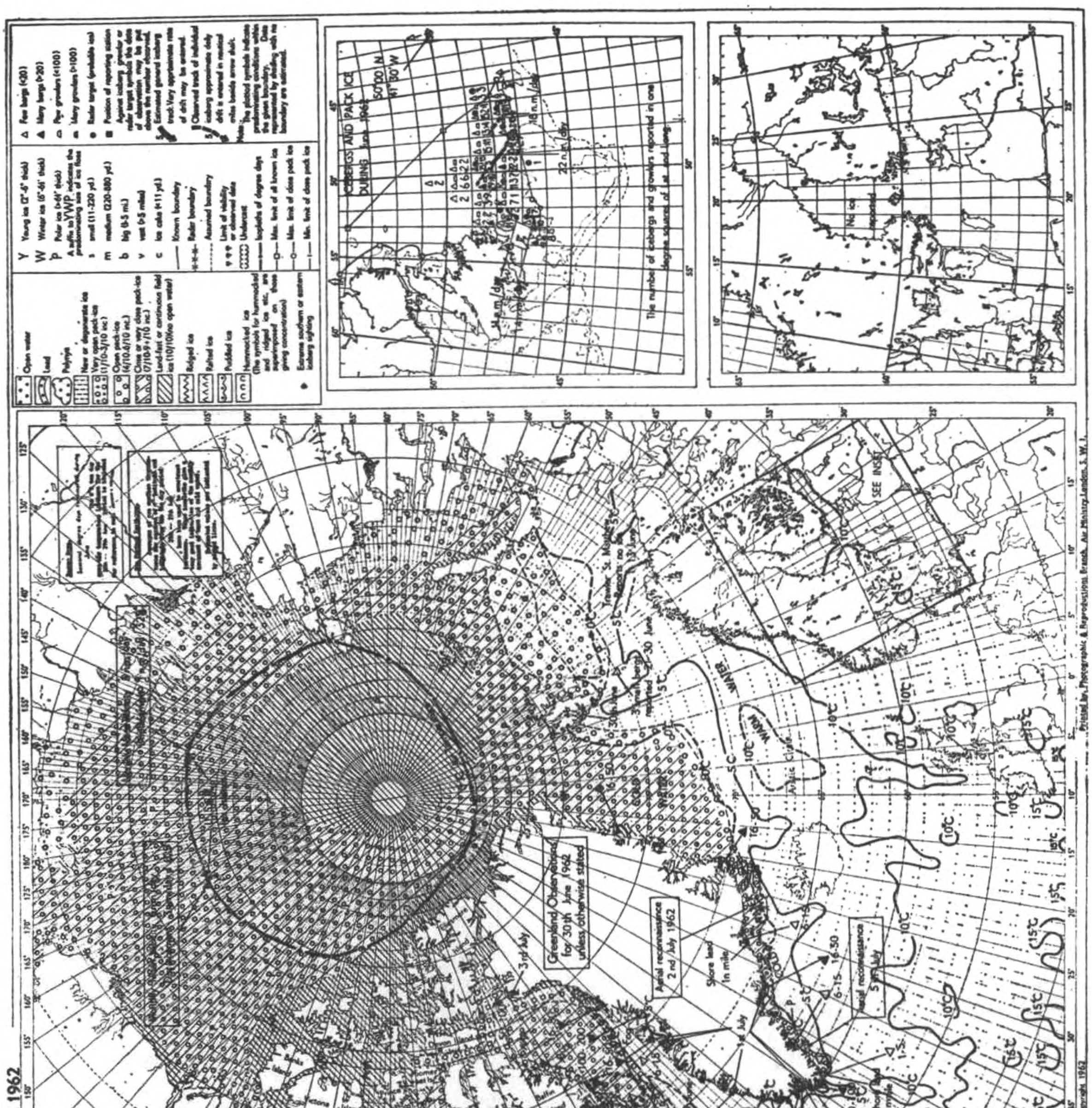
June. There was very little change in the general situation from that at the end of May. The Azores high built up and extended over western Europe but there was no sustained strong pressure gradients. Surface air masses over the polar basin were rapidly warming and a relatively small area remained with 10-day mean temperatures below 0°C.

Canadian Arctic Archipelago including Baffin Bay and Hudson Bay and Strait

April. Very little change from March was evident in this area at the end of April; open water along the west coast of Greenland had extended northward and was in excess of normal. There were more than 200 icebergs reported by a land station towards 70°N. Off Baffin Island and at the entrance to Hudson Strait icebergs and heavy pack-ice were probably moving fairly rapidly southwards and the extent of the pack-ice was probably above normal but open.

The Canadian Meteorological Service has given some interesting thickness measurements taken on 30th April 1962. Ice thicknesses in the western Canadian Arctic at this time have not varied greatly over the last three years from an average of about 6½ ft. (estimated from a small but well distributed sample of stations). In the Queen Elizabeth Islands thicknesses were on average 5½ ft. which was about 1 ft. less than thicknesses of 1961 and about equal to those of 1960. Thicknesses in the Foxe Basin were of the order of 6½ ft., that is about normal (with excessive hummocking in the north only), while in the north of the Hudson Bay the ice was about 4½ ft. thick. It is interesting to note that at the mouth of the river near Port Harrison ice 7½ ft. thick was observed. It was also apparent that the hummocking of the ice surface had been greatly reduced in the south of Foxe Basin by tidal currents and water movements in Hudson Strait and off Southampton Island. At Clyde River on the east coast

Note.—The notes in this article are based on information plotted on ice charts each month, similar to the map below, but on a much larger scale (18 in. × 13 in.). They are available at the price of reproduction on application to the Director-General, Meteorological Office (M.O.1), London Road, Bracknell, Berks. Alternatively, they may be seen at any Port Meteorological Office or Merchant Navy Agency.



KEY

—·— AIR TEMPERATURE: 0°C isotherm (mean for 20th–29th June). ['Degree-day' isopleths are not given, as none of the stations reported air temperatures below 0°C.]

— SEA TEMPERATURE, °C, for 20th–29th June. These isopleths give a good indication of the monthly movement of warm and cold water.

- - SEA TEMPERATURE, as above, but only estimated values.

of Baffin Island an ice thickness of 5½ ft. was reported, about 1 ft. thicker than in 1960 and 1961, while at Frobisher on the large inlet of the south-east of the island the thickness was 5 ft., differing little from that in 1960 and 1961. It appeared that although the 1961 to 1962 winter had been somewhat severe, ice thicknesses did not differ greatly from average and tended to be slightly below normal.

May. Very little change was evident at the end of May, with the southern extent of pack-ice in Baffin Bay in excess of normal. Two hundred icebergs continued to be reported by land stations towards 70°N off west Greenland (towards Umanak). Very high sea temperatures in the north of Davis Strait indicate that Atlantic water may have entered the current circulation of Baffin Bay and eastern Canada.

June. Rapid seasonal changes were evident at the end of June with large areas of open water appearing south of Smith Sound, south of Devon Island, in Hudson Strait and around the edges of the Hudson Bay. There was very little open water in the bays and inlets of western Greenland and Baffin Island but the general break-up in Baffin Bay had begun. More than two hundred icebergs continued to be reported towards Umanak Fjord, while 50 to 100 icebergs were reported towards Thule in the north of Baffin Bay. Small numbers of icebergs (less than 20 at a sighting) were reported in Hudson Strait and off southern Baffin Island. However, bergs and pack-ice were clearly circulating in Baffin Bay and moving south along the Labrador coast. The ice situation remained essentially normal.

Davis Strait

April. The area of pack-ice at the end of April off Greenland and Canada was below normal. The pack-ice moving south off Labrador was rapidly dispersing towards Belle Isle and north of the Great Bank. The coast of Greenland was apparently free of pack-ice north of 61°N. Sixteen to 50 icebergs were reported by individual land stations off south-west Greenland but less than 5 were observed by stations north of this. During the month there were more than 100 iceberg sightings by ships in the approaches to Belle Isle suggesting that the number of icebergs moving south off the coast of Labrador had been slightly in excess of normal.

May. At the end of May there was very little change in the pack-ice off southern Greenland but there was a general dispersal off north-east Newfoundland. The movement of icebergs along the Labrador coast appeared to have almost ceased.

June. Icebergs (up to 100) continued to be reported by individual land stations and trawlers off the extreme south-west of Greenland. There was still no pack-ice observed off this coast. Pack-ice had begun to disperse fairly rapidly from the south off the coast of Labrador but the number of icebergs drifting southwards appeared to have increased. An individual sighting of 16 bergs was reported off Labrador. It seemed that the very high sea temperatures in Davis Strait had produced a season in which the area of pack-ice was below normal but the number of icebergs had not been greatly influenced.

Belle Isle Strait

April and May. Close winter pack-ice of mainly small and medium size floes covered most of the Strait which remained closed to shipping. Numerous individual icebergs moved through the Straits and along the west coast of Newfoundland. The extent and thickness of the pack-ice was below normal and tended to be concentrated against the south shore, but the number of icebergs moving right through the Straits was above normal.

June. The Straits were navigable (though with difficulty) on 11th June and clear of pack-ice by the end of June (having been closed since 14th January); icebergs continued to move into and through the Straits but in decreasing numbers.

Great Bank and East Newfoundland Coast

April. The pack-ice that had drifted southwards off Labrador was dispersing along the east coast of Newfoundland by the end of April leaving mainly small amounts of pack-ice off the north-east coast. Icebergs moved in a fairly narrow stream west-south-westwards round the Great Bank to approximately 49°N, 50°W (about 100 icebergs were involved) and then spread across 2° of latitude, some going southwards along the 75 fm. line and others moving slightly south of east. Those moving south along the 75 fm. line appeared to drift at about 1 kt. and those moving on an easterly track at about ½ kt. The isolated bergs remaining off Newfoundland were rapidly dispersing. The only port along the east Newfoundland coast that was closed was Botwood, from 25th February to 12th April.

May. During May the number of icebergs drifting south along the Labrador coast appears to have been greatly reduced while the unusual amount of warmer water entering the Davis Strait from the southwest continued. Icebergs which had already moved on to the Great Bank drifted round its eastern edge at about 1 kt., setting mainly southward to about 46°N. (The normal southerly limit of icebergs is south of 40°N.) Numerous sightings of icebergs continued off the Avalon Peninsula (Newfoundland).

June. The number of icebergs drifting south along the Labrador coast resumed the normal seasonal increase; they continued to spread over the north of the Great Bank but their southward penetration decreased. The services of the International Ice Patrol were terminated on 22nd June.

The Gulf of St. Lawrence and River St. Lawrence

April. The River St. Lawrence and the Great Lakes were unimpeded by ice, though isolated patches remained on shallow marginal water of the lakes. The Gulf of St. Lawrence was almost free of ice but considerable patches of mainly open winter pack remained adjacent to Prince Edward Island and moving through the western side of Cabot Strait. The St. Lawrence Seaway opened on 15th April according to schedule (the first overseas vessel to reach Montreal was m.v. *Helga Dan* on 13th March).

May and June. Apart from pack-ice within Belle Isle Strait and icebergs moving through the Strait the whole of this area was ice free. The general clearance was ahead of normal although a season of the utmost severity had been experienced.

The St. Lawrence ice breaker season ended on 31st May (including operations on the Newfoundland coast and convoying from Cape Race); 216 ships had been assisted (deep sea vessels receiving escort by reporting through 'Ice Sydney'). However, there were reports on 10th May of navigational difficulties in the locks at the entrance to Lake Superior caused by ice jamming.

Greenland Sea

April. There was very little change in the area of fast- and pack-ice from the end of March. There was a tendency for the polar pack to extend southwards west of Spitzbergen. The area of fast-ice off the Greenland coast was about normal but the total area of pack-ice was slightly less. There was a wide area of open or very open pack along its eastern edge. The amount of pack-ice off western Spitzbergen appeared to be well below normal. Individual land stations reported up to 50 icebergs moving southwards in the pack-ice off eastern Greenland.

May. The whole area of pack-ice had moved southwards and south-eastwards approaching north-west Iceland and Jan Mayen. There was much open pack off western Spitzbergen.

June. Very little change, except that warmer surface water appeared to have moved northwards west of Spitzbergen and north-west of Iceland clearing much of the pack-ice locally.

Denmark Strait

April and May. Pack-ice dispersed almost completely south of 65°N. This is very abnormal. At the end of April there was the normal amount of close pack-ice north of 65°N. This increased by the end of May as the polar pack moved southwards along the coast of Greenland and south-eastwards towards north-west Iceland. Less than 15 icebergs were observed by individual land stations south of 65°N, but towards 68°N one station observed between 100 and 200 bergs within the polar pack moving southwards; 50 to 100 icebergs were reported in the pack off Scoresby Sound.

June. A relatively narrow stream of Arctic water with patches of polar pack-ice spread all along the Greenland coast. At Cape Farewell, however, it had become very open. Up to 50 icebergs were observed, by individual land stations, drifting south-westwards within the Arctic water.

Barents Sea

April. Meteorological conditions suggest that polar pack had moved south and consolidated east of Spitzbergen but both pack- and fast-ice were breaking and opening generally, in the south-east of the area. Reports were received of the break-up of the river ice in the Archangel area towards 18th April. Throughout April pack-ice extended from Spitzbergen to Bear Island and between 6 and 8 icebergs were reported off the north coast of Bear Island towards the end of the month.

May. At the end of May very little change was observed from the end of April, apart from the continued seasonal progress of the break-up of river and coastal ice in the south-east of the area.

June. Very little pack-ice remained in the south-east of the area with the polar pack retreating northwards and opening east of Spitzbergen and north-east of Bear Island. Small bergs, however, continued to be reported off Bear Island towards the end of the month. The mass of pack-ice south of Spitzbergen appeared to be well below normal.

Baltic Sea

April. Fast- and pack-ice remained in the northern half of the Gulf of Bothnia only; elsewhere almost all of the ice had disappeared from the Baltic. Along the northern shores of the Gulf of Bothnia from Vaasa to Umea there was fast-ice extending up to 60 miles from the coast and 2 ft. thick in places. Low temperatures occurred over the Gulf of Bothnia towards the end of April and new ice began to form.

May. All pack-ice and fast-ice had dispersed by the end of May and the last ice reports were received on 28th and 29th May from Finland and Sweden respectively. G. A. T.

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

(This does not include growlers or radar targets)

Limits of Latitude and Longitude		Degrees North and West										
		60	58	56	54	52	50	48	46	44	42	40
Number of bergs reported south of limit	April	*	*	*	*	*	> 169	90	0	0	0	0
	May	*	*	*	*	*	> 251	> 246	> 136	4	0	0
	June	*	> 312	> 279	> 263	> 263	> 255	139	0	0	0	0
	Total	*	*	*	*	*	> 675	> 475	> 136	4	0	0
Number of bergs reported east of limit	April	> 167	> 161	> 161	> 161	> 141	128	100	32	0	0	0
	May	> 248	> 233	> 233	> 223	> 166	> 141	> 65	8	2	1	0
	June	> 279	> 279	> 258	> 258	> 193	133	58	12	1	1	0
	Total	> 694	> 673	> 652	> 642	> 500	> 402	> 223	52	3	2	0
Extreme southern limit	April	46° 05′N, 47° 35′W on 25.4.62										
	May	42° 13′N, 48° 42′W on 4.5.62										
	June	46° 20′N, 53° 10′W on 22.6.62										
Extreme eastern limit	April	48° 30′N, 44° 40′W on 29.4.62										
	May	45° 55′N, 41° 10′W on 5.5.62										
	June	50° 00′N, 41° 30′W on 2.6.62										

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

> ("greater than") has been inserted where there is some doubt as to the actual number of icebergs at some of the sightings, but the true value is probably greater than the value given.

Table 2. Baltic Ice Summary, April–June 1962

No ice was reported at the following stations during the period: Visby, Goteborg, Ventspils, Gdansk, Stettin, Kiel, Lubeck, Tonning, Husum, Emden, Gluckstadt, Bremerhaven, Copenhagen, Aarhus, Oslo, Kristiansandfjord.

No ice was reported at any of the stations during June.

Station	April 1962									May 1962								
	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
Riga	1	4	4	1	3	0	1	0	338									
Pjarnu	1	24	24	19	5	1	0	23	511									
Leningrad	1	22	9	1	8	5	1	0	757									
Viborg	1	23	23	23	0	2	0	21	—									
Klajpeda	1	10	4	1	1	1	0	0	—									
Tallin	1	22	22	3	19	3	15	0	—									
Helsinki	1	18	18	14	0	6	8	0	727									
Mariehamn	1	12	8	0	7	8	0	0	307									
W. Norrskar	1	27	25	0	25	10	10	4	—									
Turku	1	12	12	6	0	2	6	0	706									
Mantyluoto	1	6	6	6	0	0	6	0	—									
Vaasa	1	30	30	30	0	1	25	4	953	1	1	1	1	0	1	0	0	754
Oulu	1	30	30	30	0	3	0	27	1378	1	4	4	3	0	4	0	0	1180
Lulea	1	30	30	30	0	0	0	30	1566	1	13	13	11	2	3	4	6	1400
Bredskar	1	30	30	30	0	12	15	3	—	1	9	9	1	8	2	0	0	—
Alnosund	1	11	11	11	0	2	9	0	949									
Stockholm	1	30	30	22	5	30	0	0	510	1	1	1	0	1	1	0	0	288
Kalmar	1	3	3	3	0	0	3	0	138									
Skelleftea	1	30	30	30	0	3	1	26	—	1	8	8	3	0	3	0	0	—
Roytaa	1	30	30	30	0	0	0	30	—	1	21	21	20	0	12	0	9	—
Yxspihlaja	1	30	30	27	3	1	24	5	—	1	3	3	0	3	2	1	0	—

CODE:

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

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

NAUTICAL OCCASIONS AT BRACKNELL

In the rural surroundings of Bracknell we meet all too few seafarers and we always welcome the rare occasions when we are able to welcome a shipmaster or officer to our new home, buildings of which we are rather proud and where at last, after more than a hundred years of working in somewhat improvised and scattered premises, the whole of our headquarters is together.

Two such occasions during the past year stand out, the presentations of the four barographs announced in the October 1961 number of *The Marine Observer.*

Only once in the 14 years that these annual presentations have been made, have we been able to get all four recipients in one place at one time, such are the vagaries of shipping, but in the past year we were luckier than in many when we have had to take three, or even four, bites at the cherry.

On the 16th October 1961, in the absence of the Director-General abroad, barographs were presented by Mr. B. C. V. Oddie, Deputy Director (Central Services) of the Meteorological Office, to Captain P. S. Calcutt, of the New Zealand Shipping Company, and Captain H. C. Smith, of the Shaw Savill Lines. We were glad to welcome both Mrs. Calcutt and Mrs. Smith to the presentation, which was made the occasion of a little luncheon party attended also by the Assistant Marine Superintendent and a Director of each Company. Officers from the Marine and other Divisions of the Meteorological Office which are concerned with the observations of the voluntary observing fleet were also present.

In making the presentations Mr. Oddie stressed the great value which the Meteorological Office sets on ships' observations and mentioned that these two Companies had been loyal observers for very many years, the New Zealand Shipping Company from 1867, when we first lent our instruments to the *Ruahine*, and the Shaw Savill Lines since 1874, when we received a meteorological logbook from the full-rigged ship *Crusader*.

The remaining two barographs were presented to Captain K. D. G. Fisher, G.M. and Captain B. Forbes Moffatt, both of the Shaw Savill Lines, at a similar ceremony on the 17th April 1962, by the Director-General, Sir Graham Sutton. Unfortunately, Mrs. Forbes Moffatt was unable to be present, but we were glad to have Mrs. Fisher with us on this occasion, together with the Assistant Marine Superintendent and a Director of the Comany.

Sir Graham mentioned how often on these occasions Shaw Savill's seemed to come into the picture, which was quite right and proper in a Company with such loyal observing service. He expressed the gratitude of the Meteorological Office for the help we had received from them over many years, for which these barographs were a token of appreciation.

After both ceremonies the Captains and their wives were shown round the Office and, among other things, they were impressed to see their own first meteorological logbooks and their personal record cards. L. B. P.

SPECIAL LONG-SERVICE AWARDS

For the past fifteen years, annual awards of inscribed barographs have been made to the four voluntary marine observers whose length of service on our behalf, and quality of meteorological observations throughout, are considered as deserving special recognition.

The basic qualification which brings an officer into the zone for these special awards is 15 years' voluntary service including the year previous to that of the award, but these years are seldom continuous, often being spread over 35 or more years. This year 57 officers came into the zone; their individual record cards kept in this office from the time their first meteorological logbook was received were scrutinised and their records mathematically worked up, as in previous years, on the basis of their number of years of actual service and the quality of their individual logbooks. This effectively places them in an order of merit and the first four are selected to receive the special award.

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

1. CAPTAIN G. W. B. LLOYD (Union Castle Line) who sent us his first meteorological logbook in 1923 when he was in the Leyland Line steamer *Philadelphian.* Since then he has, in 21 years, sent us 46 meteorological logbooks, of which 20 have been classed 'excellent'.

2. CAPTAIN J. L. GIBSON, O.B.E. (Anchor Line). A voluntary marine observer also since 1923 when we received his first meteorological logbook from the *Carpentaria.* In 19 years of observing Captain Gibson has sent us 49 logbooks, 28 of them being classed 'excellent'.

3. CAPTAIN N. L. WARREN (New Zealand Shipping Co. Ltd.) whose first meteorological logbook came from the *Hertford* in 1934. Of the 26 logbooks which Captain Warren has sent us in 17 years of observing, 22 have been awarded the 'excellent' classification.

4. CAPTAIN F. L. OSBORNE (Manchester Liners) who commenced his voluntary observing in 1932 when in the *Manchester Commerce,* since when he has in 21 years sent us 46 books, 13 of them being classed 'excellent'.

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

CANADIAN EXCELLENT AWARDS, 1961

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

We have recently chosen the names of the officers and ships in the Canadian Voluntary Weather Observing Fleet who are to receive Excellent Awards for marine weather observing carried out in the year 1961. (See list below.)

This is the fourteenth in our annual marine award series. Thirty-five awards, in the form of books, were presented to the captains, principal observing officers, and radio officers of ocean-going ships who made an especially noteworthy contribution to the Canadian ship weather programme.

A copy of the book *IGY—The Year of the New Moons*, by J. Tuzo Wilson, was presented to the masters of the twelve ships in our observing fleet which had done the best overall work during the year. Ten awards were made to the principal observing officers whose weather records were judged to be the best throughout the year. They received a copy of *American Practical Navigator*, by Nathaniel Bowditch. Thirteen radio officers received an award of the book *Biography of the Sea,* by Richard Carrington.

Sixty-two ships were engaged in weather observing last year, and they made a total of approximately 20,300 reports. In choosing the recipients of our annual

SHIP	OBSERVING OFFICER RECEIVING AWARD	RADIO OFFICER RECEIVING AWARD	OWNERS
Baffin	A. R. Turnbull	F. A. Webb	Govt. of Canada
Bluenose	H. Whitehead		Govt. of Canada
Cyrus Field	D. S. McGarvie	C. Kearney	Western Union Telegraph Co.
Emerillon	I. Balodis	J. Weir	Shell Canadian Tankers, Ltd.
Imperial St. Lawrence	C. H. L. Ritcey	V. M. Dykeman	Imperial Oil, Ltd.
John A. Macdonald ..		A. Sledmere	Govt. of Canada
Kapuskasing	J. F. Bourgeois		Govt. of Canada
Labrador		F. V. Williams	Govt. of Canada
Lakemba	G. F. Goodwin	F. Isaac	Pacific Shipowners, Ltd.
Lord Kelvin	G. C. Dale	G. A. Rayne	Western Union Telegraph Co.
Oriana		R. LeGear	Orient Line
Northern Shell ..		M. G. McNaughton	Shell Canadian Tankers, Ltd.
Princess Helene ..	W. J. Goodwin	C. F. MacMillan	Canadian Pacific Railway Co.
Suva		N. J. Nelson	Pacific Shipowners, Ltd.
Wabana	F. C. Kelly	J. Strang	Dominion Shipping Co., Ltd.

awards, both the number of observations made and their quality is considered, but more importance is attached to the quality.

Book Reviews

Ice Atlas of Arctic Canada, by Charles Swithinbank. 34 in. × 20 in. pp. 67. Prepared at Scott Polar Research Institute (Cambridge, England) and published by Canada Defence Research Board, 1960. $7.50.

This atlas of Arctic Canada is similar in form to that published by the Hydrographic Department of the Admiralty, entitled *Sea Ice North of the U.S.S.R.*, by Dr. Terence Armstrong. These atlases appear to be the outcome of two halves of a single project. The reviewer visited the Scott Polar Research Institute while the production of the two atlases was in progress there and was immediately impressed with the thoroughness with which they were being prepared. Publishers, authors, and the Scott Polar Research Institute can be congratulated on producing a very fine series of reference atlases, designed specifically for those contemplating sea journeys into polar regions.

The *Ice Atlas of Arctic Canada* is beautifully printed and a pleasure to use. It contains very little, but sufficient, explanatory text. There are two main series of charts within the atlas. 29 charts (Figs. 9 to 37), made mainly for weekly periods, cover the Canadian Arctic, Baffin Bay and the adjacent coasts of western Greenland extending south to about 65°N. Small circles cover most of the seas that experience ice and each of these has three concentric zones. The inner zone contains the station number and the number of years of observation. The next zone is divided into coloured segments to represent the frequency of various ice concentrations. The outer zone contains symbols indicating the frequency with which various types of ships have been able to navigate specific concentrations of ice. There are over 300 of these circles, distributed over most of the Canadian Arctic and Baffin Bay. The second series of charts (Figs. 39 to 67) gives the concentration of ice over the same period, but for each available year of observation, for the same stations as in Figs. 9 to 37, using the same colour codes and symbols. It is, therefore, by means of these charts, quite easy to see the probability of any specific ice concentration, the possibility of safe navigation within the ice, and the seasons in which specific conditions occurred.

There are a number of additional charts which provide essential information concerning an average ice season. Fig. 2 gives mean surface currents and Figs. 4 to 8 give the mean extent of fast-ice over the continental shelf of the Canadian Arctic for each of the months April to August.

There is an adequate list of references, with a full list of reporting ships which provided ice data; the latter will doubtlessly be of interest to sea historians. The long periods during which no information has been received for many areas are clearly evident. It is hoped that with the recent, and still continuing, great increase in ice data (including those from air reconnaissances), this atlas will be kept up to date in subsequent editions. It seems that by means of, for example, Figs. 39–67, a very useful piece of work could now be carried out associating ice and meteorological conditions in specific areas and noting how climatic changes have influenced the ice. Quite interesting ice forecasting rules might be derived from such an investigation.

G. A. T.

The Summer Climatic Environment of the Yorkshire Coast, by Robert E. Stevenson. pp. 239. *Illus.* Geography Branch, Office of Naval Research, U.S.A. Los Angeles, 1961.

This field study was carried out during the summer of 1959 under contract with the Geography Branch, Office of Naval Research, U.S.A. The scope of the work is considerably wider than the title would indicate, since the author deals in some detail with the various aspects of the whole of the North Sea (e.g., the circulation of water and monthly distribution of surface water temperature) and also includes an account of the climate of the British Isles as a whole, also a description of the landscape of much of the county of Yorkshire.

To meteorologists and mariners, the most important part of the book is that dealing with the detailed sea temperature characteristics off the Yorkshire coast, and their relation to fog formation. This occupies 35 pages. In dealing so thoroughly with this aspect of the summer climate of the Yorkshire coast, Mr. Stevenson has performed a most useful service. For accurate local forecasting of fog or low stratus, the importance of knowing the peculiarities of sea-surface temperature distribution in summer in coastal waters cannot be over-emphasised. By making sea temperature observations himself from small boats, Mr. Stevenson has been able to present several interesting quasi-synoptic maps of sea surface temperature isotherms off Flamborough Head, which confirm the presence of relatively cold waters just off the coast which are continually mixed by the turbulent flow of the strong tidal stream.

The occurrence of sea fog along the Yorkshire coast is then discussed. Mr. Stevenson rightly emphasises that for forecasting of advection fogs along the coasts detailed knowledge of the surface water temperature is required. He points out that it is far from sufficient to plot air trajectories over the water and relate them to the mean water temperature, since the temperature may vary significantly from year to year. In August and September 1959, for example, the sea temperature in the tidal stream was 1·8°F lower than the long-term mean. Another and more temporary factor affecting sea surface temperature just off the coast from Flamborough to Filey is the variation of the width and the configuration of the belt of relatively cold water depending upon the stage of the tide (ebb or flood), the cycle (spring or neap) and the prevailing wind. F. E. L.

The Four Winds of Adventure, by Marcel Bardiaux. 8¾ in. × 5¾ in. pp. 271. *Illus.* Adlard Coles, Ltd., London, 1961. 25*s.*

This book is, in effect, a meteorological saga. It describes a single-handed voyage in a home-made four-ton yacht from Paris to Tahiti, via Cape Horn. This was an enterprising and courageous adventure, reminiscent of Slocum, to whom the author refers from time to time. In a later book the author will describe the remainder of his voyage of circumnavigation from Tahiti to Bordeaux via Cape of Good Hope and New York.

Bardiaux built *Les Quatre Vents* himself; she is based upon a published design of a 9-metre sloop, but extensively modified to suit his own requirements. It took him seven years to build the vessel, and he was almost a year getting from Paris to Casablanca, due to the necessity of making changes in her rig, changing the engine, and fitting additional bulkheads and lockers. He thus had two valuable attributes for a seaman with which to start the voyage—patience and attention to detail—and the book shows that, although not a professional seaman, his seamanship in particular, his navigational accuracy and, above all, his courage and cheerfulness were of a very high order.

His preliminary trials being complete, he sailed from Casablanca in May 1951 for Cape Horn, which he rounded on 12th May 1952. On route he called at Dakar, Rio, Santos, Montevideo and Buenos Aires. Having derived the satisfaction of rounding the Horn, he then sailed up between Cape Horn and Hermite Island to the Argentine Naval Base of Ushuaia, where he spent about three weeks resting from the violent meteorological adventures he had experienced since passing through the Straits of Le Maire (between Staten Island and Tierra del Fuego), and doing some urgent maintenance and repair work to his craft.

From Ushuaia he proceeded via Beagle Channel to Cook Bay, where he entered the Pacific, and thence through Brecknock Pass and Barbara Channel where he joined the western part of the Magellan Straits, whence he sailed through the maze of Magallanes Channels off the Chilean coast, to Port Montt. This part of the voyage, which took about 7 weeks, was through some of the most inhospitable and dangerous channels in the world—shoals, rocks, strong currents and tides, violent winds and very low temperatures being a few of the enemies to encounter—and is almost totally unlighted, yet *Les Quatre Vents* seems to have come to an anchor in some lonely bay or other on most nights.

After leaving Port Montt, the remaining passage to Tahiti via Coquimbo was relatively straightforward although there was plenty of adventure, discomfort and seamanship to keep the captain and crew out of mischief!

Les Quatre Vents and her crew were the heroes of this book; winds and the currents were the villains, but like most villains they had their helpful and benign side. The author does not seem to think much of the meteorological and ocean current information contained in the *Instructions Nautiques* and other official publications; his complaint seems to be that they are, in many cases, somewhat too definite. On the passage from Dakar to Rio, for example, he seems surprised that he got WSW winds north of the Doldrums, and that the SE trades north of about 8°S came from the S or SW direction, and that he got so much unpleasant weather off the Brazilian coast. Meteorological charts of the Atlantic Ocean indicate the risk of such conditions, but are perhaps a bit bulky for use aboard a small craft. His comments about the variability of the Humboldt (Peru) Current which is often believed to set constantly to the north are confirmed in the text of the British Admiralty Pilot for this part of the world. The weather he experienced south of about 50°S was broadly in keeping with what might be expected: sudden and violent gales; lots of rain, snow and low visibility; and mostly overcast skies. But despite the low water temperatures there, the author more than once voluntarily went over the side to shift his anchors, and once in Le Maire Straits his ship turned turtle in a violent squall but managed to right herself again. As a result of these immersions the author acquired a partial paralysis on one leg. The following is a typical extract from his narrative in the Magellanes area: "The 24th was no good. The anchor was barely aweigh when violent squalls descended on the bay. The glass was very low and the waves in the channel very high. There was nothing to be done but pay out again those 50 fathoms of chain so painfully taken in, into 20 fathoms of water. The rain did not let up for a second in a gale from the NNW. So I spent the afternoon at make and mend."

The book contains numerous excellent photographs, but the maps are scarcely adequate. There is an appendix giving drawings and a sail plan of *Les Quatre Vents.*

C. E. N. F.

Navigator in the South Seas, by Brett Hilder. 9¼ in. × 6¼ in. pp. 232. *Illus.* Percival Marshall & Co., London, 1961. 25*s*.

Captain Brett Hilder is master in Burns Philp & Co., a company well known on the Australian coast and in the Pacific, with whom he served his time and, with the exception of service in the R.A.N.R. and R.A.A.F. during the Second World War, has spent all his working life. He has for many years been a meteorological observer.

Navigator in the South Seas is thus the autobiography of a master mariner, and the reviewer's thought on reaching the last page was that the life depicted therein could have belonged to dozens of other master mariners, not excluding himself.

For here is, with the possible exception of mine laying from Catalinas in Japanese occupied ports during the war, no story of high adventure but a sober account of the many and varied happenings which fall to the lot of most voyagers in these fascinating waters. But the difference is that Brett Hilder has eyes to see, ears to hear and a facile pen with which to set them down.

He has divided his narrative into three parts, The Years of Preparation 1928–1938, The Years of Action and Reaction 1938–1946, and the Adventures of Peace Time

1946–1960, each of which is subdivided into half a dozen or more chapters embracing his life in and above the seas from Singapore in the North West to the Cook Strait in the South East and from 'nuclear bomb' Christmas Island in the North East to Bunbury in the South West.

By far the most interesting chapters are those which deal with his voyages amongst the little-known islands of the South West Pacific, the hazards of navigation among them and the salvaging of ships which have got into trouble there.

In such waters, Captain Hilder is in touch with many of the phenomena which interest us in the Meteorological Office, notably the tropical revolving storms which he says "make straight for me whenever possible". His narratives of these make interesting and informative reading. He also frequently mentions bioluminescence of which some of his observations have been published in *The Marine Observer*. He has his own theory connecting these latter manifestations with the earth's magnetic field, a theory which, like many others, has not been substantiated, but we agree when he says "we have to take advantage of the rare manifestation to record their behaviour as accurately as possible in order to give the scientists the basic evidence to work on".

The book is admirably illustrated by many pen and ink sketches by the author himself and is well worthy of a place on the shelves of any ship's officer, particularly one interested in the area in which the author's life has been spent. He has still, we hope, some ten or fifteen years seafaring ahead of him and it is to be hoped that he will, in due course, treat us to another narrative from this fascinating area.

L. B. P.

Personalities

RETIREMENT.—CAPTAIN R. A. BARNS retired from the sea in June after 50 years' service.

Robert Alexander Barns, the grandson of an old-time Bristol Channel pilot who frequently had to sail his cutter out to the west of Ireland to find his work, went to sea in 1912 in the *Cameron*, belonging to the Cameron Line of West Hartlepool, a one-ship company. She was sold soon afterwards but he went with her to the new owners, Chr. Salvesen & Co. of Leith, who employed her in their South Georgia whaling industry. Young Barns was their first apprentice.

After passing for 2nd Mate he embarked on a varied career, firstly in tramps, then with a commission in the Royal Indian Marine, and finally in the Australian Commonwealth Government Line which was later merged into the Shaw Savill Lines. He passed for master in 1924 and attained his first command, the *Cufic*, in 1951.

As 3rd Officer of the *Boorara* (Australian Commonwealth Government Line) in 1918, Captain Barns was twice torpedoed in British coastal waters, but he sailed unharmed through the Second World War despite his employment in many operations.

His association with the Meteorological Office goes back to 1921 when he sent us a meteorological logbook from the *Boorara*. His first returns from Shaw Savill's came from the *Waipawa* in 1937, and his last from the *Afric* which he left in March 1962, occupying the next three months as relieving master. In eight years of observing he sent us 19 meteorological logbooks, of which 11 were classed 'excellent', and received Excellent Awards in 1953, 1954 and 1957.

We wish him health and happiness in his retirement. L. B. P.

RETIREMENT.—COMMODORE A. E. COLES, R.D., recently completed his last voyage at sea in command of the *Oriana*.

Arthur Edward Coles first went to sea in 1918, and received his early sea training with the MacAndrews Line. He joined the Orient Line in January 1928 as 4th Officer of the *Osterley*.

During the war he was engaged in minesweeping and escort duties and was present at the Dieppe assault in 1942, and the Normandy and Scheldt landings in 1944. In 1945 he was made Staff Minesweeping Officer for the surrender of German Naval forces at Copenhagen. He was mentioned in despatches three times, and holds the Reserve Decoration with Bar.

Commodore Coles received his first permanent command, the *Orontes*, in 1953, and afterwards commanded the *Otranto*, *Orion*, *Orcades*, *Oronsay* and *Orsova*. He became Commodore of the Orient Line in January 1961, and was given command of the *Oriana* for his last voyage before retirement.

Commodore Coles's record with the Meteorological Office dates back to 1929, and in 16 years he has sent in 46 logbooks, 21 of which were classed 'excellent'. In 1933 he received an Excellent Award.

We wish him health and happiness in his retirement. E. R. P.

RETIREMENT.—COMMODORE H. A. DELLER recently completed his last voyage at sea in command of the *Pendennis Castle*.

Harold Arthur Deller began his sea career in 1912 as an apprentice with the Prince Line. In 1919 he joined the Union Castle Line as a junior officer and has been with the company ever since. He has served in most of the company's ships and was given his first command, the *Richmond Castle*, in 1942. Of the present mail fleet he has commanded both *Capetown Castle* and *Edinburgh Castle*, and was appointed to the command of his last ship, *Pendennis Castle*, in May 1960. In September of the same year he became Commodore.

In 1941 the King of the Hellenes travelled with his family from South Africa in the *Durban Castle*, in which Commodore Deller was then chief officer. For his part in helping the Greek royal family he was awarded the Royal Order of the Phoenix.

Commodore Deller's record with the Meteorological Office dates back to 1924, and in 21 years he has sent in 44 logbooks, 13 of which were classed 'excellent'; in 1953 he received an Excellent Award.

We wish him health and happiness in his retirement. E. R. P.

RETIREMENT.—CAPTAIN W. S. DOIDGE recently completed his last voyage at sea in command of the Ellerman Bucknall liner *City of London*.

William Stewart Doidge first went to sea in February 1913 and served throughout the First World War in ships of the Globe Line of Liverpool. When this company sold its fleet he served for a while in ships owned by Messrs. McVicar Marshall of Liverpool, and joined the Ellerman Lines in 1920. He served for 42 years with this company, including 20 years in command.

Captain Doidge describes his career at sea as being uneventful, but since he served throughout both world wars and commanded ships engaged both in Malta convoys and in co-operation with the Royal Navy as stores vessels during the last war there is no doubt that, in common with many other fine seamen of his generation, he has had many periods of stress and anxiety and fully merits an honorable retirement ashore.

We received Captain Doidge's first meteorological logbook in 1935 when he was serving in the *City of Perth*, and since that date 20 logbooks have been received from him covering 14 years of observing in Ellerman Line ships. Five of these books were classed 'excellent' and he received Excellent Awards in 1951 and 1953. He has always been keenly interested in weather observing; several ships were equipped with instruments as Selected Ships at his request.

We wish him many years of health and happiness in his retirement. F. G. C. J.

RETIREMENT.—CAPTAIN J. E. EVANS, D.S.C., R.D., completed his last voyage with the arrival of the Pacific Steam Navigation Company's flagship *Reina del Mar* at Liverpool on 17th May last, after 45 years at sea, 35 years of which were spent in the service of the Pacific S.N. Co.

John Emrys Evans, after training in H.M.S. *Conway*, joined Alfred Holt & Co. as a midshipman in 1918. Obtaining his 2nd Mate's certificate in 1922 he served for some years on the China coast with Jardine Matheson & Co., passing for Mate and Master in Hong Kong. In 1927 Captain Evans joined the Pacific S.N. Co. and was appointed to the *Orepesa* as 5th Officer. He was appointed to his first command, the *Loriga*, in 1950. He subsequently commanded the *Reina del Pacifico* and latterly the *Reina del Mar*, in which ship he served as Commodore of the company's fleet.

Captain Evans joined the R.N.R. in 1926 and on the outbreak of the last war was mobilised as Lieut. Commander and appointed to the armed merchant cruiser *Patroclus*. Later he served for five years as Commodore of Coastal Convoys for which service he was awarded the D.S.C., being demobilised in 1946 with the rank of Captain R.N.R.

Captain Evans has been observing for the Meteorological Office since 1946 and in 13 years has completed 26 logbooks, 6 of which have been classed 'excellent'.

Captain Evans is retiring to his home at Pwllheli in North Wales, and we wish him health and happiness for many years. J. R. R.

RETIREMENT.—COMMODORE D. M. MACLEAN, D.S.C., R.D., recently completed his last voyage in command of the *Queen Elizabeth*.

Donald Murdo Maclean began his seafaring days in 1915 as a signal boy in the Royal Navy. He signed indentures with the Cunard Line in 1917 and sailed as an apprentice in the *Tyria*. In 1925 he joined the company's permanent staff as 3rd Officer in the first *Caronia*; he afterwards served in many Cunard ships, receiving his first command, the *Media*, in 1950. He became Commodore of the Company's fleet in March 1960.

During the Second World War, Commodore Maclean was engaged on escort duties with Atlantic, North Russian and Mediterranean convoys, for which he was mentioned in despatches, and was awarded the D.S.C.

Commodore Maclean's record with the Meteorological Office dates back to 1925, and in 22 years he has sent in 100 logbooks, 55 of which were classed 'excellent'; in 1928 he received an Excellent Award, and in 1956 was presented with an inscribed barograph in recognition of his long and zealous voluntary service to the Meteorological Office.

We wish him health and happiness in his retirement. E. R. P.

RETIREMENT.—CAPTAIN N. C. H. SCALLAN, R.D., retired from the sea after bringing the *Empress of England* into Liverpool on 5th May, completing over 40 years at sea served with the Canadian Pacific Steamships.

Norman Carlyle Hurst Scallan received his early training in H.M.S. *Conway* and joined the Canadian Pacific Steamships as a cadet in the *Montezuma* in 1921. Captain Scallan obtained all his certificates in London and has served in most of the ships of the Canadian Pacific including the 'Mont' and 'Duchess' classes. He was appointed to his first command, the *Beavercove*, in 1949. He subsequently commanded six of the Beaver ships and has been relieving Captain of the *Empress of England*.

Captain Scallan, as a permanent R.N.R. officer, was mobilised in 1939 as a Lieut. Commander in command of a group of Asdic trawlers. He later commanded 'Flower' class corvettes and then became Commodore of East Coast Convoys. After demobilisation with the rank of Commander R.N.R. in 1946 he returned to the Canadian Pacific as Chief Officer of the *Empress of Australia*.

Captain Scallan's record with the Meteorological Office dates back to 1922 whilst serving as a cadet, and in 23 years' observing he has sent in 57 logbooks, 26 of which have been classed 'excellent'. In 1960 he was presented with an inscribed barograph in recognition of his long and valuable voluntary service for the Meteorological Office.

We wish him health and happiness in his retirement. J. R. R.

Notices to Marine Observers

SHIPS IN W.C.S.A. WATERS

Up to now, observing ships in the area south of the equator and east of 120°W have not had a detailed radio station through which to pass their weather meassages. We are now glad to inform ships that the countries interested in this area have agreed that, until further notice, the radio weather messages from ships therein should be transmitted to NBA Balboa, addressed to Observer San Francisco.

British observing ships are asked to act on this notice now. The *Marine Observer's Guide* will be amended in due course.

OCEAN CURRENT OBSERVATIONS—ADOPTION OF G.M.T.

Consequent on the adoption of mechanical and electronic methods for the treatment of ocean current data in the Marine Division of the Meteorological Office, it is now possible to link such data with a ship's synoptic meteorological observations. It has therefore been decided to adopt the Greenwich date and time as the standard for all ocean current observations, which have hitherto always been asked for in ship's time.

Ships' officers are therefore asked to discard the use of ship's time in the ocean current pages of the meteorological logbook and to use only G.M.T. and Greenwich date in these pages.

In order that we may fully appreciate the precision of these currents when compiling future editions of our atlases it is essential that the type of fix used in determining the current shall be noted in the Remarks column, e.g. 'noon to noon', 'a.m. stars to p.m. stars', 'land fix to radar fix', etc.

SOUTHAMPTON PORT OPERATION AND INFORMATION SERVICES

A port operation and information centre, on the general lines of those functioning in the Thames (see *The Marine Observer*, October 1960) and at Liverpool (concerning which a notice will appear in the next number), was inaugurated at the Calshot signal station, Southampton Water, in January 1958. The service fulfils two important functions: firstly, it co-ordinates the movement of tankers using the petroleum terminals with vessels proceeding to and from Southampton Docks: secondly, it provides information on request, including present wind speed and visibility, to individual vessels entering, berthing and leaving the port. An example of the value of this service in berthing a large vessel in reduced visibility was given in *The Marine Observer*, October 1961.

For the carrying out of these functions, Calshot signal station is equipped with a high discrimination harbour surveillance radar with three viewing units. Any of five display areas can be selected for presentation on either viewing unit. A scanner with a 25 ft. aperture has been installed at a height of 108 ft. above mean high water springs for operation in winds of up to 52 kt.

VHF R/T is installed at Calshot signal station, Southampton Docks and the Esso Marine Terminal at Fawley, as well as aboard the Harbour Board's patrol launches, the tugboats of a large towing firm, and the Trinity House pilot vessels at Nab, Needles and Hythe. Details of these channels of communication are contained in *Admiralty List of Radio Signals*, Vol. 1, as amended by Notices to Mariners, Weekly Edition 12/62.

Vessels fitted with VHF R/T equipment are particularly requested to establish contact with Calshot signal station before sailing and on arrival when entering Nab or Needles channel, and inform the operations officer of the master's intentions. In turn the operations officer will pass the information of other ship movements taking place in the port and its approaches. A two-way exchange of information is an essential prerequisite to efficient operations. The advisability of maintaining R/T contact with the Harbourmaster cannot be over-emphasised, particularly in the event of unforeseen circumstances developing in the port area. Ships not fitted with VHF R/T equipment may communicate direct with Calshot signal station through the MF radio telephone public service provided by Niton Coast Radio station at the standard rate of charges.

The Meteorological Office has installed an anemometer on Calshot Spit, clear of obstructions, with electrical transmission to Calshot signal station where the direction and speed of the wind in knots is registered. This information is available on request either by R/T or telephone. Also, for record purposes, the direction and speed of the wind is automatically recorded in the signal station on a chart. Information is also available on request concerning the height of tide and state of previous tides.

Calshot also receives a weather forecast from the Southampton Weather Centre three times daily, at approximately 0900, 1300 and 1830 GMT, which will be transmitted on request by VHF.

L. B. P.

ANTI-LOCUST RESEARCH CENTRE

Isolated grey locusts have been recently reported over the southern Red Sea by m.v. *Kuala Lumpur*, and in the eastern Gulf of Aden by s.s. *Cornwall.* The grey colour of these locusts suggests that they may be different from the Desert Locusts which are more usually pink or yellow.

Several species of locusts, including the African Migratory Locust, have recently become numerous in the Red Sea area following the heavy rains which fell last winter, and may now be on the move. It would be of great interest to find out which of them may be migrating over the sea, and Anti-Locust Research Centre would be very grateful if specimens of locusts landing on ships in the Red Sea and the Gulf of Aden could be sent to them for identification, at the following address: Anti-Locust Research Centre, 1 Princes Gate, South Kensington, London, S.W.7.

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

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

Captain A. D. White, R.D., Lt.-Cdr. R.N.R., Deputy Marine Superintendent. (Telephone: Bracknell 2420, ext. 284.)

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

Mersey.—Captain J. R. Radley, Port Meteorological Officer, Room 709, Royal Liver Building, Liverpool 3. (Telephone: Central 6565.)

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

Bristol Channel.—Captain F. G. C. Jones, Port Meteorological Officer, 2 Bute Crescent, Cardiff. (Telephone: Cardiff 21423.)

Southampton.—Lieut.-Commander E. R. Pullan, R.D., R.N.R., Port Meteorological Officer, Southampton Weather Centre, 160 High Street, Southampton. (Telephone: Southampton 20632.)

Clyde.—Captain R. Reid, Port Meteorological Officer, 136 Renfield Street, Glasgow. (Telephone: Glasgow Douglas 2174.)

Forth.—Captain G. N. Jenkins, 'Fairwind', Kings Road, Longniddry, East Lothian. (Telephone: Longniddry 3138.)

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

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

ADDENDUM

The Marine Observer, January 1962. Page 50—

AUTOMATIC TELEPHONE WEATHER SERVICE. In connection with this notice, it should be noted that the forecasts available are, except in the case of Southern Hampshire (which also covers Southampton Water, Solent and Spithead), only for land areas.

IN LIGHTER VEIN

After the observing officers in a certain ship had been asked by the principal observing officer to enter all phenomena in the meteorological logbook, the following was found inside the logbook. We look forward to seeing the phenomena pages in the poet's next meteorological logbook!

Ode to Phenomena

Eclipses by the dozen, sunspots by the score,
Comets by the hundred—this and Oh! much more.

Hail the size of golf balls, feet and feet of snow,
Scintillating Venus and the Zodiacal Glow.

Aurorae and magnetic storms, abnormal rise of seas,
Realistic mirages and Brocken spectrivies.

. . . Whether a shower of meteors, or just a water spout,
We are on the job again, so phenomena . . . LOOK OUT.

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

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