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The Marine Observer

A quarterly journal of Maritime Meteorology

Volume XLIV No. 243

January 1974

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THE MARINE OBSERVER

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

Vol. XLIV

1974

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

VOL. XLIV No. 243 JANUARY 1974

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

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Editorial

Because our memories shall live
When folk forget the way to drive
The black keel through the heaped-up sea,
And half dried up the waters be.
William Morris, *Song of the Argonauts.*

The turn of the year is traditionally a time for stocktaking and to review the hopes, achievements, fears and failures of the past twelve months. Occasionally it is a pleasant exercise to cast a glance astern a little further, a century perhaps.

There was probably nothing remarkable about the visit of our Agent in Liverpool to the *Bowfell* on 21st October 1873. Part-time Agents at the principal ports in the U.K. had been appointed by Admiral FitzRoy in 1854 (they have since been superseded by full-time Port Meteorological Officers though the duties are basically the same). The *Bowfell* had already been in the Voluntary Observing Fleet for some four years but this particular visit makes a convenient point of departure for it took place a hundred years, almost to the very day, before this Editorial goes to the printer. She was a wooden full-rigged ship of 1,002 tons, owned by Messrs. T. & J. Brocklebank and one of the last three ships built in their own yard at Whitehaven, where all their ships were built from 1788 until it was closed in August 1865. Many of them were still in useful service in coastal waters both at home and abroad long after they had left Brocklebank's. Some had lengthy careers, the longest known being that of *Globe II* which came off the stocks in 1836 and ran until 1910 when she was destroyed by fire in Strangford Lough, Northern Ireland; she had out-lived all their large iron and steel barques by several years.

The *Bowfell* was in Brocklebank's service until 1886 when, homeward bound from Manila with a full cargo of sugar, she was wrecked, without loss of life, on the Discovery Shoals, south of Singapore. She was the last of Brocklebank's wooden ships.

At the time of our Agent's visit, the Master of the *Bowfell* was William Ellery; the name will be remembered by many officers who obtained their certificates before World War II because his son, another William Ellery who had also been Master in Brocklebank's, was Principal Examiner of Masters and Mates from 1922 until 1939.

The first meteorological logbook made out in the *Bowfell* after our Agent's visit (it was written by Captain Ellery himself) was received on 17th August 1874 and contained observations made in her over the period 27th October 1873 to 4th August 1874, a voyage from Liverpool to Calcutta and return. Beyond the fact that the meteorological logbook, then called the Weather-Book Register, made provision for observations to be entered every 2 hours, though in fact they were normally entered every 4 hours at the end of the watch, the format of the book has changed surprisingly little. Three items, specific gravity of the sea, magnetic variation and weather in Beaufort notation have been discarded over the years whilst there have been added cloud heights, weather in code instead of Beaufort notation, and numerical wave data to replace the bald 'state of the sea' then asked for. An interesting point about this voyage is that the vessel was carrying our very first marine mercurial barometer. It carried the tally B.T. No. 1 (we were then still a department of the Board of Trade) and its first sea-going job for us had been in the *City of Benares* belonging to Smith & Son of Glasgow, forerunners of the present Ellerman Lines, in 1856. Its last ship was the *Manchester Corporation* in 1907 and now it is in honourable retirement in the National Maritime Museum at Greenwich. Interesting also is the height of the barometer cistern which is given as two and a half feet! A height of 100 feet in a voluntary observing ship today is not uncommon.

Seventy-six years later a middle-aged Master Mariner joined the Meteorological Office Headquarters then at Harrow, as Nautical Officer. It was not very long before

he sought out his own first meteorological logbook, made out some 20 years previously. Later comparison between this book and that of the *Bowfell* showed what a little difference had been wrought over the years. The book now provided for observations for only 6 times daily, at the end of the watch which had been the practice for many years anyway, Magnetic Variation had been succeeded by Total Compass Error and a column had appeared for the recording of visibility. Sea Surface had been enlarged to two columns, sea and swell, direction and disturbance on a scale from 0 to 10. By this time, of course, radio weather messages were part and parcel of the voluntary observing system but the radio records were kept in a separate book; it was not until 1953 that the two appeared inside the same cover.

Today's meteorological logbook is too well known to warrant description in an Editorial; virtually the only change is its shape and size and the fact that observations are now made four times daily at specified GMT hours, in a five-figure code which, with a few deletions, becomes a radio weather message. So we may safely say that voluntary observing has changed but little in the past hundred years. The areas covered though have changed vastly and the passing of sail meant that observations were more and more inclined to be confined to the steamer tracks. On the other hand, of course, of recent years many new trades have come into being, particularly since the end of World War II and the discovery of oil and minerals essential to the new sciences in hitherto little visited parts of the world. These events have put us in the way of a considerable amount of fresh data, not only from the regular voluntary observing fleet, but also through the Sparse Area Form (the 'SHRED' Form) which is being increasingly used in ships not carrying our instruments.

Certainly the basic requirements have not changed and, despite the advent of the radiosonde, the meteorological aircraft, rocket or satellite and the computer to process the data which each one provides, no less than three-quarters of the world's surface would be meteorologically naked were it not for ships' observations.

One other thing has remained unchanged too and, in spite of decimalization, metrication, Celsius succeeding Fahrenheit and, not impossibly, metres per second succeeding knots, it has mercifully not yet been suggested that there shall be any other than 28, 29, 30 or 31 days in a month nor any variation in 365 or 366 days in a year. We still have the Equation of Time with us and no one day, nor yet any one year, is of exactly the same length as its predecessor. It is perhaps somewhat reassuring to realize that it is almost 400 years since anyone attempted to tinker with the calendar and even that change, to the Gregorian system, was not fully implemented until 1923. The first day of January is still the first day of the new year; may we therefore wish all voluntary observers at sea or in port a very happy New Year. May it be one of pleasant voyages, reasonable weather and good landfalls.

L.B.P.

January, February, March

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

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

SEVERE STORM

North Atlantic Ocean

m.v. *Geestland*. Captain P. W. Groves. Vieux Fort, St. Lucia to Barry, Glam. Observers, the Master, Mr. D. Flynn, Chief Officer and Mr. P. G. Gough, 2nd Officer.

15th–16th January 1973. The following extracts are from the deck-log entries made during a severe storm with 80 kt wind speeds estimated during periods of W'ly winds. The smudges on the barograph trace were caused by the violent motion of the vessel in mountainous swells, some estimated at 24 m. Vessel's draught: fore 4·3 m, aft 6·8 m. (The cargo was 600 tons of bananas.)

15th

GMT

1600: Wind SSW, force 7. Pressure 989·2 mb. Air temp. 14·6°C, sea 13·0°. Rough sea, heavy swell, vessel rolling moderately. At 1718 the vessel hove to; by 1848 the wind had increased to force 10.

2000: Wind SW'S, force 10. Pressure 974·7 mb. Air temp. 13·5°, sea 12·0°. High seas and swell; vessel pitching and rolling easily and shipping spray.

2200: Wind W'ly, force 10. Pressure 974·1 mb, rising to 977·2 mb by 2300. Courses to Master's orders; using engine movements to keep vessel hove to.

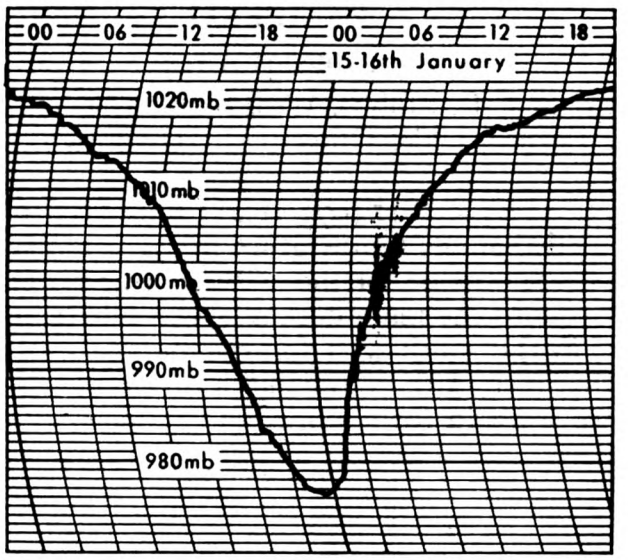
16th

0001: Wind W'ly, force 11. Pressure 982·5 mb. Air temp 9·8°, sea 12·0°. Vessel hove to in high seas and heavy swell.

0100: Wind W'ly, force 12. Pressure rising evenly throughout watch. Continuous driving spray, visibility 50 yd.

0400: Wind WNW, force 10–11. Pressure 1001·3 mb. Air temp 10·2°. Shipping water over all. High rough seas and heavy mountainous swell. Vessel pitching and rolling heavily at times.

0800: Wind NW, force 12 abating to force 10. Pressure 1011·1 mb. Air temp 10°, sea 11°. Mountainous confused seas and swells. Vessel rolling and pitching violently. Occasional squalls.



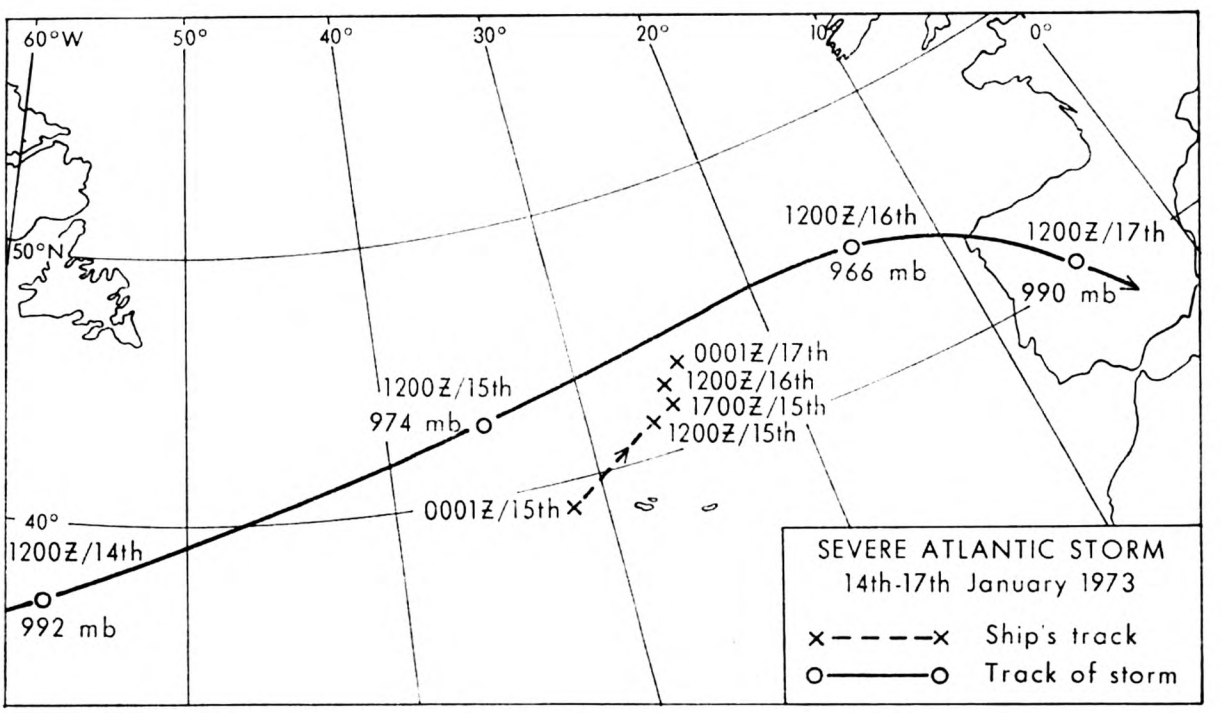
1200: Wind NW, force 9. Pressure 1017·7 mb. Air temp. 11·3°, sea 11°. Vessel hove to; pitching and rolling heavily in high seas and heavy confused swells. Spray occasionally over all.

1600: Wind NW'N, force 8. Pressure 1020·2 mb. Air temp 10·9°, sea 12°. Vessel shipping occasional water for'ard. By 1900 the wind speed had decreased to force 6.

We believe the storm centre passed within 20 miles of our vessel. When the storm was over we compared notes and no one could recall such mountainous seas, swells and wind velocity throughout their respective careers at sea, which in some cases meant between 30 and 40 years afloat.

Position of ship at 1200 on 15th: 41° 27'N, 26° 36'W.

Position of ship at 1200 on 16th: 42° 22'N, 25° 36'W.



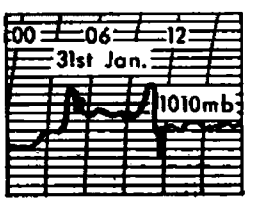
Note. The storm formed as an ordinary wave depression on a cold front in the Gulf of Mexico on the 10th. It accelerated ENE'wards (see chart) and deepened rapidly to reach its minimum central pressure of 963 mb on the morning of the 16th; during the previous 48 hours the depression averaged 40 kt. After reaching minimum pressure it slowed down and turned ESE into the Iberian peninsula, filling fairly quickly and losing much of its intensity as it crossed into the western Mediterranean on the 18th.

PAMPERO

at Buenos Aires

m.v. *Langstone*. Captain J. L. Stobbs. West berth, Darsena E, Puerto Nuevo. Observers, Mr. A. T. Turner, Chief Officer, Mr. D. Brown, 2nd Officer and Mr. I. Kepple, 3rd Officer.

31st January 1973. At 0430 GMT (0730 LMT) I received my call from the night-watchman and decided that the temperature in my cabin was a little high—about 34°C—and decided to go outside for the fresh air (the air conditioning was not on that day). When I got into the main deck alleyway all I could see were huge black clouds boiling away in the south-west (on our port beam) with lightning flashing between them. At that instant there was not a breath of wind and the air was very humid. I decided we were in for a storm and watched the sudden rise of wind;



at first it blew a cloud of dust across the dock road. About 15 seconds later the ship was struck by a blast of cold air and I watched helplessly as the ship was blown bodily sideways off the wharf, breaking the forward spring. The rest of our polypropylene mooring ropes (port side) just stretched and kept stretching. The time was then 0432 and the wind was SW, force 8, with rain being blown horizontally. I let go the port anchor so that there was something out if our ropes decided to part. By now the 2nd and 3rd Officers were up and the ship was 18–25 m off the wharf with all lines holding. The rain was torrential and the wind SW, force 9–10. Our gangway had come off the wharf and we were trying to rescue it. The wind continued with heavy rain until 0510 when it subsided. Until then no attempt was made to heave the ship alongside as it would have been impossible but by 0530 we were back alongside and secured with gangway on the bridle.

During the morning it continued raining, sometimes heavily, and the wind was frequently changing between NW and S; in fact it seemed that the same clouds, with the rain, were going backwards and forwards. The rain stopped just before 1200 and we started to load cargo.

A cutting from the *Buenos Aires Herald* of 1st February is enclosed. The padre at the Mission to Seamen said it was the worst storm he had experienced in his two years' stay there.

Position of ship: 34° 36′S, 58° 22′W.

Note. Buenos Aires has on the average about 12 pamperos a year. This was an example of Pampero sucio (foul pampero) which is basically the bad weather marked by strong squalls and at times heavy rain and thunder during the passage of a cold front. A maximum instantaneous wind speed of 107 kt has been recorded during a Pampero sucio at Montevideo in the month of July. The danger to navigation lies in the sudden onset of the heavy squall.

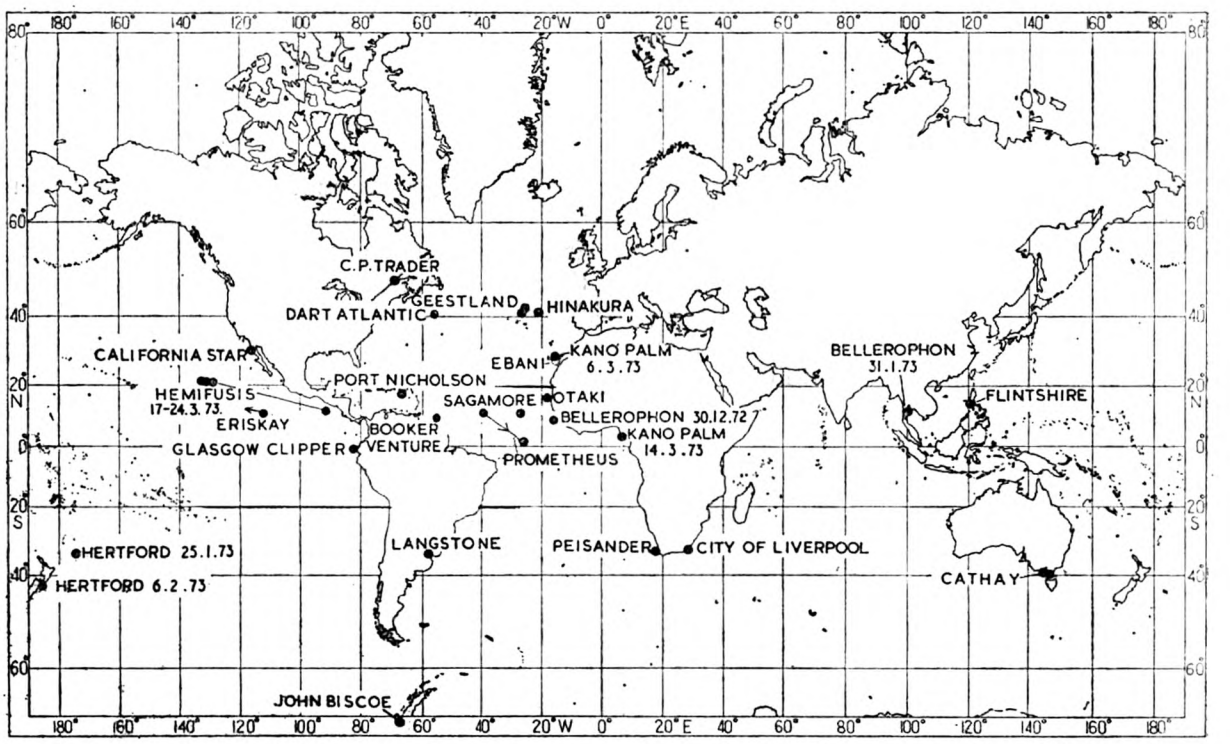
The newspaper cutting gave details of the loss of life and damage to property ashore in winds of 60 m.p.h. The worst incident occurred in the shanty town of Sarandi where 17 people were killed and 60 others seriously injured when the side wall of a large factory collapsed on to huts. Vast areas of Buenos Aires were left without power and telephones, and flooding was caused by the torrential rain.

FOG BANK

South African waters

m.v. *City of Liverpool*. Captain J. I. Owen. Birkenhead to Mombasa. Observers, the Master, Mr. N. Kerr, 2nd Officer and Mr. N. M. Hardy, 3rd Officer.

23rd February 1973. At 0948 GMT, whilst proceeding along the South African



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

coast in the vicinity of East London, a dense bank of fog was encountered. At 1030 the following observations were made: wind SW, force 3, pressure 1012 mb, air temp. 20·5°C, sea temp. 15·5°, at a distance of 6 miles from the coast. The ship's course was altered to bring the vessel outside the 100-fm line. On crossing this line the sea temp. rose to 27·5°, visibility improved from half a mile to 10 miles immediately and the air temp. rose to 24·5°. This is an example of advection fog and it was interesting to observe the immediate improvement in visibility on entering the warmer water.

Position of ship at 0948: 33° 05′S, 27° 53′E.

Note. The sudden clearance of the fog was due to the air being warmed over the Agulhas Current beyond the 100-fm line. A very large sea-surface temperature gradient on the inshore edge of the current is not a usual occurrence.

SEA SMOKE

Western North Atlantic

m.v. *Dart Atlantic*. Captain E. Irish. Norfolk, Va. to Antwerp. Observer, Mr. C. E. Walford, 2nd Officer.

31st January 1973. At 1615 GMT the vessel encountered an area of sea smoke, very thin and only a few feet above the sea surface. Most of the smoke occurred to the north of the vessel and slightly denser patches could be seen within about 5 miles. The patches that the ship passed through at no time impaired the visibility. From radar observations precipitation could be seen to the north and east at about 12 miles. Wind SE, force 6. Air temp. and wet bulb both 7°C, sea 21°, pressure 1020·5 mb. The sea smoke lasted for about 30 min. Course 076°T at 21 kt.

Position of ship: 40° 35′N, 56° 04′W.

St. Lawrence River

m.v. *C.P. Trader*. Captain J. Waling. Tilbury to Quebec. Observer, Mr. G. Cotton, 3rd Officer.

11th February 1973. At 0800 GMT, while the vessel was off the Escoumains pilot

station in the St. Lawrence River, sea smoke was rising to about 6 m in areas of new ice and was dense towards the south shore. Air temp. −25°C, river water −2°, wind light N'ly.

Position of ship: 48° 20'N, 69° 20'W.

Note. Sea smoke occurs when the air temperature is considerably cooler than the sea temperature, preferably a difference of 11 degc or greater. Under these circumstances the evaporation from the warmer sea surface supplies abundant moisture to the cooler air and condensation occurs almost immediately. However, due to the sharp temperature lapse rate in the lowest layers of the air, the condensed vapour particles are carried up into drier upper levels and vaporize again. Hence, for sea smoke to persist for any length of time a fresh wind is required to keep up the supply of cold air.

CHANGES IN AIR TEMPERATURE

New Zealand waters

m.v. *Hertford.* Captain A. Britain. Wellington to Lyttelton. Observer, Mr. A. R. Davidson, 2nd Officer.

6th February 1973. At 1200 GMT the wind was NNE, force 6, air temp. 17·9°C, wet bulb 17·7° and pressure 1004·8 mb. Course 215°T.

At about 1410 the wind slowly died away and backed to SW, force 2 and with the change in wind direction came a blast of warm air. The following readings were taken:

Time (GMT)	Dry (°C)	Wet (°C)
1414	22·5	20·2
1416	23·2	20·5
1418	24·1	21·0
1420	24·9	21·5
1432	25·0	22·0
1436	26·0	22·4
1442	25·5	22·3
1448	25·7	22·4
1500	25·4	22·4

The wind remained steady throughout and there was no change in the barometric tendency, the trace continuing to fall steadily. At first the warm air was thought to have been caused by a bush fire but the glow in the sky later proved to be the lights of Christchurch viewed at 70 miles. Visibility was very good: at 1500 Godley Head Light (24 miles) was seen at 40 miles.

At 1514 the wind increased to SW, force 3–4. Air temp. 24·8° and wet bulb 22·4, unaltered until our arrival in Lyttelton at 1630.

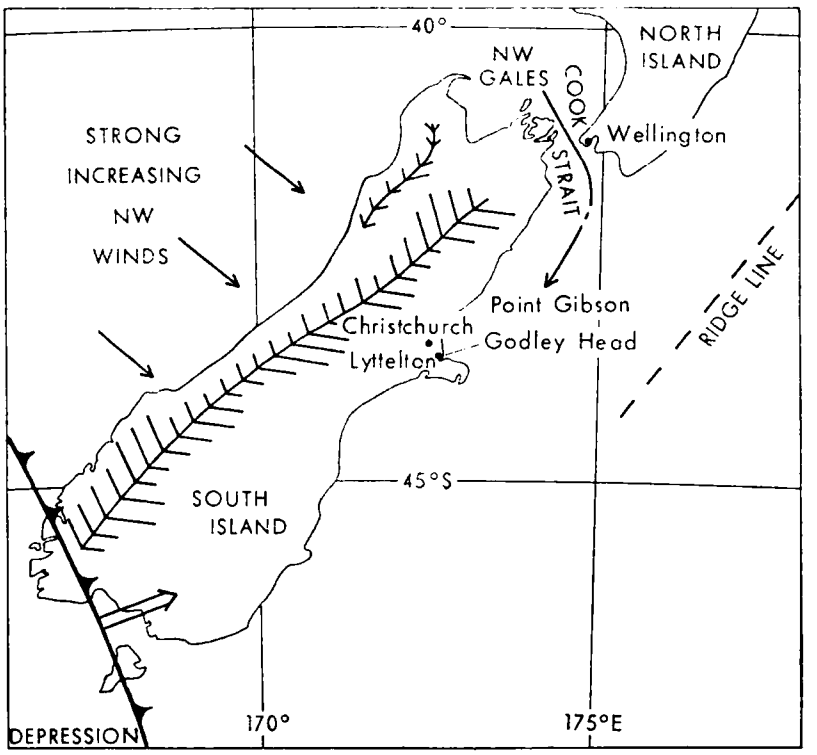
It is interesting to note that later the same day a new highest temperature for New Zealand was recorded at Christchurch Airport.

Position of ship at 1200: 42° 24'S, 173° 54'E.

Note. The above report was forwarded to the New Zealand Meteorological Service and Mr. I. S. Kerr, Assistant Director (Forecasting) commented:

"The conditions observed by Mr. Davidson off the east coast of the South Island of New Zealand between 1200 and 1630 GMT on 6th February 1973 occurred in a synoptic situation which is relatively common in this area.

"When a rapidly deepening depression occurs in the area south-west or south of the South Island in association with an anticyclone north-west of the North Island a very strong, stable NW'ly airsteam develops east of the advancing cold front (see chart) and flows on to the west coast. Initially, this airstream is not strong enough to overcome at low levels the barrier presented by the broad mountain chains (mostly reaching at least 1,500 to 2,100 m) running the length of western parts of the Island. The east coast is therefore a sheltered lee area where normally moderate NNE to ENE surface winds will blow. But in Cook Strait separating the



two Islands, funnelling occurs, resulting in NW'ly gales. On this occasion there was a pronounced ridge to the east of the Strait and this deflected the NW'ly gales southwards, resulting in the NNE, force 6, reported by the *Hertford* at 1200 GMT. This is supported by the fact that the temperature and dew-point at the ship was almost identical to that at Wellington at the same time.

"However, as the NW'ly airstream strengthens with further deepening of the depression and the approach of the cold front, the strong NW'lies that have continued to blow at high levels over the mountains and above the lighter NE'ly surface wind along the east coast will finally descend to reach the surface as very warm föhn-type NW'ly surface winds. This happens at different places at different times. On this occasion, surface NW'lies were reported by the coastal ship *Holmlea* (43° 00'S, 173° 24'E; air temp. 24°C, dew-point 19°) at 1500 GMT, but not at Christchurch till 2300.

"The radiosonde flight made at Christchurch at 1200 GMT showed that there was a strong ground inversion: the surface temperature was 16·5°C but at the top of the inversion at 366 m the temperature was as high as 28°. In these circumstances, air would only need to descend from about 275 m warming dry adiabatically to arrive at sea-level with a temperature of 25°, as was reported by the *Hertford*. This is apparently the explanation of the sudden encounter with very warm air.

"There are, however, some unusual features of the conditions experienced. The NNE wind was rather stronger than usual, and the warm air was blowing from the south-west, not north-west as reported by the *Holmlea* only a short distance to the north. Light SW'ly winds are occasionally reported on parts of this coast in somewhat similar circumstances but the air is not usually appreciably warmer than the air that has come through Cook Strait, i.e. is not föhn air.

"Later in the day the previous highest temperature reported in New Zealand, 38°C, was exceeded in many eastern places in the northern half of the South Island, three of them reporting a maximum of 42°C."

DUST DEPOSIT

North Atlantic Ocean

m.v. *Hinakura*. Captain H. J. D. Sladen. Curaçao to London. Observers, the Master and ship's company.

7th February 1973. We noticed that the vessel was coated in a thin film of brown, sandy dust, presumably brought by the prevailing ENE'ly wind from the area of Spain. Visibility 10 miles.

Position of ship at 1400 GMT: 41° 43'N, 21° 30'W.

DUST HAZE

Eastern North Atlantic

m.v. *Ebani*. Captain R. Wild. Liverpool to Port Harcourt. Observers, the Master and ship's company.

2nd February 1973. From 1200 to 2000 GMT thick sand in the atmosphere limited the visibility to 1 mile. The vessel was covered in a fine layer of red sand. Wind ESE, force 2. Course 016°T at 14·5 kt.

Position of ship at 1200: 28° 10'N, 15° 12'W.

Eastern North Atlantic to Gulf of Guinea

m.v. *Kano Palm*. Captain N. C. Swan. Liverpool to Port Harcourt. Observers, the Master and Mr. D. W. Fleming-Miller, Chief Officer.

6th–14th March 1973. During our southbound run we had visibility of only 3 miles for practically the whole time, night and day, from the Canary Islands to Port Harcourt. Conditions during this time were practically the same each day with cloud definition extremely difficult and sometimes not there at all due to sand suspension in the air, from approx. the Canary Islands to the Bijagós Breaker. The approach to Freetown, the entrance to the Sierra Leone River, was only dimly visible at under 2 miles. Shore reports at that period complained of "the hottest days of the year".

Continuing further south on leaving Freetown we were once again surrounded by this hazy horizon and mostly indiscernible sky although we all tried to give a reasonable cloud report. Having run down this coast since 1960, I discussed these exceptional conditions with the Master. He had not seen anything quite like it before, with visibility sometimes down to less than half a mile, for such a continuous period and an almost universal coverage in latitude. Ships passing northbound confirmed the same atmospheric conditions. Winds were mainly light variable throughout the period.

Position of ship at 1800 GMT on 6th: 28° 30'N, 15° 30'W.

Position of ship at 1200 on 14th: 04° 06'N, 06° 06'E.

Southern North Atlantic

m.v. *Prometheus*. Captain D. L. Emery. Newport News to Durban. Observers, the Master and all observing officers.

8th–10th March 1973. From 1030 GMT on the 8th a brown haze was observed all round the horizon. This was later discovered to be caused by a fine light-brown sand. Wind predominantly from NE, visibility 4–6 miles. The phenomenon eventually cleared when the wind shifted to SSE at 1400 on the 10th.

Position of ship on 8th: 11° 15'N, 39° 21'W.

Position of ship on 10th: 01° 00'N, 25° 49'W.

m.v. *Sagamore*. Captain J. R. Stephen. Rio de Janeiro to Gijon, Spain. Observers, the Master and ship's company.

27th March 1973. During the day sand particles built up on bulkheads of outside accommodation. Visibility 5 miles. Wind NE, force 3.

Position of ship at 1400 GMT: 10° 47'N, 27° 20'W.

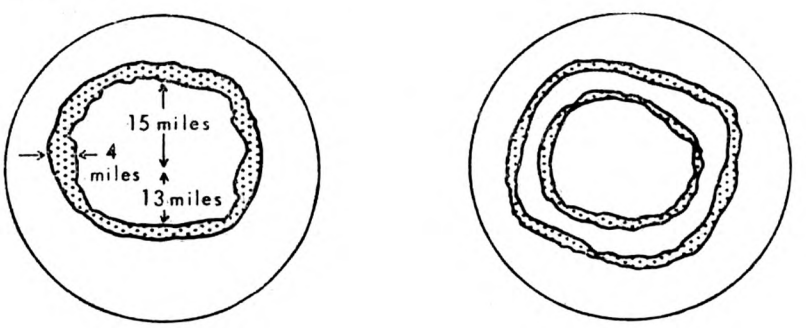
Note. Dust and sand particles are carried into the atmosphere under favourable conditions over the drier parts of Spain and Africa. These are carried well into the Atlantic by prevailing NE'ly winds and eventually reach the sea surface, giving rise to various optical phenomena, radar echoes and visibility problems. However, these occurrences are not often encountered west of about 25°W in the North Atlantic.

RADAR ECHOES

Eastern North Atlantic

m.v. *Otaki*. Captain J. H. B. Weston. Lisbon to Cape Town. Observer, Mr. D. H. Moorhouse, 3rd Officer.

28th January 1973. At 1825 GMT, shortly after coming on watch, a curious effect was observed on the radar screen when the vessel was about 70 miles north of Cap Vert. A ring of echoes, similar to land and about 4 miles deep, was forming into a concentric circle about the centre spot of the screen. For the first hour or two the echoes varied in diameter from 13 to 15 miles. Ship echoes were still displayed, apparently unaffected.



After several hours the echoes became less intense and a second concentric ring formed; shortly afterwards the top half of the circles began to fade. Just before going off watch all that was left of the effect was the odd patch of echoes still concentric about the centre spot. (This effect had been observed by the 4–8 watch the night before though not recorded.) At 1825: air temp. 20°C, wet bulb 17·5°, sea 19·4°, pressure 1015·5 mb, visibility (in dust haze) 4–5 miles, wind NE, force 2.

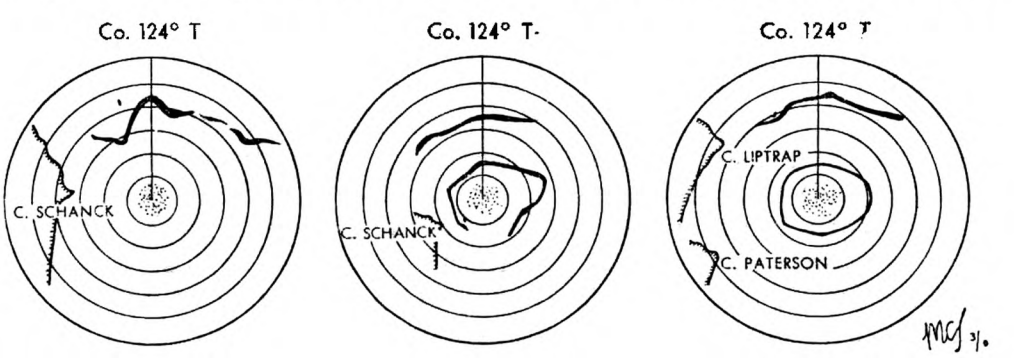
Position of ship at 1825: 15° 52′N, 17° 49′W.

Note. The radar echoes were caused by widespread dust in the atmosphere, as indicated by the preceding reports of dust haze.

Bass Strait

s.s. *Cathay*. Captain N. J. Mackie. Melbourne to Sydney. Observers, Mr. A. R. Savill, 2nd Officer, Mr. M. C. Simpson, 3rd Officer, Mr. F. White and Mr. J. Cardelli, Cadets.

19th January 1973. During the day of our departure (at 1500 LMT) from Melbourne, and for some days before, the temperature had been high and at 1400 was 38·0°C, with the wind N′W, force 3. Pressure 1018·0 mb. Just before 2000 a faint radar echo was noticed approx. 7 miles ahead. The vessel was approx. 6 miles off Cape Schanck (38° 30′S, 144° 53′E). At 2000 the echo appeared on the radar screen as shown in sketch 1. The thickness of the echo was approx. 1 mile. At the time a very strong echo was painting 9 miles distant although the vessel causing this



1. 12 mile range 2. 24 mile range 3. 24 mile range

appeared visually to be a small fishing craft. Air temp. 25·5°, wet bulb 21·0°, sea 18·0°. Wind ENE, force 3. Pressure 1015·7 mb. Clouds 5/8 Ci and Cc.

By 2015 the echo of the vessel was quite small. On passing abeam, distant 2·5 miles, the vessel was identified as the ocean-going cargo ship *Cap Norte* at this point appearing quite normal in size but shimmering (as was the land). Apart from this shimmering the land appeared as normal and the horizon seemed clear, but appeared to undulate, and looked exactly like a low-lying coastline.

At 2030 the radar echo had formed an open ring around the ship, open astern. At 2100 another faint echo was painting ahead, as shown in sketch 2 (which also shows the *Cap Norte* just off Cape Schanck). Air temp. 24·9°, wet bulb 20·7°. Pressure 1015·6 mb. Wind ENE, force 4.

The general shape of the radar echo at 2200 was similar but with a gradual drifting of the outline. It was noticed that the ring was nearer to the ship to port than to starboard. An average distance to the echo on the port side would be 6 miles, whereas the corresponding distance to the echo on the starboard side would be 9 miles (this is most readily seen in sketch 3).

Lighthouses were raised and observed in an apparently normal way. Vessels were passed to port at varying distances and appeared normally, except that their lights seemed brighter than one would usually expect.

At 2330 the air temp. was 21·8°, wet bulb 18·2°. Wind NE, force 3. Pressure 1016·7 mb. By that time the echo was fading ahead and by 2345 was completely gone, leaving only a faint trace on the port quarter.

Position of ship at 2330: SW of Citadel Island (39° 07′S, 146° 14′E).

Note 1. Mr. R. L. Birch, Bureau of Meteorology, Melbourne, comments:

"These observations appear consistent with super-refraction in a layer just above the radar scanner, and propagation in hops as shown in the sketch below. The radar energy back-scattered from other than rough seas is minute, but detection beyond a few miles is possible

if there is significant focussing. Analysis of a model, prompted by the observations, has shown that focussing occurs only if the curvature of the rays is much greater above scanner height than below, with the change in curvature close to scanner height. Calculations indicate that the focussing enhances the sea echo, normally below the threshold of detection, by three or four orders. Considered in conjunction with synoptic data of the time, the super-refractivity in this case would have occurred in a thin transition layer between a hot, over-flowing, off-shore breeze, and the cooled, mixed and slightly moistened air, of seaward increasing depth, below."

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

WHALES

Marguerite Bay, Antarctica

R.R.S. *John Biscoe*. Captain E. M. S. Phelps. Servicing British Antarctic Survey Bases. Observers, the Master, Mr. M. L. Shakesby, 3rd Officer, rest of ship's company and B.A.S. Base personnel.

30th January–18th February 1973. During the period that the vessel was in Marguerite Bay numerous whales of the Rorqual species were observed, apparently Lesser Rorquals (*Balaenoptera acutorostrata*). In all, more than 100 whales were sighted. On 12th February, while the vessel was steaming in Laubeuf Fjord, about 60 whales were sighted in numerous schools but it was impossible to give an exact

tally. Three or four attempts were made to collect krill or plankton in a proper plankton net to discover if krill shoals were in abundance but all attempts proved negative.

Position of ship at 0600 GMT on 30th January: 67° 42'S, 68° 24'W.

Position of ship at 0600 on 12th February: 67° 48'S, 69° 00'W.

Note. The above report was forwarded to the Whale Research Unit, National Institute of Oceanography (now the Institute of Oceanographic Sciences).

DOLPHINS

South Pacific Ocean

m.v. *Hertford.* Captain A. Britain. Panama to Auckland. Observer, Mr. A. R. Davidson, 2nd Officer.

25th January 1973. At 0130 GMT a large school of dolphin was observed, 60–70 in number in a line, one behind the other, stretching over a mile in length. They were jumping out of the water at regular intervals. As the vessel approached, instead of swimming towards the vessel as is usual, the whole school turned SSW and headed away, still in the same formation. Wind E'N, force 3. Heavy rain. Ship's course 255°T at 16–20 kt.

Position of ship: 34° 00'S, 173° 19'W.

Note. Last January we published a similar report from the *Act 1* of dolphins avoiding a vessel and the observers wondered whether the surface speed (21·75 kt) and the bulbous bow had anything to do with it and whether observers on ships of similar performance had noticed the same phenomenon. The following reply came from the *California Star.*

Eastern North Pacific

m.v. *California Star.* Captain A. J. Cheshire. Balboa to Los Angeles. Observer, Mr. A. Frost, 3rd Officer.

16th March 1973. After reading the observation from the *Act 1* in *The Marine Observer* (January 1973), the actions of marine life of various forms in the vicinity of this vessel were carefully observed. Like the *Act 1*, this vessel is a high-powered container ship with a bulbous bow and 21·5 kt service speed. Average r.p.m. is 118–121. However, unlike the *Act 1*, this ship is powered by a single diesel engine and, unlike the *Act 1*, we have no problems regarding apparent indifference of marine life, particularly dolphins and porpoises. Particularly in the area between Balboa and Los Angeles, these mammals sport about the ship often to within a few feet of the ship's side. On this particular occasion, at 1800 GMT today with the vessel 32 miles west-south-west of Ensenada, Mexico, 4 or 5 of a school of about 30 dolphins were observed within a few feet of the ship, one playful fellow in particular attempting to emulate a torpedo, heading for the ship at full speed just below the surface then diving just beneath the ship and surfacing off the opposite quarter. He continued this game for 5–10 minutes, then left with the remainder of the school.

On consideration, a possible explanation for dolphins' avoidance of the *Act 1* in particular may be that a very high noise level exists in the vicinity of the ship due to the movement of the turbines. Since it has been demonstrated on many occasions that these creatures possess very sensitive audio faculties, I consider it likely that the high-pitched whine so characteristic of turbine-powered ships could encroach on the frequency used by dolphins, etc., for sonar and communication purposes. Incidentally, a possible support for this theory may be found in the fact that the creatures mentioned in this observation flagrantly avoided a United States Naval destroyer which was within 4 miles at the time of observation.

Position of ship (approx.) at 1800: 31° 23'N, 116° 51'W.

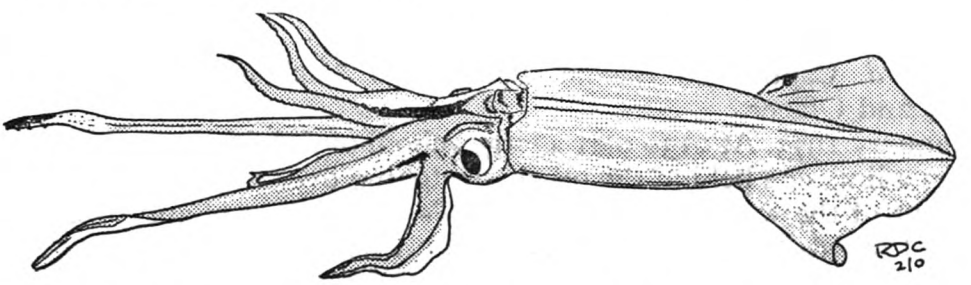
SQUID

North Pacific Ocean

m.v. *Hemifusis*. Captain M. M. Wilkie. Balboa to Yokohama. Observers, the Master and all deck officers.

24th March 1973. At 0730 SMT a squid was found on deck, having come aboard with a sea the vessel had taken. It was 33 cm long and had 8 tentacles with suckers on them. In addition to these it had 2 tentacles which were longer than the rest but without suckers. They flattened out at the ends and were covered in little hooks, very similar in appearance to briar thorns. When the squid was being examined it gave off large quantities of 'black ink' from the base of its head.

Position of ship: 21° 04'N, 131° 35'W.



Note. The hooks or claws enable the squids to grip the slippery surfaces of their victims and in some species can be sheathed or extended at will, like those of a cat.

SWIMMING CRABS AND OTHER MARINE LIFE

Eastern South Pacific

m.v. *Glasgow Clipper*. Captain R. E. Brooks. Puerto Bolivar, Ecuador to Long Beach, California. Observers, Mr. R. E. T. Sneeden, 3rd Officer, Mr. A. O'Sullivan, Radio Officer and Mr. P. Laidler, A.B.

27th March 1973. At 1430 GMT, while the vessel was stopped, numerous crabs were observed on the surface and to a depth of at least 6 m. Some would shoot to the surface and pop out of the water with their claws scrabbling furiously until horizontal movement was achieved, whereupon they would move away across the surface at a considerable speed. They were a red-purple colour and the total number observed was at least 40.

Also observed were what appeared to be baby jellyfish approx. 60 mm in length and 6 mm in diameter with light-purple heads and trailing bodies of a lighter shade. They were in groups, never less than 3 to a group and more often 20–30, and the larger groups appeared in a V formation. They appeared to be joined together. The total number observed was about 500.

Position of ship: 01° 30's, 82° 15'W.

Note 1. Dr. A. L. Rice, Department of Zoology, Natural History Museum, comments:

"Like the observations of swarming crabs in the western Indian Ocean (*The Marine Observer*, January 1969, pp. 17–20) these crabs almost certainly belong to the family Portunidae. They might even belong to the same genus (*Charybdis*) as the Indian Ocean crabs since several species of this genus are known from the Pacific although, as far as we know, there are no records of them swarming in this area. Specimens to back up observations would be very welcome at the Natural History Museum."

Note 2. To quote from Dr. Rice's article in January 1969: "Ideally these specimens should be killed in fresh water and preserved in a 5–10 per cent solution of sea-water formalin but, where this is not available, surgical spirit is a fair substitute which is usually to hand; as a last resort sun-dried specimens are better than none at all. Specimens which have been in the preservative for a week or two can be safely sent through the post dry and simply wrapped in paper or some other suitable packing material." (Port Meteorological Officers in the U.K. can collect specimens from the ship and forward them to the Museum.)

Note 3. Dr. P. F. S. Cornelius, Head of the Coelenterate Section, Department of Zoology, Natural History Museum comments:

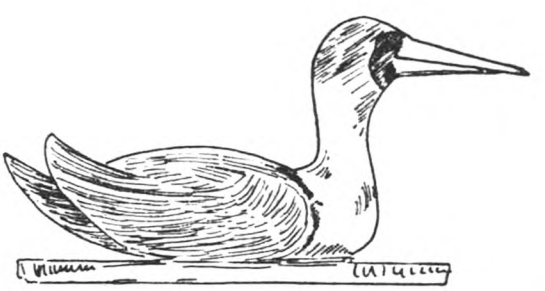
"The animals reported as jellyfish were probably siphonophores, related colonial animals many of which habitually associate in chains."

BIRDS

North Pacific Ocean

m.v. *Eriskay*. Captain Wilby. Panama to Japan. Observers, Mr. M. A. J. Dawes, 2nd Officer, Mr. B. Keeble, Chief Officer and Mrs. Dawes.

16th–24th January 1973. At 1400 SMT on the 16th a large sea-bird was seen gliding round the ship. It was curious in that it kept its beak widely open and when it eventually landed, or flopped, on to the working platform on a samson post it remained this way and also kept stretching its neck and apparently convulsing. The verdict was either that it was exhausted and was panting like a dog or else it had a large fish caught in its throat. Either way the bird remained in a similar state for the rest of the day. The nearest land at the time was Clipperton Island which we had passed the previous night and was now 190 miles ESE.

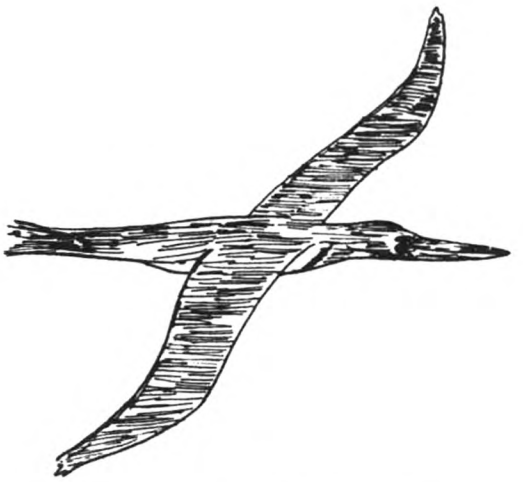


Next day revealed our friend in the same place, now with his beak politely closed having ceased his desperate convulsive routine. He merely sat all day busily preening himself. The sketch illustrates something of his appearance (unfortunately no one on board had much knowledge of birds and we could not identify him), with a rather comical head due to a black band around his beak and eyes, giving the appearance of wearing a mask. His head and upper neck were mottled grey/brown and the wings very dark brown, about 150 cm span. The beak was ivory-coloured, very powerful looking, about 18 cm in length and was a sufficient deterrent to keep anyone from gingerly climbing the samson post for a closer inspection. In flight the bird looked far longer in body length than one would expect and, with the long neck and fairly big tail, we estimated it was about 120 cm from tip to tip. The body was very white but we were unable to see the feet to ascertain either colour or claw characteristics.

The same day (17th) a gang of 12 sea-birds appeared, similar in shape to our friend but slightly smaller and darker and without the mask. They settled down on the working platform of another samson post.

Early next morning our friend took off, reappearing later to sit among the new arrivals who took little notice. Apparently the lack of privacy was too much for him, however, and he left for good early that afternoon. The flock spent the day busily preening themselves and turning the samson post from red to flat white. The birds were about 90 cm in length with a wing span of about 120 cm. The eyes were set very close to the upper part of the strong beak which was about 13 cm long and dark blue/black, although sometimes it seemed to be a dark orange colour. The feet were pink and the plumage a medium shade of brown, with the underside a dirty tawny-white. The most distinguishing feature was a dark ring around the lower neck. The sketch illustrates roughly the shape and proportions in flight.

On the 19th we still had the 12 aboard and it seemed to be a rest day as they apparently dozed all day and occasionally glided off to make a half-hearted chase of



the odd flying fish. Next day, however, they were extremely active and provided much entertainment in their flying-fish chases, skimming just above the water and occasionally plummeting below the surface if the fish took evasive action. They were by no means always successful and at times it looked as if the fish were deliberately humouring the birds, leading them on a long, low flight, then dropping into the water and leaping out again at right angles when the bird was a short distance away. Occasionally it happened that a bird would be successful but his hungry rivals would squabble for a share and the catch would be dropped. When these squabbles developed they made a noise very similar to ducks in flight.

Between periods of action the 12 returned to their samson post to preen but their number was reduced to 7 on the 21st. On the 23rd we passed 6 miles south of Hawaii and they showed little interest but they left by noon the following day, much to the Chief Officer's relief as the whitened samson post was becoming very obvious.

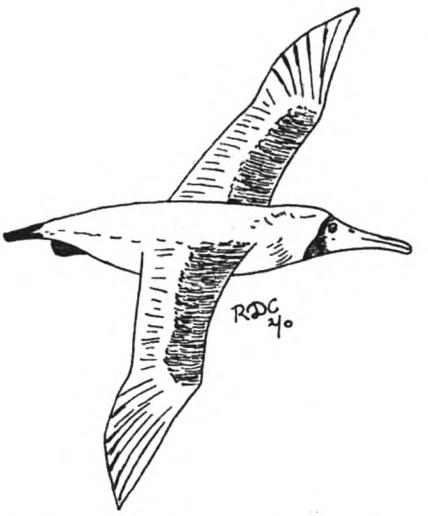
Position of ship at 1400 on 16th: 11° 10′N, 112° 10′W.

Note 1. Captain G. S. Tuck, D.S.O., R.N., Chairman of the Royal Naval Birdwatching Society identified the lone bird as an immature Blue-faced Booby (*Sula dactylatra*) and those in the flock as Red-footed Boobies (*Sula sula*) in the intermediate dark phase. Both species breed on islands in the western and central Pacific and on the Galapagos Islands.
Note 2. The *Eriskay* is a Hong Kong Supplementary Ship.

North Pacific Ocean

m.v. *Hemifusis*. Captain M. M. Wilkie. Balboa to Yokohama. Observers, the Master, Mr. R. D. Caile, 2nd Officer and all other deck officers.

17th–24th March 1973. During the period numerous Boobies were observed around the ship; the maximum number at any one time was 12. They spent most of the day catching flying-fish off the bow of the vessel, occasionally landing on the foremast yard for a break. As soon as dusk approached they would start settling down for the night on the same yard and the forestay, any late comers seeming to perch only with great difficulty. Dawn would see them resuming their fish-catching activities. All of them appeared to have an over-all length of about 60 cm and a maximum wing span of about 120 cm. Most of the birds had drab-brown upper parts with dark-brown tail feathers and a dark-brown patch on the forward part of the wing. In some cases the upper body was flecked with white and most of the birds had a white band just forward of the tail feathers. The underside of the birds varied from a very light brown to white with most of them having a circle of brown feathers passing under the body from shoulder to shoulder. All birds had a dark, almost black patch around the eyes and dark-grey feet. Several birds had dark-brown stripes on the underside of the wings (these stripes ended at the body). Two birds were exceptions to the above description in that they were completely dark brown



on the upper body and neck and completely light brown on the undersides. The feathers in the necks of these two had the appearance of cropped wool. It is thought that they may have been immature birds as they were also very inefficient in their fishing.

Position of ship at 1200 SMT on 17th: 10° 11′N, 91° 30′W.

Position of ship at 1200 on 24th: 21° 19′N, 132° 57′W.

23rd–24th March. Observers, Mr. R. D. Caile, 2nd Officer, Mr. W. B. Ferguson, 3rd Officer and Mr. G. Hamilton, E.D.H.

At 2000 SMT on the 23rd an exhausted Petrel was found on deck. It was 19 cm long and graphite-grey in colour, blending into brown on the wings. Just in front of the tail feathers it had a small patch of white. After being given a mixture of condensed milk and water the bird was placed in a box to rest. After about 8 hours it was released and it flew off quite strongly, appearing to have completely recovered.

Position of ship on 23rd: 20° 25′N, 128° 55′W.

Note. From the excellent sketch and description Captain Tuck identified the main flock as immature Blue-faced Boobies and the two others as immature Brown Boobies (*Sula leucogaster*). He thought that the bird which came on board on the 23rd was a Madeiran Storm Petrel (*Oceanodroma castro*) which breeds on the Galapagos and Hawaiian Islands and has previously been identified in the area.

INSECTS

Eastern North Atlantic

m.v. *Bellerophon*. Captain P. J. Broomfield, R.D. Birkenhead to Bangkok. Observers, Mr. R. Wiltshire, 2nd Officer and all other officers.

30th December 1972–31st January 1973. On 30th December, while the vessel was off the west coast of Africa about 120 miles from Guinea, a Praying Mantis flew on board. At the time there was only a light wind though previously it had been NNE, force 3–4. The insect was placed in the officers' lounge, to the delight of the wives on board, and took up a dangerous position under the light for the dartboard, feignedly waiting for prey (pray?). Unfortunately for some, the ship had been fumigated before the present voyage started and the only surviving cockroaches were to be found in the engineers' changing rooms. However, our mantis had his diet supplemented with liver sausage.

During his stay he took an active interest in bar proceedings and on film nights made his contribution to the picture on the screen. He was a pious creature, saying grace prior to every meal before snatching from the proffered forceps. Whilst on our way to Bangkok he ventured outside when the deck was being washed. Rescued from the scupper he never seemed to recover and passed away peacefully on 31st January. Our globe-trotting mantis was on board for approx. 10,145 miles. Could this be a record?

Later, on reading about a Praying Mantis in *The Marine Observer* [January 1973—comment on a report from m.v. *Author*] and considering the size and twin appendages on the tail of our specimen, it would seem that 'he' was in fact a 'she'.

Position of ship at 1800 GMT on 30th December: 09° 00′N, 16° 00′W.

Position of ship at 0600 on 31st January: 12° 06′N, 100° 54′E.

Caribbean Sea

m.v. *Port Nicholson*. Captain W. J. Williams. Panama to Southampton. Observers, Mr. P. A. Carter, 3rd Officer.

28th February 1973. At 1630 GMT this insect [shown life-size] was found on the deck of the wheel-house. We believe it came from Puerto Rico on the wind (E's, force 4). The 'shell' folds back and there are wings underneath.

Position of ship: 17° 12′N, 66° 24′W.

Note. Mr. R. T. Thompson, Department of Entomology, Natural History Museum, comments:

"Thanks to the trouble taken by the artist to record accurately the appearance of the specimen, I have been able to identify it with reasonable certainty. Its scientific name is *Steirastoma histrionicum* White (family Cerambycidae). This longhorn beetle is a common species in Central and South America. The present specimen appears to belong to the western form, var. *larva* Thomson, which occurs in Ecuador, Colombia, Venezuela and the Caribbean (Jamaica, Grenada and probably elsewhere).

"Virtually nothing has been published on the biology of this species but a close relative, *S. breve* (Sulzer), has become an important pest of cacao trees. The adults eat the young shoots and pods while the grubs tunnel beneath the bark.

"It would be interesting to establish whether such beetles really are carried across the sea by air currents; they are usually thought to travel as grubs in driftwood."

PHOSPHORESCENT WHEEL

Manila Bay

m.v. *Flintshire*. Captain M. G. Thomas. Manila to Bugo. Observers, the Master and Mr. M. F. Tomlinson, 2nd Officer.

10th February 1973. At 1915 LMT (1115 GMT) in Manila Bay patches of changing light patterns, similar to those expected from a searchlight shining across the water, were observed about half a mile ahead and fine on the port bow. As the vessel approached the area the lights could be seen to form the pattern characteristic of the phosphorescent wheel. Unfortunately the density of fishing craft and other vessels in the vicinity at that time prevented a more detailed observation. However, the visual impressions gained are recorded below in the form suggested by R. J. Turner in his article on Marine Bioluminescence (*The Marine Observer*, January 1966).

The wheel was under observation for about 3 minutes before bright fishing-vessel lights drowned it out. Air temp. 25·8°C, wet bulb 22·8°. Wind ENE, force 4. Moderate sea. Weather fine with good visibility. Pressure 1014 mb. Ship's course approx. 240°T.

The diameter of the wheel was about 180 m; the colour was white with a slight bluish tinge. Intensity was difficult to judge due to lack of parameter and presence of other lights. However, it was estimated that the wheel would have been visible at a range of 1–2 miles on a dark night.

The light was steady in intensity between the emergence of the 'ray' at the hub of the wheel to its disappearance at the periphery. It spread out rapidly from an unilluminated hub, radially, but with a rotating movement as of a spinning wheel. In the quadrant nearest the vessel (when on the port bow) the rotation was definitely anticlockwise but this direction became confusing to the observers when trying to follow it round the display. It was thought to be clockwise on the far side. If a line of symmetry did exist it would seem likely to be approximately on an east/west line.

The light patches themselves expanded as they moved from the hub, being perhaps 9 m across when they reached the periphery of the area, taking about 1 second to do so. The phenomena gave the impression of being on or slightly above the water, rather than in it, and were not affected by sea waves.

Navigational duties prevented any experimenting with various stimuli. The radar was on, the echo-sounder off, engine r.p.m. approx. 100. The light appeared to be unaffected by the ship's presence or the deck lights. We passed along the edge rather than through the display so the effect of 'cutting' it could not be observed.

Position of ship: 14° 31′N, 120° 49′E.

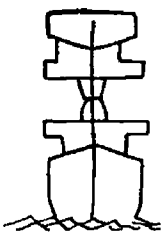
Note. Despite numerous ship reports of phosphorescent wheels collected for over a century, many as carefully detailed as Mr. Tomlinson's, no satisfactory explanation can yet be given. All we know for certain is that luminescence in the sea is usually brought about by small planktonic organisms in the sea-water. Prof. Dr. Kurt Halle of the German Hydrographic Institute in Hamburg, a well-known authority on the subject, has pointed out that wheel phenomena occur in shallow areas bordering the Indian Ocean and in the Gulf of Thailand and parts of the South China Sea. Also, the fact that the whole area of observations is, seismically, a very active region suggests that seismic shock waves are primarily responsible, reflecting down from the surface and up again. Where this occurs there will be two adjacent 'sources' of concentric circular waves which will supplement each other at the points where they are in phase and cancel out where they are not. The resulting interference pattern will be a system of rays whose positions will be revealed by the stimulation at these points of potentially luminescent plankton.

ABNORMAL REFRACTION

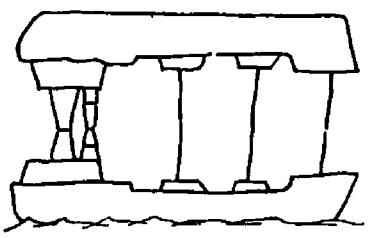
off Cape Town

m.v. *Peisander*. Captain D. K. Dunlop. Dakar to Durban. Observers, the Master, Mr. T. P. Seel, 2nd Officer and all officers.

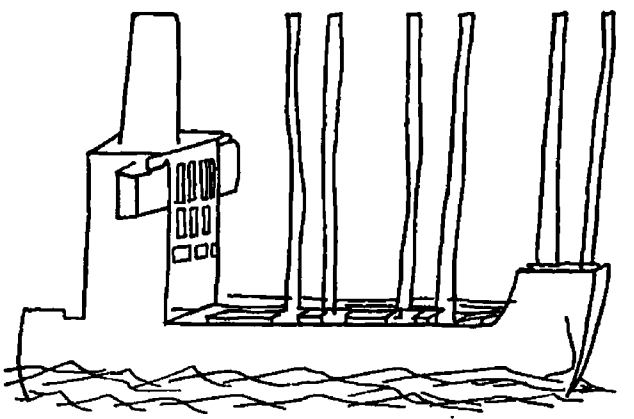
14th January 1973. At 1200 SMT (1100 GMT) the refraction was first noted when



1. Distance about 7 miles

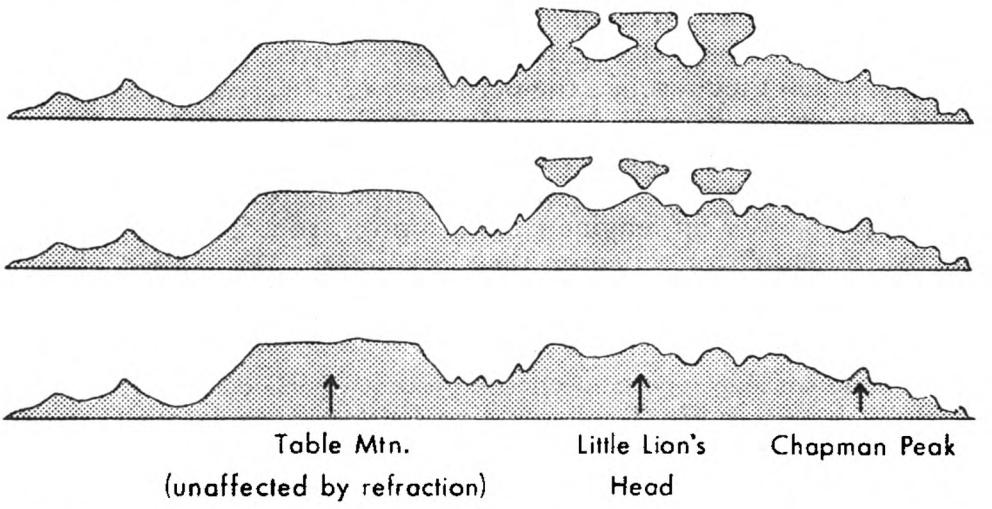


2. Distance about 10 miles



3. Distance about 5 miles

the vessel was approx. 25 miles WNW of Cape Town. The first indication we had was a completely inverted image of a tanker sighted about 2 points on our starboard bow (ship's course 149°T). The tanker was almost end on at the time, as shown in sketch 1. A few minutes later a cargo vessel (2) was seen, apparently crossing upside-down on our port bow. (We could find nothing in the collision regulations to cope with this situation!) Also at that time a beach on the coast appeared to be 'floating in the air' and the horizon, for about 180°, seemed very distorted; in fact it was hard to decide what was the horizon. On our port quarter a vessel's masts and superstructure were elongated vertically (3) but no inversion occurred.



Towards 1300 some of the mountains on the coast were affected by the refraction. The tips of the mountains at first appeared 'mushroom-shaped' before splitting away from the real image and then disappearing. This continued to happen at very frequent intervals, in fact almost continuously for about 20 min. At this time a faint line of demarcation seemed visible in the sky where the normal image ended and the refraction began. Air temp. 19·0°C, sea 16·0°. Wind mainly SE, very light and variable. Small amount of $C_L I$ present.

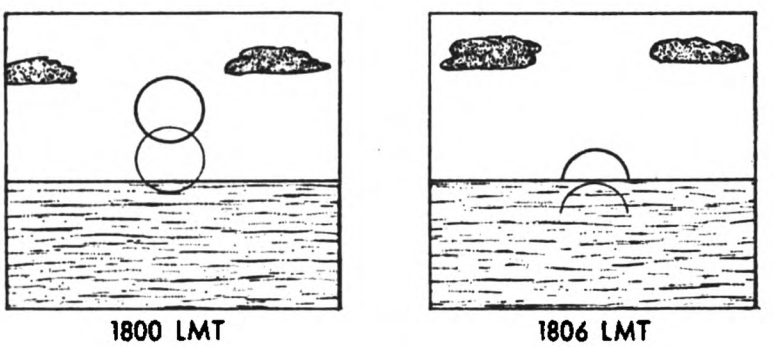
Position of ship at 1300: 33° 54′S, 18° 06′E.

Southern North Atlantic

m.v. *Booker Venture*. Captain R. McKechnie. London to Georgetown. Observer, Mr. I. E. Brady, 3rd Officer.

28th February 1973. At 1800 LMT (2145 GMT) a phenomenon was observed which took the form of a 'double sun' with the 'lower sun' being semi-transparent in that the waves could be seen through it. The two 'suns' kept the same position relative to each other. The position of the vessel was at this time about 200 miles NE of Georgetown, Guyana. Air temp. 26·0°C, wet bulb 24·0°, sea 26·0°. Wind E'ly, force 4. Pressure 1013·7 mb and steady. Cloud $\frac{3}{8}$, comprising small Cu and a haze of Ci on the horizon.

Position of ship: 09° 26′N, 55° 30′W.



Note. The temperature observations from the *Peisander*, together with the "faint line of demarcation", indicate the presence of a temperature inversion, a normal atmospheric condition off the south-west coast of South Africa. Light rays from an object are bent downwards and may suffer distortion, resulting in an elongated and possibly inverted image above the object—a 'superior' image.

The abnormal refraction in the case of the *Booker Venture* report is due to a strong temperature lapse rate in the vertical, as confirmed by the presence of cumulus cloud. The resultant refraction bends the light rays upwards to the observer's eye so that the image is seen below the object—an 'inferior' image.

AURORA

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

"Reports of aurora from British ships for the first three months of 1973 appear in the accompanying list.

"In January geomagnetic activity was never more than moderate and the aurora reported by the listed ships was confined to the auroral and trans-auroral zones; m.v. *Gothland* was approaching the auroral zone at the time of the brilliantly colourful display observed on 24th January. This was seen as a glow between cloud in northern Scotland.

"It will not be news to the observers in O.W.S. *Weather Monitor*, that the outstandingly active period of the three months extended over the last week of February and the first week of March, when from their position at station 'Alfa' they produced a portfolio of valuable reports and sketches.

"The display most widely reported to the laboratory occurred on the night of 21st/22nd February and was visible between sunset and 0200, at times to southern England. The *Weather Monitor* was *en route* to 'Alfa' and cloudy conditions prevented little more than recognition of the coronal rays occupying all visible sky, and observers in H.M.S. *Berwick*, in the North Sea, reported a rayed arc, giving a height measurement which enabled its overhead position to be plotted as northern Scotland. The following night, 22nd/23rd activity was again seen during all darkness hours in the British Isles, and clear skies at 'Alfa' between 2130 and 0100 allowed observation of constantly changing forms with flaming in all parts of the sky.

"Reports were more detailed from the *Weather Monitor*, the *Cape Howe* and the *Ross Orion* for the nights 26th–28th February. On two successive mornings Mr. Anderson of the *Cape Howe*—off the Norwegian coast—sketched the multiple forms visible. Between 0330 and 0350 on the 27th there were four perfectly concentric arcs across the sky, pulsating and showing red coloration. This activity was obscured at 'Alfa' until cloud cleared at 0515, when the multiple forms seen there were accompanied by continuous flaming which continued until daylight. The activity was visible in Scotland as a glow all night, with the occasional rays visible to northern England. Near midnight (GMT) of the 27th, Mr. Laing of the *Ross Orion*—also off the Norwegian coast—again reported red coloration and flamingly active forms. This was not seen further south than Shetland.

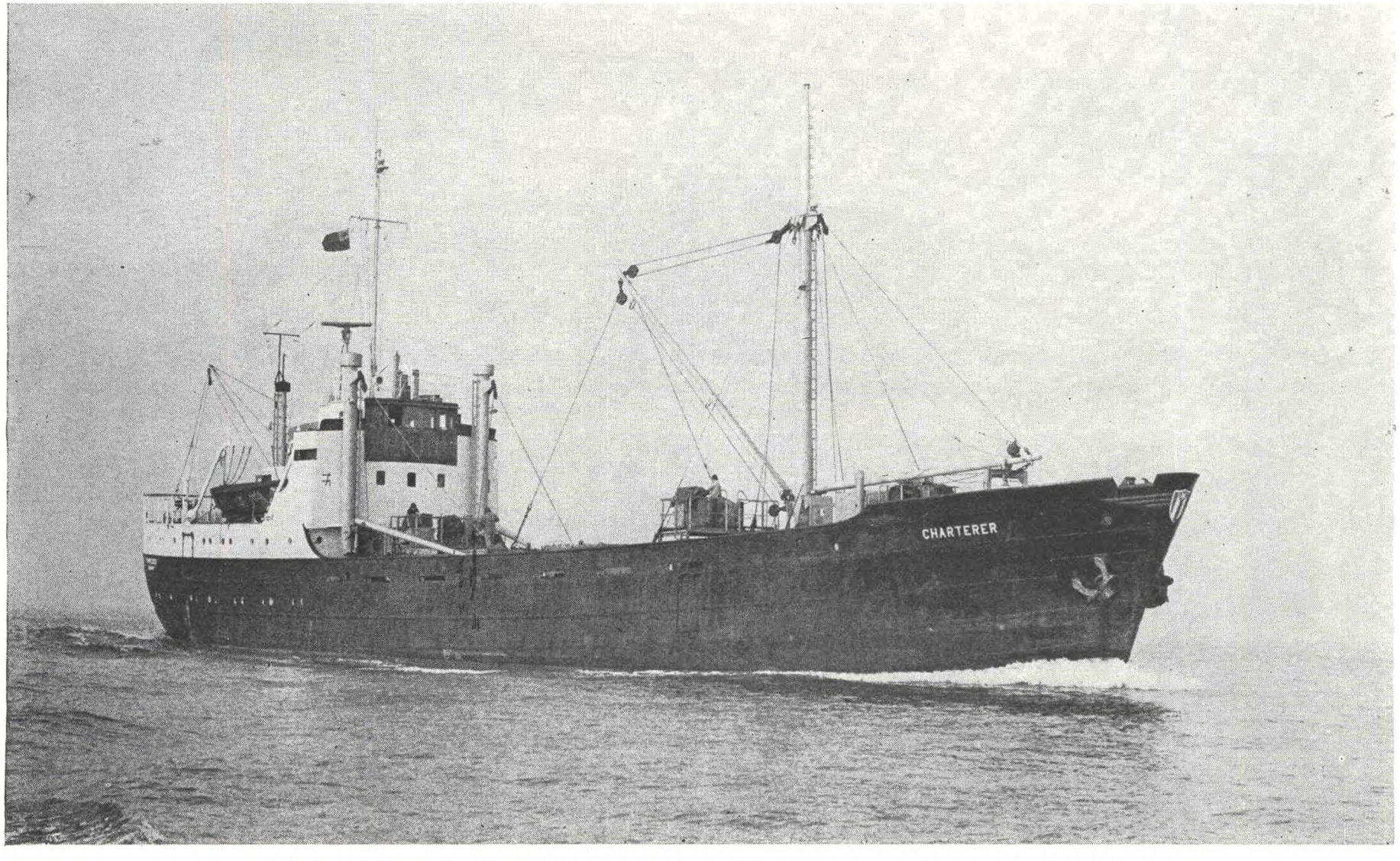
"Observers in the *Weather Monitor* were given no rest until 10th March, though the fine display of 8th/9th March, beautifully sketched and annotated, was associated with only moderate geomagnetic activity; our only other report for the display came from Kiruna in northern Sweden.

"Magnetic activity again became fairly high on 19th March and remained moderate to the end of the month. Associated active aurora, reported from higher latitudes off the north Norwegian coast, was seen on many nights as glows and occasional rays from those stations favoured with clear periods in northern Britain. On three nights, reports from the *Manchester Quest* and the *Manchester Concorde* in the St. Lawrence showed the overhead position of the aurora to have moved a few degrees south of the 'quiet' position. On one of these nights, 22nd/23rd March, all land bases were experiencing cloudy conditions, but observers in the *Summity*, off the north-east coast of Scotland, filled the gap in this zone with a report of glow and rays at around 2100.

"Our thanks once again for your help. We are grateful to you all, heading for Murmansk, on fishery patrol, weather watch, or wherever you may be, for logging the details of auroral display which enable us to plot among other things, their progress, overhead position and southern extent."

Date (1973)	Ship	Geographic Position		Λ	Φ	I	Time (GMT)	Forms
5th Jan.	*Weather Monitor*	55°30'N	07°08'W	080	60	+70	2350–0050	N
9th	*Miranda*	66°35'N	13°25'W	080	71	+77	2100	HA
10th	*Miranda*	66°45'N	13°35'W	080	71	+77	2100	RA
11th	*Miranda*	66°40'N	13°50'W	080	71	+77	2100	RA
	Weather Surveyor	59°05'N	19°00'W	070	65	+72	2255	N
16th	*Miranda*	66°15'N	12°30'W	090	71	+77	2030	HA
20th	*Weather Surveyor*	59°10'N	18°40'W	070	65	+72	2045–0515	HA, RA, RB, N
	Miranda	66°25'N	13°30'W	080	71	+77	2100	HA
21st	*Dunadd*	70°36'N	19°51'E	120	68	+78	1700–1815	HB, V
24th	*Gothland*	66°14'N	09°46'E	110	66	+76	1600–1730	RB
							1800–1830	HB, RB, N
	Berwick (H.M.S.)	64°30'N	10°55'W	080	68	+76	1830–1920	HB, RA
	Miranda	67°00'N	15°20'W	080	71	+77	2100	RR
27th	*Miranda*	67°00'N	15°00'W	080	71	+77	2100	RB
29th	*Weather Adviser*	58°32'N	19°00'W	070	65	+72	0209–0238	R
1st Feb.	*Berwick* (H.M.S.)	64°50'N	10°35'W	080	69	+76	0210–0230	RR
3rd	*Cape Howe*	68°08'N	15°09'W	080	68	+77	1800–1900	RB, RR, N
4th	*Weather Adviser*	59°00'N	18°58'W	070	65	+72	0100–0230	HB, P
	Weather Reporter	52°25'N	20°12'W	060	59	+69	0550	N
5th	*Weather Adviser*	59°00'N	18°50'W	070	65	+72	0130–0215	P
8th	*Berwick* (H.M.S.)	65°15'N	10°20'W	080	69	+76	1921–1940	HA, HB, RB, P
9th	*Weather Adviser*	59°00'N	18°32'W	070	65	+72	0109–0138	RA, RR
							0600	N
18th	*Ross Orion*	70°25'N	17°20'E	120	68	+77	1735–1755	HA, HB, RR, P
21st	*Berwick* (H.M.S.)	55°40'N	00°50'W	090	58	+70	1845–1905	RA
	Weather Monitor	58°30'N	14°25'W	070	64	+73	2150, 2350	RB
22nd	*Weather Monitor*	59°12'N	16°50'W	070	64	+73	2130–0100	RB, RR, P
24th	*Weather Monitor*	60°10'N	21°50'W	070	67	+74	0115–0605	RB, RR, N
25th	*Weather Monitor*	61°47'N	32°02'W	060	70	+76	2350–0010	V
26th	*Cape Howe*	63°30'N	06°40'E	100	64	+74	0415–0505	HA, HB, RR, N
	Weather Monitor	62°06'N	32°45'W	060	70	+76	2210–2245	HA, N
27th	*Cape Howe*	67°40'N	11°45'E	110	67	+77	0330–0405	HA, HB, P
	Weather Monitor	62°17'N	32°43'W	060	70	+76	0515–0725	All forms
		62°03'N	32°58'W	060	70	+76	2330–0445	RB, RR, P, N
	Ross Orion	68°30'N	11°30'E	110	68	+77	2340–2350	HB, RB, P
1st Mar.	*Weather Monitor*	61°44'N	33°00'W	060	70	+76	0140–0250	N
							0545	N
		62°02'N	32°51'W	060	70	+76	2130–0221	A, HB, RB, P, N
2nd	*Weather Monitor*	62°02'N	32°51'W	060	70	+76	0350–0355	NH
		61°58'N	32°34'W	060	70	+76	2130–2156	HB, RB
3rd	*Weather Monitor*	62°12'N	32°33'W	060	70	+76	2345–0049	HB, RR, N
4th	*Weather Monitor*	62°07'N	32°49'W	060	70	+76	2150	N
							2345–0020	RR
6th	*Weather Monitor*	62°21'N	32°46'W	060	70	+76	2314–0150	HB, RA, RB, RR, P
7th	*Weather Monitor*	62°02'N	33°08'W	060	70	+76	2335–0020	HB
8th	*Weather Monitor*	62°03'N	33°06'W	060	70	+76	0230–0500	HA, RR, N
		62°15'N	32°54'W	060	70	+76	2225–0035	RA, RB, RR
9th	*Weather Monitor*	62°17'N	32°48'W	060	70	+76	0110–0400	HA, HB, RA, RB, V, P
10th	*Weather Monitor*	62°14'N	32°32'W	060	70	+76	0224	RA
21st	*Weather Monitor*	58°47'N	16°40'W	070	64	+72	2120, 2140	N
	Manchester Quest	Gulf of St. Lawrence		010	60	+74	2400–0030	RB
22nd	*Summity*	58°13'N	02°24'W	080	61	+71	2053–2118	RR, N
	Weather Reporter	59°12'N	18°28'W	070	65	+72	2250–2358	RB
	Manchester Quest	Gulf of St. Lawrence		010	60	+74	2400–0030	RB
24th	*Manchester Concorde*	47°18'N	59°06'W	010	59	+74	2330	HA, RR
28th	*Silversand*	Vestfjorden		110	66	+77	2200–2400	N
29th	*Silversand*	Vestfjorden		110	66	+77	0030–0120	RA, RR, P
	Northella	71°10'N	30°03'E	130	66	+78	2200–2210	RR
30th	*Weather Reporter*	59°03'N	19°06'W	070	65	+72	2140–0100	HB
31st	*Weather Reporter*	59°01'N	19°14'W	070	65	+72	2145–0100	HB, RB

Key: Λ = geomagnetic longitude; Φ = geomagnetic latitude; I = inclination; HA = homogeneous arc; HB = homogeneous band; RA = rayed arc; RB = rayed band; R(R) = ray(s); P = Patch; V = Veil; S = striated; N = unidentified auroral form.



The m.v. *Charterer*, Guardline Shipping Ltd., one of the two vessels being chartered by the Meteorological Office to take part in an international experiment in the Atlantic during the summer of 1974.

(*Opposite page 24*)

(Opposite page 25)

The presentation of barographs on 24th January 1973 to Captain J. D. Blake and Captain J. T. Sheffield, M.B.E.; left to right: Captain Blake, Mrs. Blake, Dr. B. J. Mason, C.B., F.R.S., Mrs. Sheffield and Captain Sheffield (*see* page 39).

551.5:06:92

British Architects of the International Meteorological System*

By D. G. Harley
(Meteorological Office)

In the centenary year of 1973 many things were written and spoken about the International Meteorological Organization (IMO) and its successor the World Meteorological Organization (WMO). The international system constructed by them is wonderful in its complexity, its flexibility and the methods of its control. Formed of independent national services, which work in continuous daily or hourly contact with each other, it is governed entirely by consensus of the professional heads of those services. Since the beginnings in 1873 the technical developments have been enormous, but the records of the early years show how far-seeing were the men who laid the foundations, and how well designed was the structure that rose on them. What C.-G. Rossby wrote in 1956 fits well the early leaders of IMO: "During the last decades the technological development has time after time shown the dreams of a visionary mind to be closer to reality than the commonsense judgement of the realists".

The IMO, which began in Europe, was naturally strongly influenced by European meteorology, as indeed WMO still is. It is not surprising then that although no permanent seats have ever been reserved for any person or country, certain founder countries have nearly always been represented in the governing body. Of these the only one with unbroken continuity from 1873 until today is the United Kingdom. In these one hundred years a great many British meteorologists have played important parts in the developing scene, but during the 78 years of IMO's existence four in particular played leading roles. Those four were R. H. Scott, Napier Shaw, Ernest Gold and Nelson Johnson.

R. H. Scott and the early years

The development of electric telegraph services in Europe stimulated the growth of meteorological services, and soon the mutual exchange of reports was begun. Even before this stage the first step in international meteorology was taken, when Maury of the U.S.A. and Quetelet of Belgium organized a conference of ten countries in Brussels in 1853 on maritime meteorology. The main object of this conference was to achieve a uniform system of meteorological observations at sea.

By 1872 many meteorologists were convinced of the need for uniformity of practice and for international co-operation on a large scale, so 52 directors of meteorological services and a number of other scientists met in Leipzig to plan a formal intergovernmental conference to take place in the following year. Immediately there arose the problem of who should be invited, as many eminent meteorologists were not directors of their country's central services, and some countries indeed had several institutions of similar standing. Thus early began 'political meteorology', that inescapable incubus of international action.

Governments agreed, and in September 1873 there assembled the first International Meteorological Congress in Vienna, whose centenary WMO celebrated in the same place in September 1973. The Congress was a great success, took a number of important technical decisions, and chose a Permanent Meteorological Committee (PMC) to see to their implementation and to call another Congress in a few years.

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The PMC met immediately, and elected as its President Buys Ballot of the Netherlands who had been the moving spirit and leader of events, and as its Secretary Dr. R. H. Scott of the United Kingdom.

Scott, a Dubliner, had become in 1867 Secretary of the Meteorological Committee of the Royal Society, and Director of the Meteorological Office. The Office was then a very small body—its total budget for the year 1874–75 was £11,685 10*s.* 6*d.*—and in low repute scientifically. In 1866 the issue of forecasts had been suspended as being scientifically unjustified, but the public outcry was such that by May 1867 the Board of Trade asked the Meteorological Committee to resume giving some intimation of storms. At first this was done by merely repeating actual reports, but before 1876 a storm-warning system had again been developed. It is difficult now to realize just how little information was available: no ship reports, British reports for one hour in the morning and one hour in the evening (many of the latter came only with the next morning's message) and, gradually, some reports once daily from neighbouring countries. But these messages contained no cloud reports, no pressure tendency, and there was little uniformity of units. Even the hours of observation differed from country to country, a problem that took many decades to resolve.

From the start the vision of meteorologists saw far beyond these handicaps. Indeed, before Scott arrived, the Meteorological Committee went on record in 1866 as looking forward to international co-operation in the indication of the causes of meteorological changes over the greater part of the globe. Thus in 1873 Scott was named with Alexander Buchan, Secretary of the Scottish Meteorological Society, to represent the United Kingdom at the Vienna Conference, with strict instructions "to abstain from pledging Her Majesty's Government in any way". He was in the event able to report back that no decisions had been taken involving expenditure.

Scott seems to have been a good organization man, a cautious and sound science administrator rather than a research scientist, although he was also a Fellow of the Royal Society, whereas Buchan from his less official position spoke more independently as a scientist. For example, when the Vienna Congress discussed the units to be used for observations and the universal use of the metric system was urged, Buchan was all for it, but Scott felt bound to say that his Government was now not so keen and was not likely to be able to accept the proposal.

The PMC had seven members initially, this number being increased to eight in 1878 when the French felt able to accept an invitation. They had been absent from the Congress, no doubt as a consequence of the Franco–Prussian war of 1870, the first of the painful effects of war on the continuity of meteorological co-operation. The second Congress, which met in Rome in 1879, elected in its stead an International Meteorological Committee (IMC) to function until another Congress, and this system continued throughout the life of IMO. The PMC and the IMC met frequently from 1874 onwards, generally every two or three years. There was no other organization for continuity, no Secretariat until 1926, no permanent offices or officers. Even the name International Meteorological Organization only appears thus with capital letters in the 1920s when at last a permanent Secretariat was set up. Between the meetings of the IMC the President and Secretary carried on the business by correspondence. Scott was continuously Secretary until he retired in 1900 from the Meteorological Office. In more lowly affairs one might be tempted to suspect that perhaps a Secretary stayed so long because no one else would take on the job, but in this work there were many strong, active and indeed brilliant men, and one can but conclude that Scott was that most useful of men, the industrious, reliable, continuity man, who underpins the work of his enterprising colleagues.

To one used to today's large organizations for supporting international activities, some features of the early IMO are surprising, such as the publication of reports, language problems and finances. Finance was managed by each country paying its own way; for example, in 1874 Scott asked the Meteorological Committee for £20 as a contribution to the Permanent Meteorological Committee. There is little or no

mention in any of the early reports of the problems of language, whereas nowadays simultaneous interpretation seems indispensable. Yet large agendas were disposed of in meetings of a few days only. Publication of the reports of meetings was done by courtesy of various governments. Scott evidently persuaded his Meteorological Committee at home to support the work, and until the 1920s all the main reports of IMO were published in English by HMSO "by Authority of the Meteorological Committee". French and German editions were likewise published by other governments, for the general good. There being no Organization there was no book of rules, but there were the accumulated resolutions and decisions of the various meetings. Only in 1909 was there finally published in London a codex of such resolutions, drawn up by Hildebrandsson of Uppsala and Hellman of Berlin, at the request of the IMC. Until then personal experience and continuity saved the day. The 1896 Paris Conference noted Scott's knowledge of previous decisions and his pressure for consistency. By that time he was one of the only two active survivors of the 1873 Congress, Professor Mohn of Norway being the other (Mohn served from 1873 to 1913!). The Conference accepted Scott's advice that earlier decisions made for good reasons should be adhered to.

After the Rome Congress of 1879 which was, as before, intergovernmental, it gradually became clear that governments did not want any more such Congresses, apparently because the decisions were mainly technical and did not justify the use of such ponderous diplomatic procedures. For several years the IMC could not see clearly how to proceed. Eventually in 1888 it concluded that, as its agenda was finished and it could not call a Congress, its work was finished and it should dissolve itself. It asked its ex-officers President Wild of Russia (who had succeeded Buys Ballot in 1879) and Secretary Scott of the U.K. to carry on and to call together the representatives of meteorological services to decide what should be done. So a Conference of Directors was convened to meet in Munich in 1891, many of them uncertain what could usefully be done in their semi-private capacity. However, they soon found that they could do useful work, elected a new IMC, and so in practice things went on much as before. Before the next Conference in Paris Wild fell ill and Scott carried on all the preparations alone, because the rules did not then permit a new appointment to be made.

By this time the organization had spread far beyond Europe. From the beginning the U.S.A. had been involved to some degree, and from time to time participants from India, China, Argentina, Australia and Mauritius came to meetings. In the reports of the 1873 Congress and its Permanent Committee there are recorded discussions on the meteorological problems of Samoa, South America and the Congo among others. To the Paris Conference in 1896, which Scott called and opened single-handed, directors from most parts of the globe were invited, although in the event Asia, South America and the West Indies were not represented.

Until the first Conference of Directors in 1891 there were no subsidiary bodies to the IMC, although *ad hoc* conferences on special subjects had been called from time to time. Such were the private Conference of Maritime Meteorology called by Scott in London in 1874 to update the great work of Maury's Brussels Conference of 1853, and the special Polar Meteorology Conference in Hamburg in 1879. There were no Regional Associations until 1935 although Australasian inter-colonial meteorological conferences met in Sydney, N.S.W., as early as 1879 and 1881. The first permanent Commission, forerunner of today's Technical Commissions, was established in 1891 and two more in 1896. At this time the long process of laying firm foundations and a good understanding began to allow real development of the science and practice of meteorology. But not until radio-telegraphy allowed services to escape from the limitations and heavy costs of telegrams, and to collect synoptic data from the oceans, and not until user demand from aviation opened the money bags, could meteorology really begin to take off.

In 1900 Scott retired, and was succeeded by Napier Shaw. The IMC thanked Scott for his "unfailing zeal" during his long service. Scott died in 1916, before the

rapid growth of meteorology had really got under way. It is sad to find that in the two obituary notices of him in the *Quarterly Journal of the Royal Meteorological Society* there is not one mention of all his international activities over so many years. Elsewhere, however, someone recorded that Scott had been "the architect of the international system".

Sir Napier Shaw as President

Napier Shaw was a physicist of renown at Cambridge, and some were surprised that he took on Scott's job. However, his subordinate position as Secretary of the Meteorological Council (imposed on Scott in 1877) was soon changed and he became Director of the Meteorological Office. In place of the fortnightly meetings of the Meteorological Council of the Royal Society, which controlled him, he now became Chairman of a Meteorological Committee which met only every two months to advise him. The Royal Society and the Treasury were represented on this Committee. Shaw found the means to bring into the Office first-class young scientists and thus set it on a course from which it has never since looked back. Among these new men were Ernest Gold and R. G. K. Lempfert, whose names began to appear on scientific papers which had great influence. Shaw himself led this work enthusiastically and for the rest of his long life produced many writings on meteorology, culminating in his 4-volume *Manual of Meteorology*, written mostly after his retirement in 1920. Shaw was given the place on the IMC vacated by Scott, and Hildebrandsson of Sweden took over as Secretary. Mascart of France had succeeded Wild as President of IMC, but in 1907 he was seriously ill and had to resign. The IMC, then in session, came to his bedside where Shaw, who had been chosen to succeed Mascart, spoke movingly of the task before them and quoted a French saying to the effect that "the most terrifying difficulties are those that do not really exist".

By this time, 1907, radio had begun to be fitted on ships, and the IMC had already been quick to pursue ways of getting synoptic reports from ships at sea. Several meteorological services tried to collect radio messages, but in the early years the results were disappointing, partly because someone had to pay for the messages, largely because of the long delays before the messages reached the forecast offices. In 1907 the British and German services reported that in a 2-month experiment less than 18 per cent of messages arrived within 24 hours and less than 50 per cent within 48 hours! Although the system has gradually improved since then, some of these problems are still with us.

To meteorologists of the 1970s, used to floods of data from around the world, it is surprising to discover how long it was before synoptic reports were available in Europe from the Atlantic islands and from North America. Cables across the Atlantic began to work properly in the 1870s, and then extended rapidly throughout the world wherever the traffic appeared to justify it, but cablegrams were expensive and reports from North America were of little use in Europe with none from the 3,000 miles of ocean in between. From the Azores three telegrams a day began when a cable there was completed in 1893, and a much-improved service direct to the U.S.A. and Britain began in 1901 when new cables were completed. This new service resulted from a generous offer from Colonel F. H. Chaves, Portuguese Director in the Azores, and a quick response from the IMC urged on by Napier Shaw. A cable to Iceland was repeatedly suggested in those years but the financial support could never be organized. As the data-collection system developed the inadequacy of the code form agreed in 1874 became more and more apparent, but just how it should be improved took much labour to decide, and much basic work such as the classification of clouds and preparation of a cloud atlas had to be done first. This was done by the Commission for the Study of Clouds set up in 1891. The Commission for Weather Telegraphy made some progress but the old code remained until 1919.

With these growing demands and opportunities, and 30 years' experience of working together, meteorologists recognized that the system of unofficial Conferences of Directors had advantages, and settled down to plan their future development. The 1905 Conference of Directors at Innsbruck asked the IMC to prepare a regular scheme for regulating international meteorological organization, taking account of historical development and the resolutions of past Conferences, IMCs and Commissions. The Conference also agreed that there should continue to be Commissions appointed for special subjects, and especially to organize collective researches. From this time on the fact of the IMO may be said to have been recognized, although it was not so named until later. Also from this time began the rapid acceleration of development which still continues today.

It is worth noticing here some other historical links between IMO and the WMO of today. The IMC, unlike the Executive Committee of WMO, was the only continuing body, and was completely responsible for action between Congresses and Conferences. Later on as the volume of work continued to grow, a small Executive Council of five members was set up in 1929 within the IMC. Neither the Executive Council nor the IMC corresponds exactly to the Executive Committee of today. As to the Conferences of Directors, the informality and possibility of direct inter-service working agreements were soon found to be useful, and political difficulties were reduced by the informality of the system. The formality of the intergovernmental Congresses had had the advantage of settling the question of representation. Necessarily there had had to be one principal delegate, although others from the same country might be of equal or greater scientific eminence, and the Conferences of Directors maintained that convention. The institution of Commissions, readily arranged in so informal a meeting, provided the means and opportunity for the scientists and experts to play their full part. When later the inconveniences of being unofficial became apparent, for example, the lack of status of IMO decisions *vis-à-vis* those of intergovernmental bodies, there was much reluctance to lose the now accustomed freedom of association and work. In consequence the WMO Convention has firmly built into it, to the greatest extent practicable, these methods of representation, work and organization devised by IMO. One of the most valuable legacies of IMO to WMO, as noted by President Viaut in 1960, is "the principle of effective and constant participation by the meteorological services of Members in the life processes of the Organization".

Under Napier Shaw the IMO was working up steadily and energetically when catastrophe struck the world with the outbreak of the first World War. During the war meteorology, radio and aviation all developed enormously, and by 1919 a new situation faced the survivors. Shaw, as President of IMC, summoned a meeting in London of six members, and representatives of others, and a new Conference of Directors was summoned in October of the same year in Paris to set the new course. Not only were there new demands from the customers, new systems of observing and reporting, and new scientific methods to absorb, but there were new organizations to cope with. On the one hand the new International Commission for Air Navigation (ICAN), a fully intergovernmental body, had its own sub-commission for meteorology, and on the other was the establishment, also in 1919, of the non-governmental body of scientists called the International Association of Meteorology. The latter body freed IMO to concentrate on practical matters, of which it now had more than enough to cope with. The former body was a potential rival with whom to come to terms.

Under Shaw's vigorous leadership, the 1919 Extraordinary Conference took firm grip of the situation and established 9 Commissions (the IMC set up 3 more in 1921) nearly all on urgent practical matters. Shaw was selected as President of the new IMC and, although he retired as Director of the Meteorological Office in 1920, he was maintained as President until the next Conference in 1923, when he was made an Honorary Member of the IMC and so remained until his death in 1945. For several years from 1921 he was also President of the Commission for the Study of

Clouds, and of the Commission for the Investigation of the Upper Air, which has since become WMO's Commission for Atmospheric Sciences. Until 1919 Shaw had for twelve years been President of both the Commission for Storm Warnings and Maritime Meteorology, and of the Commission for Weather Telegraphy.

Ernest Gold and the development of synoptic meteorology

In this last Shaw was succeeded in 1919 by Colonel E. Gold, one of those he had brought into meteorology a dozen years before. The Commission soon changed its name to Commission for Synoptic Weather Information, and under the pressure of circumstance and the qualities of its President it became the focus of developments in international meteorology. Gold remained President until 1947, during which turbulent time the world-wide meteorological system which is now known as World Weather Watch grew into much of its present form. He then retired but is fortunately still with us. In 1958 he was awarded the third IMO Prize, the first of three British meteorologists to be so honoured.

When Gold took over the Commission for Weather Telegraphy the need for urgent action was unmistakable. Not only had the pre-war system of exchanges of telegrams been disrupted, but under the pressure of military needs meteorological services were using a variety of codes including new elements, had greatly increased both the frequency of reports and the numbers of stations, and had developed the use of radio. There was no question of return to the pre-war poverty of data, but the immediate problems were to bring international order to the riot of national arrangements. Nor could the defeated Central Powers be left out of the new plans, as meteorology was now clearly more international than ever. Gold set up two permanent sub-commissions, one on codes and specifications directed by himself, and one on radio transmissions of weather reports under Delcambre of France, and also developed working arrangements with the Commissions serving aviation and marine meteorology. The 1874 code was replaced immediately by one drawing largely on British and Allied experience, and successive revisions based on experiments culminated in the classic SYNOP code adopted in Copenhagen in 1929 for world-wide use, together with all its variants and associated codes. Aviation codes were included and were adopted by ICAN, which thus acknowledged IMO's primacy in meteorological affairs. This was not altogether surprising, because Gold was also President of ICAN's sub-commission of aviation meteorology! Starting from scratch, a whole structure of scheduled national, regional, and continental radio transmissions was developed, enabling any station to receive all its data needs, using only two radio operators in the daytime (one by night) on a standard set of frequencies. This process of forming a single comprehensive and uniform world-wide system for exchanging data from a great number of national systems was an enormous and unprecedented feat of standardization, reached entirely by the free consent of all concerned. From almost the start the meteorological services of the Central European powers were brought into consultation, and from 1923 Austria and Germany were back in IMO. Russia returned to the IMC in 1929, and Japan and India had never left.

As IMO had no Secretariat until 1926 (although the idea was first considered in 1873) voluntary help was the only way of circulating the flood of decisions. The British Meteorological Office publication *Wireless Weather Messages* was thus for some years the only comprehensive manual of reporting stations, codes and broadcasts and was widely used. Later the new Secretariat was able to take over the task with its Fascicules of IMO Publication No. 9.

In the twenty years 1919–39 the Commission for Synoptic Weather Information (CSWI), as Gold's Commission became, held eleven sessions. Its membership rose from 16 in 1919 to 59 in 1929 and 80 in 1937, at which time its work was distributed among 11 sub-commissions for joint meetings with other Commissions. In 1939 world war again broke out, and again rapid developments left IMO with quite a

new situation at its end. In 1946 Gold and the CSWI set about remoulding the structure, with again new and diverse national practices to reconsider and new requirements, mostly from civil aviation, to meet. In the final 3-week session of CSWI at Toronto in 1947 revised world-wide codes and specifications were agreed. In substance these are the ones which are still in use today. These codes were approved by the immediately-following Conference of Directors in Washington, and became known as the Washington codes. It was true then, and is even more true now, that the growing scale of meteorological operations and the variety of purposes served by the codes makes agreement on changes increasingly difficult to achieve.

At the end of the Toronto session of CSWI Gold retired from the Presidency after 28 years, and was succeeded by J. R. Tannehill of the U.S.A. Gold was appointed Honorary President of CSWI.

Sir Nelson Johnson and the IMO/WMO transformation

When N. K. Johnson succeeded Sir George Simpson in 1938 as Director of the Meteorological Office and as member of the IMC and Executive Council, the IMO was already deep in discussion of its future status. The disadvantages of its non-governmental status, as already mentioned, were apparent in the 1920s, when the formation of ICAN in 1919, with its intergovernmental status, had soon caused difficulties for IMO. Agreements affecting meteorology reached in ICAN, and elsewhere as the applications of meteorology developed in many fields, had full governmental backing, whereas those of IMO did not. IMO attempted to meet the ICAN problem by giving its Commission for Aeronautical Meteorology a special official status. This 'cuckoo in the nest' showed the growing absurdity of the situation. The Directors sat in IMO treasuring their informality, while their subordinates sat in the other bodies where the users took the effective decisions. Many Directors decided that the time had come for change so that intergovernmental decisions on meteorology could again be concentrated within the one organization. Progress was made, though slowly, in drafting a new intergovernmental Convention, though with fears that it would endanger the principle that scientific considerations should be the chief basis for any decision.

Came the war, during which the IMO continued in the form of the Secretariat in Lausanne (reduced to Dr. Cannegieter and two others). Throughout the war the Secretariat maintained contact with the members of the Executive Council and with the President, Dr. Th. Hesselberg, in Oslo. At the end of the war, as in 1919, all had to be rebuilt, and London again seemed a good place to start. An extraordinary Conference of Directors gathered in London in the spring of 1946, but without the representatives of the defeated countries. The address of welcome given by the Under Secretary of State described meteorology as the "key science of the world". The Conference re-established the Commissions and put them to work, elected a new International Meteorological Committee of 20 members, and charged it with finalizing the new Convention. Dr. Hesselberg stepped down from the Presidency and Sir Nelson Johnson was elected in his place. The new IMC met the same July in Paris, and 14 months later a new Conference of Directors assembled in Washington. This session was preceded by simultaneous sessions in Toronto of the 10 Technical Commissions, from which emerged several hundred resolutions for the consideration of the Conference. The agenda also included the reports of 4 Regional Associations (3 had met in the previous year) and such major matters as relations with the new United Nations Organization and with the new International Civil Aviation Organization. Above all there was the new Convention to be considered and, if all went well, decided on. The Conference, in 31 sessions during three weeks, adopted 220 resolutions and finished the new Convention. The struggles over the Convention were long and of great difficulty. Under the President's patient guidance all the crises over equality of rights, membership, the world-wide character of the

organization, and professional representation as distinct from political, were successfully overcome. In the final meeting of the Conference the new Convention of the World Meteorological Organization (WMO) was signed. This was a most remarkable feat by all concerned, and speaks much for the reality of the international spirit of meteorology and of meteorologists.

Sir Nelson Johnson remained as President until IMO met for the last time in 1951, to die and be immediately reborn as the new WMO. The final Extraordinary Conference of Directors lasted three days and was followed directly by the first Congress of WMO. Sir Nelson Johnson opened the new Congress, and was elected President for its duration. He was then succeeded by Dr. Reichelderfer of the U.S.A. as President of WMO. The final action of that Congress was to pass by acclamation a resolution proposed by Dr. Reichelderfer. That resolution recognized how much the accomplishments of Congress were due to the "experience, insight, skill, careful planning, and patient perseverance of its President", and expressed its lasting appreciation to Sir Nelson Johnson "for his unselfish service and devotion to the aims of the Organization and for his distinguished services in launching the new WMO". Sir Nelson Johnson retired in 1953 but did not long survive.

The twenty months of intense IMO activity, from London in the spring of 1946 to Washington in the fall of 1947, bore heavily on all concerned, but especially on the President on whom lay the burden of leadership. Sir Nelson as Director, and Ernest Gold, President of CSWI, as Deputy Director of the Meteorological Office, had at the same time to rebuild the Office for post-war tasks as the flood of wartime staff receded. Their international labours at this time completed the structure, built by so many hands, which was bequeathed to WMO by the International Meteorological Organization.

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551.465.4

An Oceanic Front off South-east Iceland

BY D. J. GEORGE
(Meteorological Office)

During trawler support operations off south-east Iceland in late April 1973, a marked sea-surface temperature (SST) change of about 3 degc in one nautical mile was recorded several times aboard the m.v. *Miranda* (Commander G. E. Hammond), some 40 miles south-east of Berufjördhur (see Figs. 1 and 2). This is an area where the cold East Iceland Current mingles with a branch of the warm North Atlantic Current which sets northwards off the Faroes; a zone of strong SST gradient exists here when the ice edge has approached the extreme position,[1] usually in April. The observed gradient was much stronger than indicated on the 5-day mean SST chart as drawn at the Central Forecasting Office (Fig. 1).

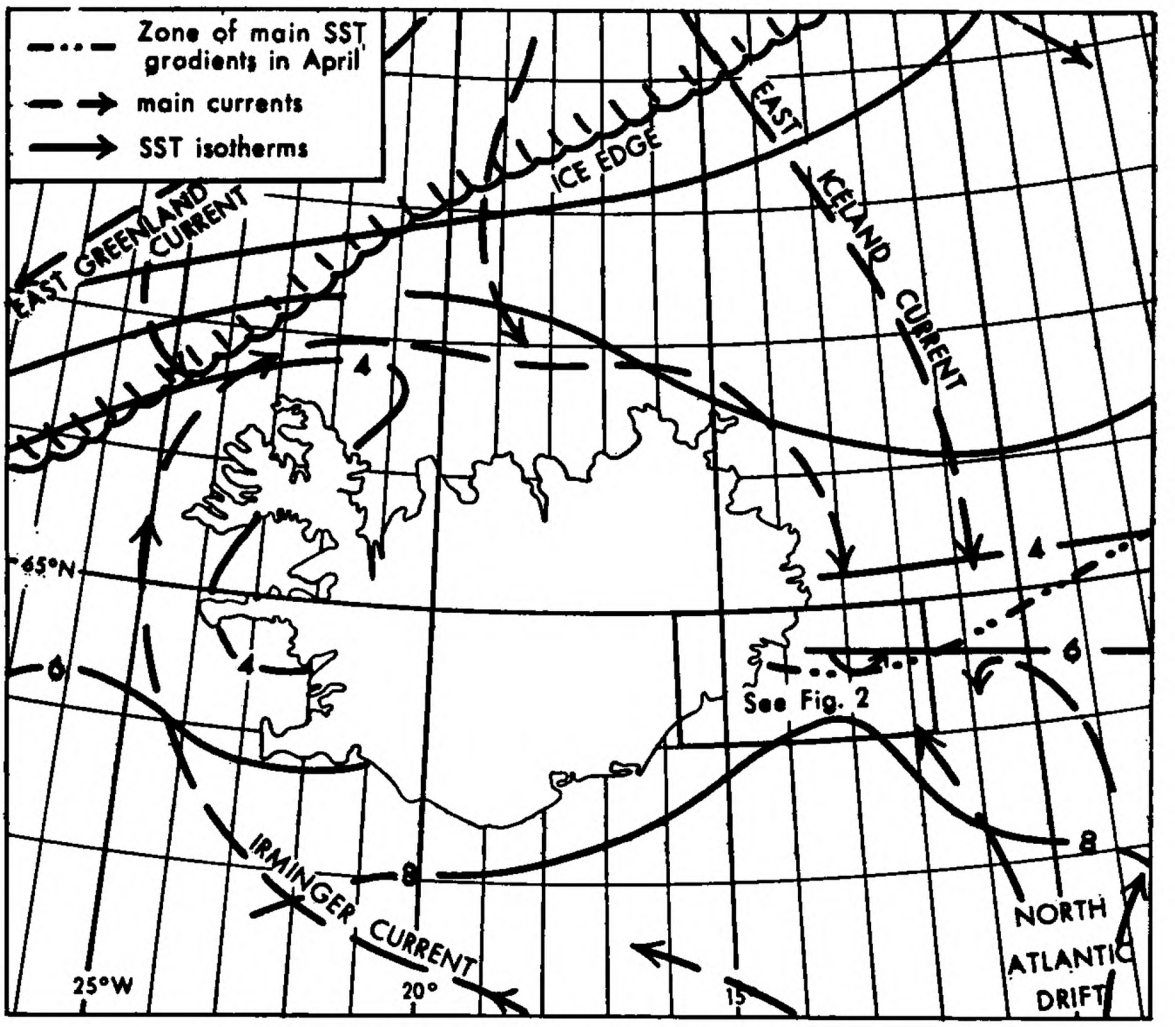

Fig. 1. Five-day mean sea-surface temperature isotherms for 24th–28th April 1973. (Main ocean currents are shown with the estimated position of the mean SST gradient in April.)

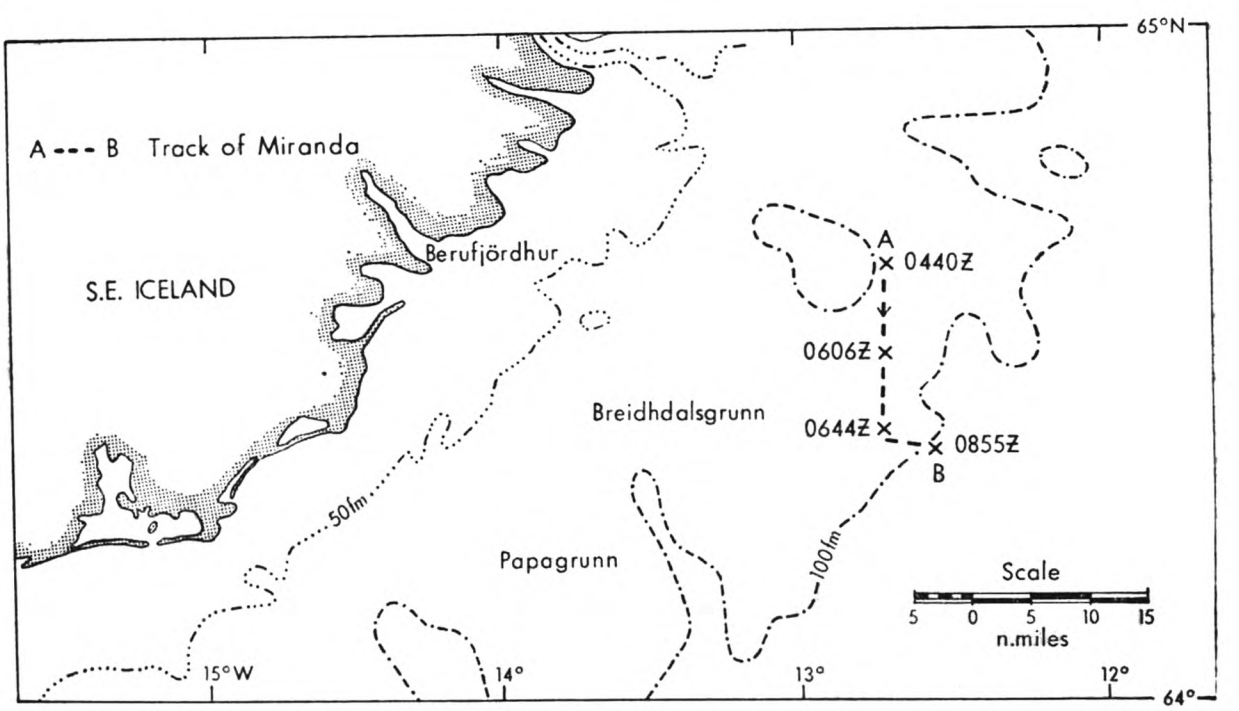

Fig. 2. Enlargement of the inset area in Fig. 1 showing main submarine contours and ship's track.

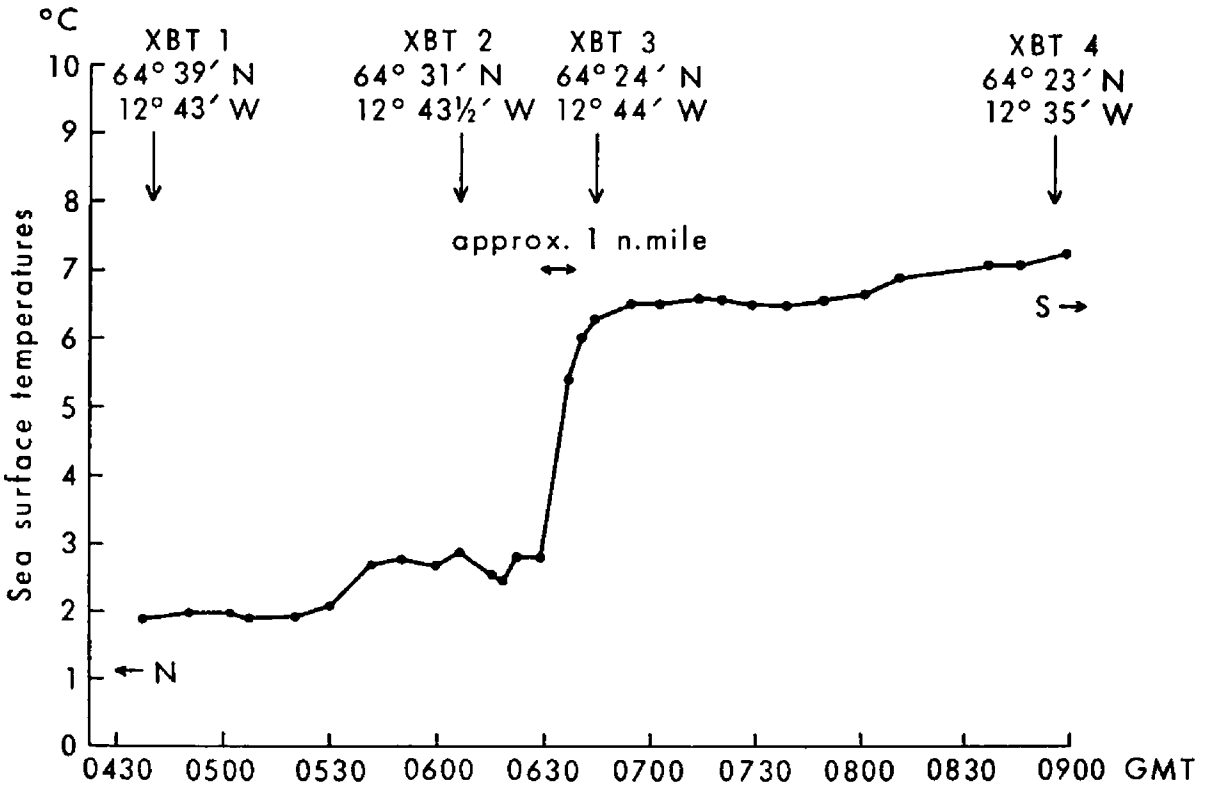

Fig. 3. Sea-surface temperatures measured off S.E. Iceland on 26th April 1973, using standard Met.O. rubber bucket.

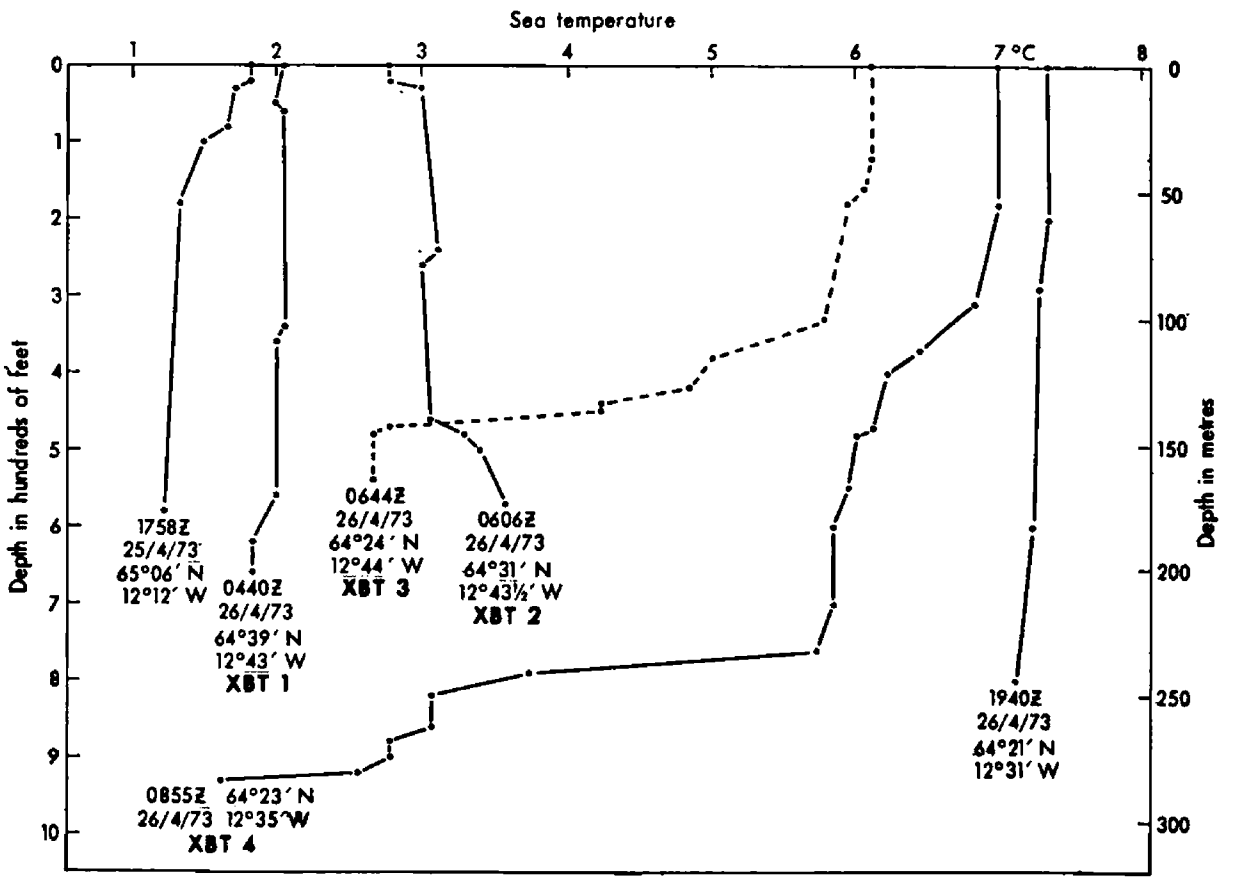

Fig. 4. Bathythermograph soundings off S.E. Iceland on 25th–26th April 1973.

In the early hours of 26th April the *Miranda* was recrossing the area and the opportunity arose to take frequent SST readings, using a rubber bucket, and to launch several expendable bathythermographs (XBT) in order to obtain a two-dimensional picture of the temperature gradient along a north to south track, as shown in Fig 2. The results of the SST measurements are plotted in Fig. 3 and show an abrupt rise from 2·6° to 5·4°C between 0628 and 0636 GMT, with a further slower rise to 6·5°C over the next 15 minutes, the maximum measured gradient being approximately 3 degC per nautical mile. At the time the weather was fine with excellent visibility, only a trace of cloud, wind calm or light east to north-east and air temperature around 0°C.

The XBT soundings are plotted in Fig. 4 and show cold water throughout at 0440 and 0606 GMT (and also the previous evening some distance to the north). At 0644 (about half a mile to the south of the maximum SST gradient) there was warm water to 100 metres (330 feet), with a marked thermocline from 100 to 143 metres (470 feet) where the water temperature fell about 3 degC, with cold bottom water. By 0855 the warm water extended to 229 metres (750 feet) with a 3 degC thermocline to around 244 metres (800 feet), and cold water below.

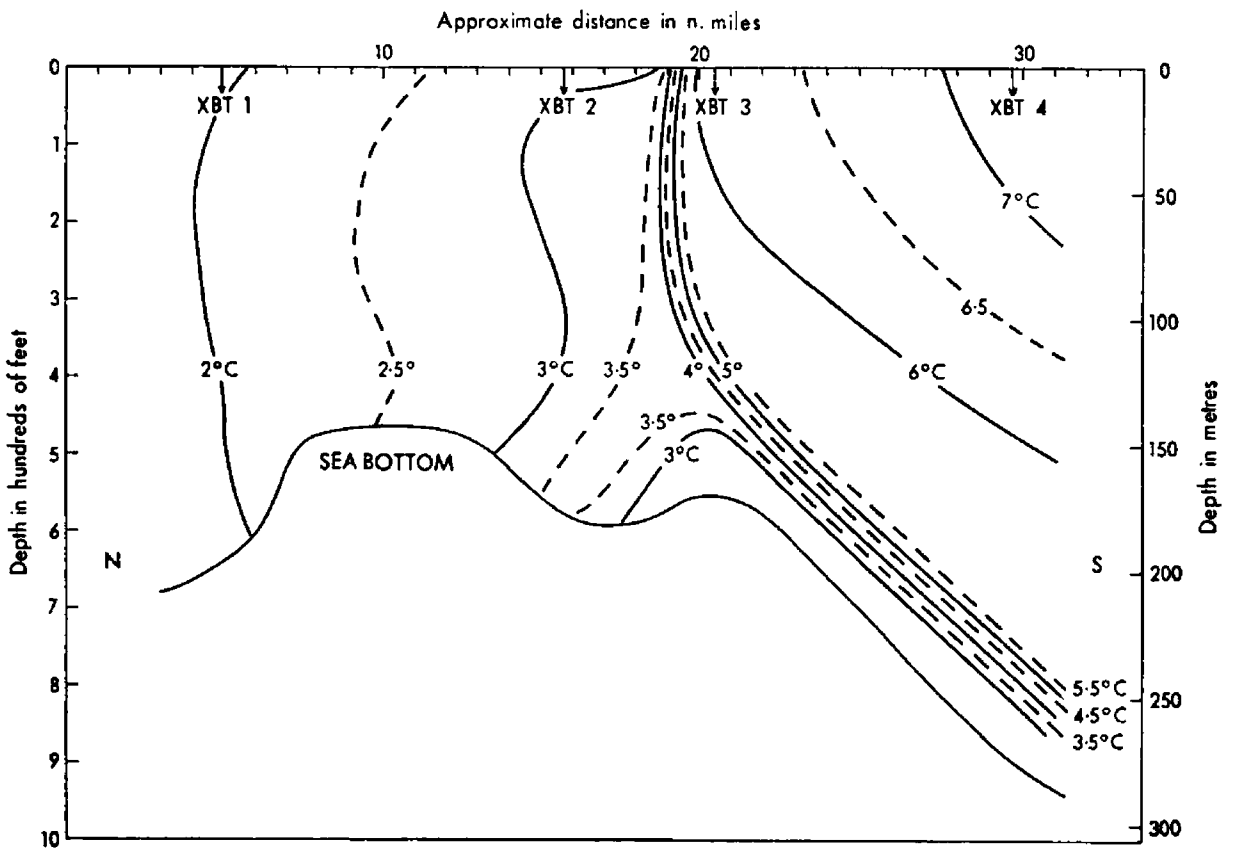

Fig. 5. Cross-section from north to south across oceanic front off S.E. Iceland on 26th April 1973, derived from frequent SST readings and four bathythermograph soundings. (The vertical scale is 50 times the horizontal scale.)

The SST and XBT results have been combined in Fig. 5 to obtain a cross-section of temperature with depth, the times of observation having been converted into approximate distances along the *Miranda*'s track. The temperature discontinuity is as well marked with depth as it is on the surface, having a slope of about 1:150 or 0° 22′ from the sea bottom to 137 metres (450 feet), and then practically vertical to the sea surface. There may be some connection between the location and slope of the front-like discontinuity and the slope of the sea bed. It was noticed that the warm water was much milkier in appearance than the cold water, suggesting an abundant plankton population, but no other effects such as disturbed water or

floating debris were noticed. This front bears resemblances to oceanic fronts observed in more temperate regions.[2, 3, 4, 5] Several authors[2, 4, 6] mention that plankton aggregate at oceanic fronts because of upwelling and that fish tend to shoal there also. At the time trawlers were fishing some distance to the west-south-west of the *Miranda*'s position. Surface winds over the previous 26 days had been cyclonic variable or mainly westerly, becoming light or calm on the 25th/26th (Fig. 6).

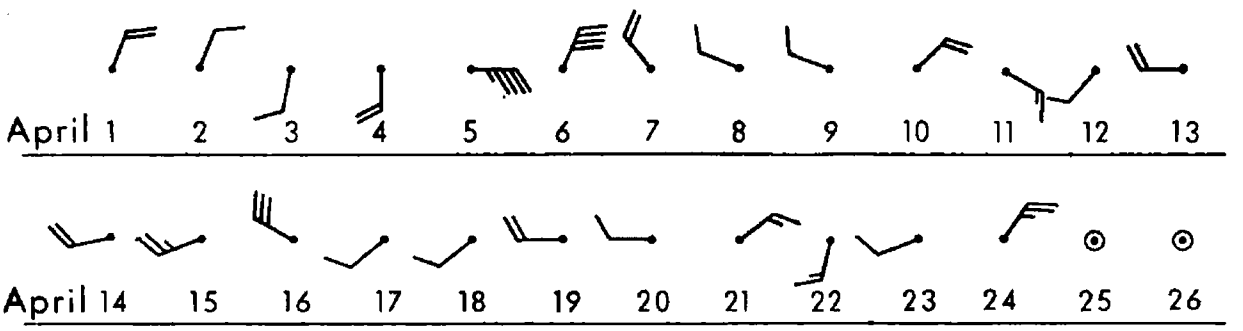

Fig. 6. Surface wind in area 64° 30′N, 12° 30′W at 1200 GMT each day. (Based on measured geostrophic winds and a few ship reports.)

One wonders if in northerly airstreams there is a tendency for a 'trough-line' to persist just south of the oceanic front, when showers are intensified due to the increased heating from below.

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TYPHOON 'SUSAN', 7th–15th JULY 1972

(From the Director, Royal Observatory, Hong Kong)

We would like to forward our commiserations to Captain J. C. Allen of the m.v. *Benarmin* (*The Marine Observer*, July 1973, p. 101) in his encounter with the unruly Susan. As one can see from the track (Fig. 1), Typhoon Susan's path was not what one would normally expect from a well-behaved young lady.

On 5th July 1972 an area of low pressure developed to the east of the Philippines about 300 miles east-south-east of Manila and drifted westwards across central Philippines the next day. After entering the South China Sea on the 7th the circulation became well organized and by about 2100 (local time) on the same day it deepened into a tropical depression about 400 miles south-east of Hong Kong. The depression moved west-north-west at about 10 knots at first, but soon began to meander towards the north and intensified into a tropical storm named Susan early on the 8th.

In Hong Kong the Stand By signal, No. 1, was hoisted at 1115 on 8th July to indicate that a tropical cyclone alert was in force. Susan intensified further to a severe tropical storm in the evening and continued to drift slowly in a general direction towards the Colony. The Strong Wind signal, No. 3, was hoisted to replace No. 1 at 2215 on the 9th when Susan was centred about 160 miles to the south-east of Hong Kong.

Early on the 10th, Severe Tropical Storm Susan began to move in a series of loops to the west of Pratas Island. During the morning, several ships to the south of the centre reported winds in excess of 50 knots, but satellite cloud pictures received at the Royal Observatory showed that the eye of Susan was ill-defined. By the evening Susan became a typhoon and at 1916 a reconnaissance aircraft reported maximum surface winds of 90 knots (equivalent to 10-minute mean winds of 80 knots) near its centre. Most of the rain in Typhoon Susan was confined to the south-west sector and the Royal Observatory radar showed that the eye was not well formed.

Typhoon Susan weakened to a severe tropical storm early on 11th July and began to drift slowly away from the Colony. The Strong Wind signal was replaced by the Stand By signal at 1030 on the same day because there was no longer any immediate threat of strong winds over the Colony. However, during the evening, Susan began to move closer to the Colony again and the Strong Wind signal was again hoisted at 2135 to warn that strong winds were again expected.

On the 12th Susan weakened further to a tropical storm and remained almost stationary to the east of Hong Kong. At 0640 on the same day the Stand By signal was lowered in order that normal activities could be resumed in the Colony.

By about dawn on 13th July Tropical Storm Susan once again started to move in the general direction towards Hong Kong and the Stand By signal was raised at 0520, followed by the Strong Wind signal at 0710. Susan continued to move slowly in a series of loops about 90 to 120 miles east of Hong Kong until about 0900 on the 14th, when it began to move steadily away from the Colony. The Strong Wind signal was replaced by the Stand By signal at 1010.

By the afternoon of the 14th, Tropical Storm Susan accelerated rapidly north-eastwards across the Taiwan Strait and all signals were lowered at 0620 on the 15th. Susan crossed the east coast of China in the late afternoon of the 15th and rapidly degenerated into an area of low pressure near Foochow by the evening.

During the periods when the Strong Wind signal was on display, the weather in Hong Kong was mainly cloudy with scattered showers. Thunderstorms and squally showers were reported in the evening of 11th July. Winds were strong and gusty from the north in exposed places but only moderate to fresh in Victoria Harbour area which is generally sheltered from northerly winds. The maximum gust peak speeds recorded during 9th–13th July were 42 knots at Cape Collinson, 41 knots at Tate's Cairn, 40 knots at Cheung Chau, 39 knots at Hong Kong Airport, 37 knots

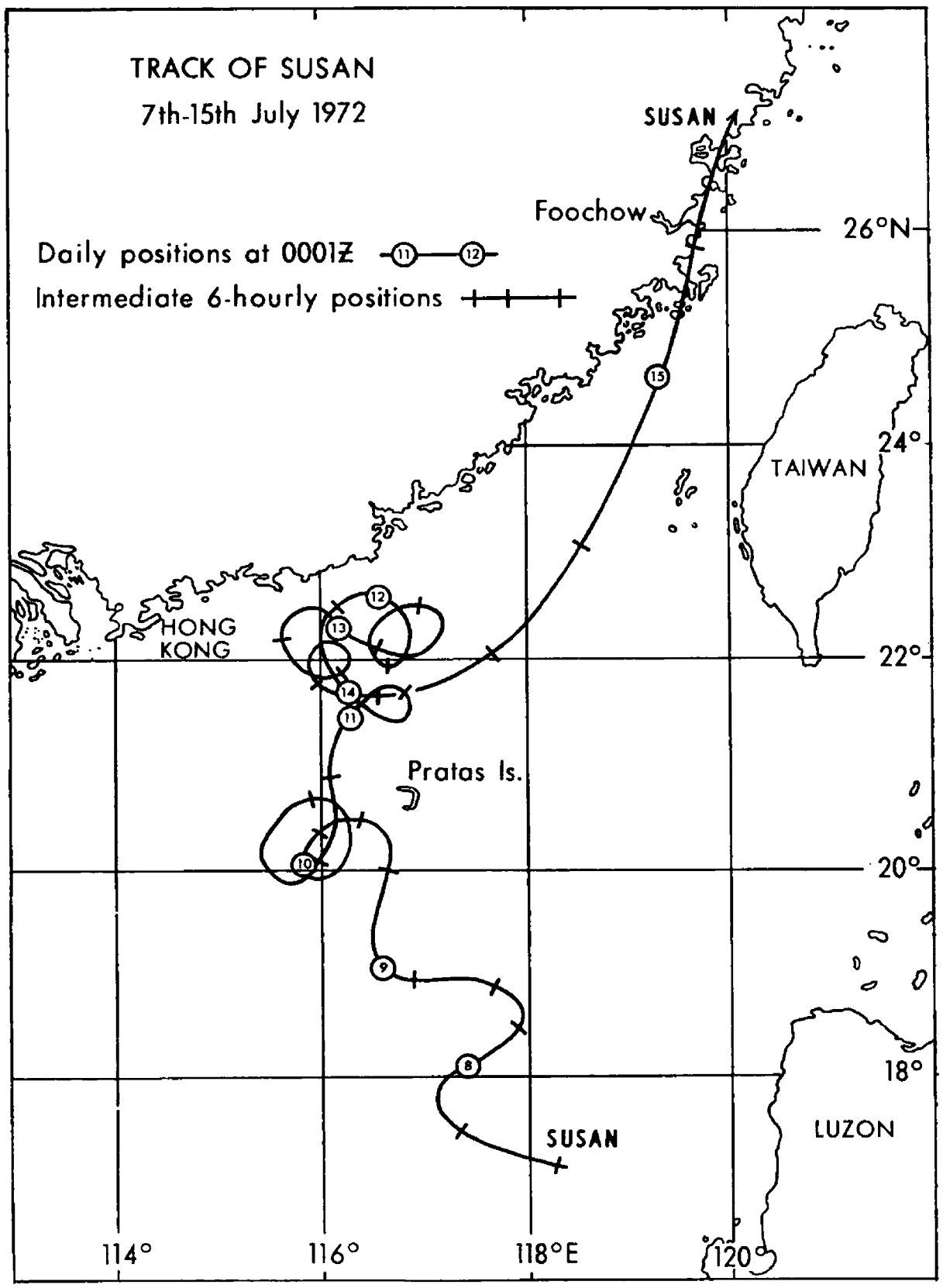

Fig. 1. The tortuous track of Susan.

at the Royal Observatory and 35 knots at Waglan Island. There were no abnormal changes in tide height during periods when local signals were displayed.

The following daily amounts of rainfall were recorded at the Royal Observatory on 8th–15th July:

8th	Nil	12th	8·4 mm
9th	13·4 mm	13th	0·5 mm
10th	Trace	14th	1·1 mm
11th	31·4 mm	15th	Nil

Since records began in 1884 no other tropical cyclone has remained within 200 miles of the Colony for such a long time. During the period 10th–11th July, when Susan was centred to the south-east of Hong Kong, strong (to gale force) south-westerly winds persisted over the whole of the South China Sea and brought heavy rain and inundations from high tides and large waves over the north-west part of the Philippines. Disastrous floods were reported in many provinces and in Manila some sections of the sea wall were ripped away by gigantic waves on the 11th. At least 20 persons were drowned.

The sequence of local signal display during the passage of Typhoon Susan is as follows:

Name of Signal	Signal No.	Hoisted		Lowered	
		Date (July)	Time (Local)	Date (July)	Time (Local)
Stand By	1	8th	1115	9th	2215
Strong Wind	3	9th	2215	11th	1030
Stand By	1	11th	1030	11th	2135
Strong Wind	3	11th	2135	12th	0640
Stand By	1	13th	0520	13th	0710
Strong Wind	3	13th	0710	14th	1010
Stand By	1	14th	1010	15th	0620

PRESENTATION OF BAROGRAPHS

As announced in the January 1973 number of *The Marine Observer*, Captain D. E. Moran of the P. & O. General Cargo Division (formerly the New Zealand Shipping Co.), Captain P. N. Fielding of Manchester Liners, Captain J. D. Blake of Messrs. Trinder Anderson & Co. and Captain J. T. Sheffield, M.B.E. of Furness Lines had been selected for the 1971 Annual Barograph Awards.

Once again we were unable to get all four shipmasters in the one place at the one time so that we could have the one ceremony; our hopes ran higher than usual this year but within weeks of the date arranged we suffered two 'pier-head jumps'.

Thus it was that on 24th January 1973 only Captain Blake and Captain Sheffield were available for the presentation. Captain Blake was accompanied by Mrs. Blake and supported by Mr. O. G. Trinder and Mr. D. Eunson from the Management, the latter being in place of Captain H. R. Coates, a Marine Superintendent. Captain Sheffield brought Mrs. Sheffield and was supported by Mr. H. Quilliam, the Public Relations Officer, representing the Company.

The presentations were made by Dr. B. J. Mason, Director-General of the Meteorological Office who, in a short preliminary speech, stressed the great value which meteorologists all over the world placed on observations from ships at sea. This would go on for many years, certainly within the foreseeable future, despite the tremendous strides which are now being made in the newer techniques.

After luncheon with the Director-General and Senior Officers in the Meteorological Office, the party was taken round and shown the work of the various branches which deal with ships' observations.

The next opportunity of arranging a presentation did not occur for some eight months. On 10th September 1973 Captain D. E. Moran came down to Bracknell with Mrs. Moran. In support came Captain A. C. Davies, Assistant Marine Manager of the P. & O. General Cargo Division and Mr. G. C. Shaw representing the Management.

This presentation was made by Mr. J. K. Bannon, one of the Deputy Directors of the Meteorological Office, in the absence of Dr. B. J. Mason. Luncheon was taken with the Directorate and the party subsequently shown round the Office.

At each of these presentations the Captains' personal cards together with their first meteorological logbooks were on view, those of Captain Blake and Captain Moran both going back to 1948 and that of Captain Sheffield to 1929.

Photographs taken at the two ceremonies are shown opposite pages 25, 40 and 41.

We now await an opportunity of presenting the fourth of the 1971 awards to Captain Fielding.

L.B.P.

ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM JULY TO SEPTEMBER 1973

The charts on pages 42 to 44 display the actual and normal ice edges (4/10 cover), sea-surface and air temperatures and surface-pressure anomalies (departures from the mean) so that the abnormality of any month may be readily observed. (The wind anomaly bears the same relationship to lines of equal pressure anomaly as wind does to isobars. Buys-Ballot's law can therefore be applied to determine the direction of the wind anomaly.) Southern and eastern iceberg limits will be displayed during the iceberg season (roughly February to July). In any month when sightings have been abnormally frequent (or infrequent) this will be discussed briefly in the text.

The periods used for the normals are as follows. Ice: Eurasian sector, all data up to 1956,[1] North American sector, 1952–56 (for north of 68°N)[1] and all data up to 1963 (for south of 68°N).[2] Surface pressure: 1951–66.[3] Air temperature, 1951–60.[4] Sea-surface temperature: area north of 68°N, 1854–1914 and 1920–50,[5] area south of 68°N, 1854–1958.[6]

July

Sea-ice was more extensive than usual over Baffin Bay and Davis Strait during July, largely due to the persistence of cold conditions over north-west Greenland and assisted by a cold northerly wind anomaly over Baffin Bay. Conditions were about normal over Denmark Strait and the Greenland Sea, but a deficit continued over the Barents Sea due to a warm west-south-westerly wind anomaly. However, over the Kara Sea, where there was a deficit in June, the ice conditions returned to near normal due to the cold north-easterly wind anomaly during the month.

August

The strong north-north-westerly wind anomaly over the Baffin Bay and Davis Strait during the month maintained the excess of ice over the area. Conditions were again near normal over Denmark Strait and the Greenland Sea, though there was an excess off south-east Greenland due to the cold north-easterly wind anomaly. Ice conditions returned to near normal over the Barents Sea, after large deficits during the previous months. Despite the warm south-westerly wind anomaly over the Kara Sea, the excess of ice there did not decrease appreciably during the month.

September

Ice conditions were mostly near normal over the Baffin Bay and the Davis Strait, with a slight excess over the Greenland Sea and a slight deficit over the Barents Sea. However, with a cold north-easterly wind anomaly over the Kara Sea, there was a significant excess over this area. Freezing-up started over the eastern Canadian Arctic, the extreme north of Baffin Bay and the northern Kara Sea during the third and fourth weeks of September.

K.J.

Captain D. E. Moran (centre) receiving his barograph from Mr. J. K. Bannon at the presentation ceremony at Bracknell on 10th September 1973, watched by Mrs Moran (*see* page 39).

(*Opposite page 40*)

(Opposite page 41)

The barograph presentation at Bracknell on 10th September 1973; left to right: Mr. J. K. Bannon, Captain A. C. Davies, Captain and Mrs. D. E. Moran, Mr. G. C. Shaw, Captain G. V. Mackie, Lt. Cdr. L. B. Philpott and Captain G. A. White (*see* page 39).

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SPECIAL LONG-SERVICE AWARDS

In 1948, in addition to the Annual Excellent Awards which had been a feature of the voluntary observing system for many years, special awards were instituted for four officers whose long and zealous voluntary work at sea on our behalf was considered as deserving special recognition.

The minimum qualification for a special award is fixed at fifteen years in which meteorological records bearing the officer's name, either as observer or master, have been received, including of course the year previous to that in which the award is made. It so happens that there are invariably long breaks in an officer's voluntary observing record during periods of sitting for a certificate or his ship being laid up or, more often, his service in a ship which is not on the voluntary observing lists and the fifteen years is therefore often spread over forty years or even more. But a personal record card is kept for every officer from the time his first meteorological record is received and every year the cards of all officers with fifteen or more years' service are brought out and put under scrutiny. Consideration of the length of their service, combined with the quality of their records, effectively forms them into a 'League Table'.

This year there were again 94 officers in the zone and the Director-General is pleased to make the special awards to the following shipmasters:

1. CAPTAIN J. A. NORTH of the P. & O. Lines (formerly the New Zealand Shipping Co.) whose first meteorological logbook was received here in 1950 from the *Deebank* of the Bank Line. During 20 years of voluntary observing he has sent us 29 meteorological logbooks, all but 2 of which have been classed Excellent.

2. CAPTAIN J. E. ASKEW of Manchester Liners. He first observed for us in 1946 when he was in the *Manchester Progress*; he has 22 years of voluntary observing to his credit and has sent us 52 meteorological records in that time.

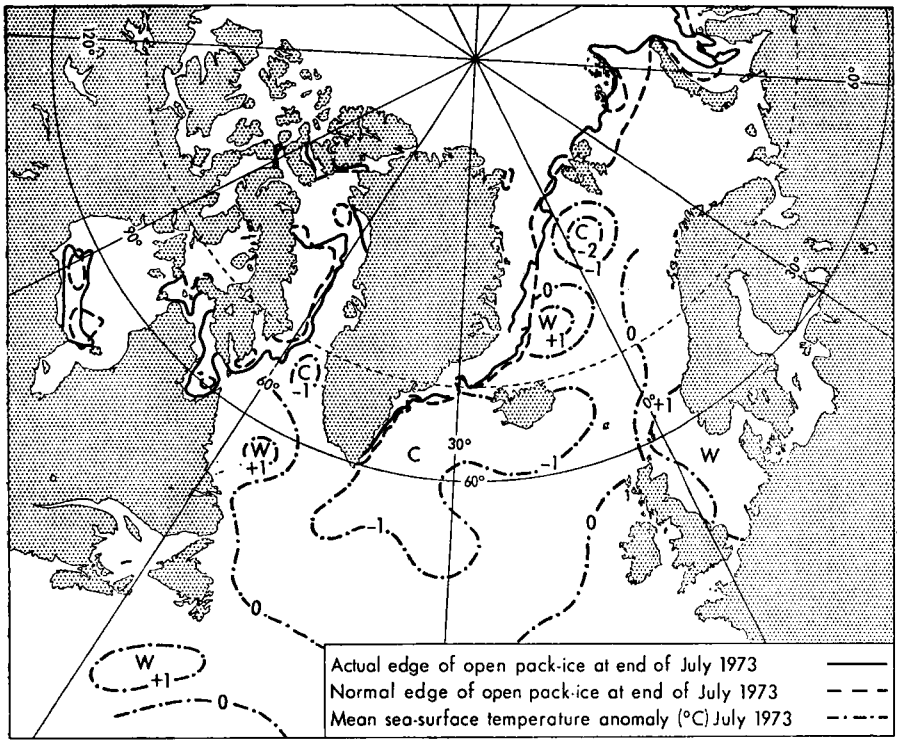
3. CAPTAIN W. MACVICAR, O.B.E. of Runciman & Co. Since his first meteorological logbook came here in 1934 from the *Caledonia* of the Anchor Line he has sent us 46 meteorological logbooks in 22 years.

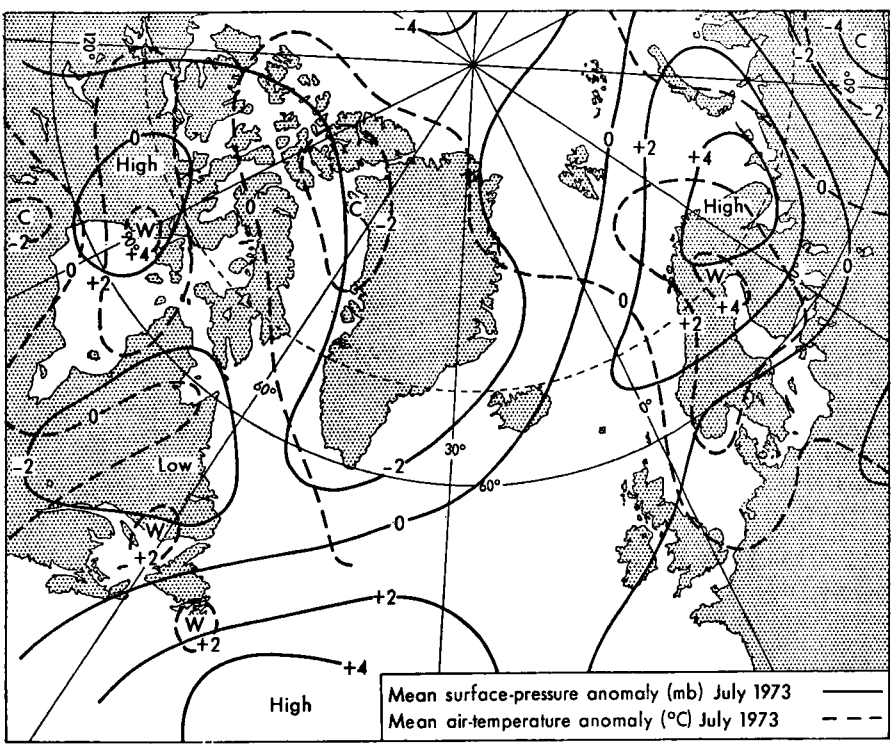
4. CAPTAIN W. F. JOYCE of the Head Line. During 20 years as a voluntary observer he has sent us 46 meteorological logbooks, the first one coming in 1946 when he was in the *Norwegian* of the Donaldson Line.

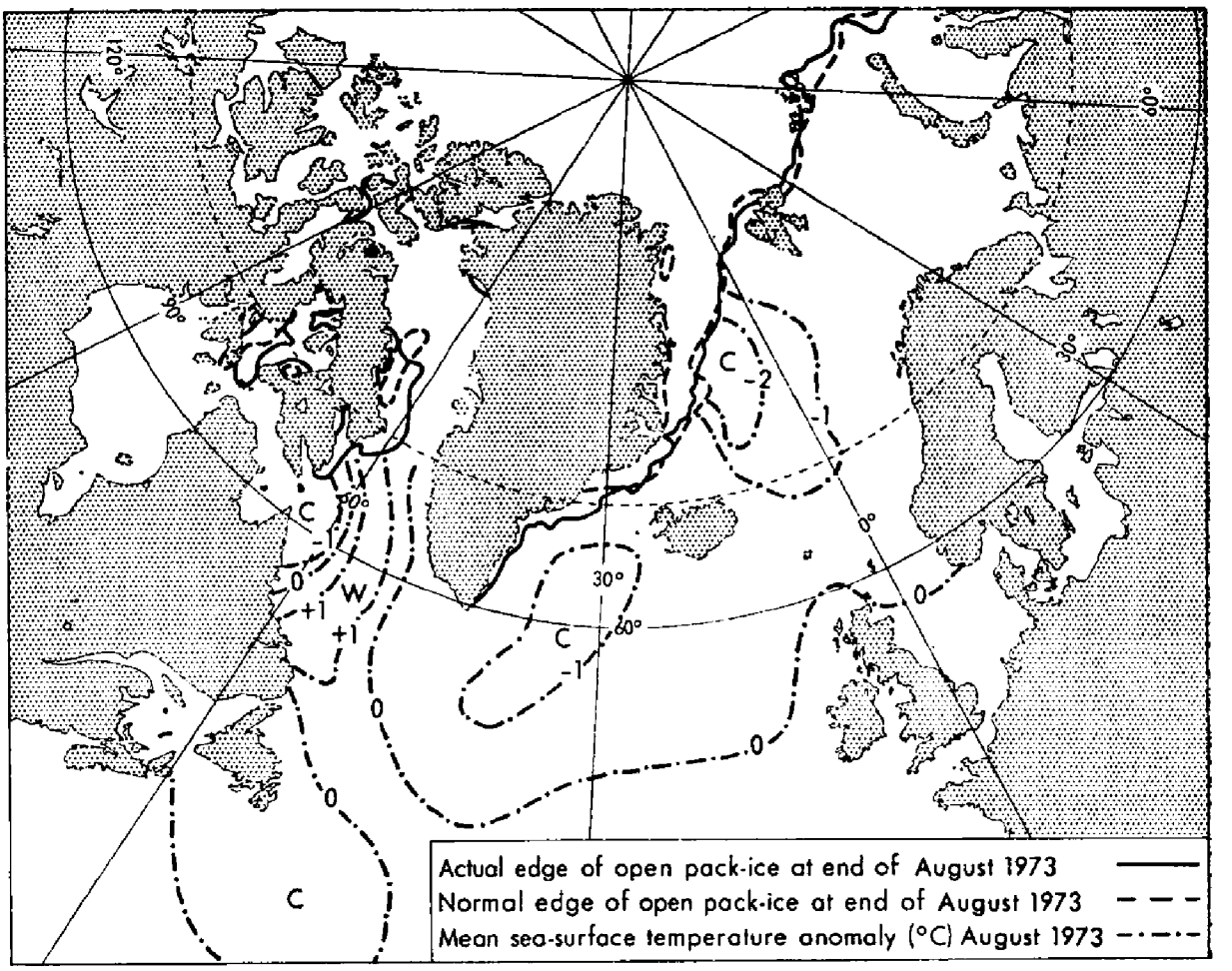
As in past years, the award will be in the form of a suitably inscribed barograph and we congratulate these four shipmasters on this recognition of many years voluntary meteorological work at sea. They will be personally notified of the award and of the arrangements which will be made for its presentation.

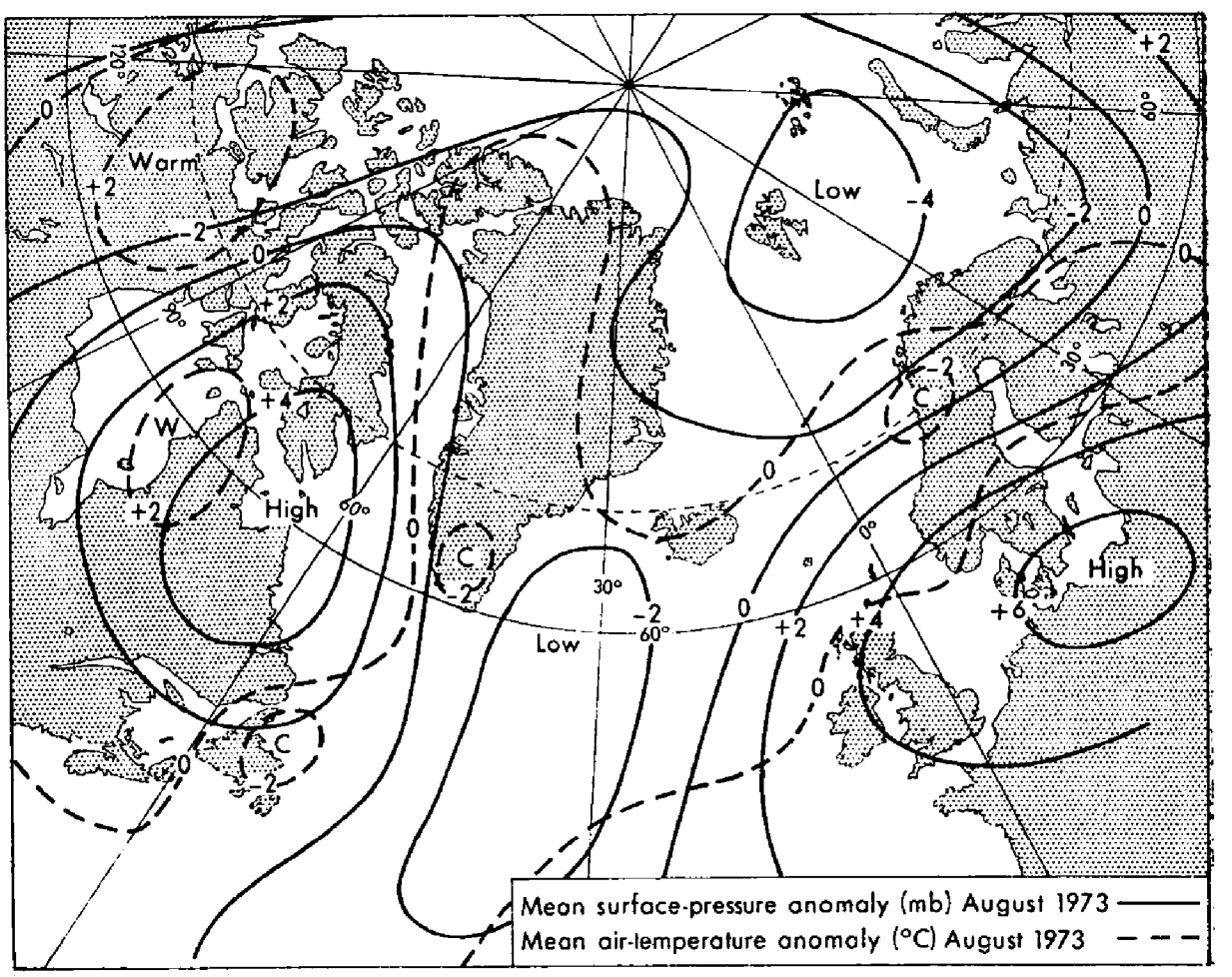
An account of the presentation of three of the previous year's awards appears on page 39 of this issue.

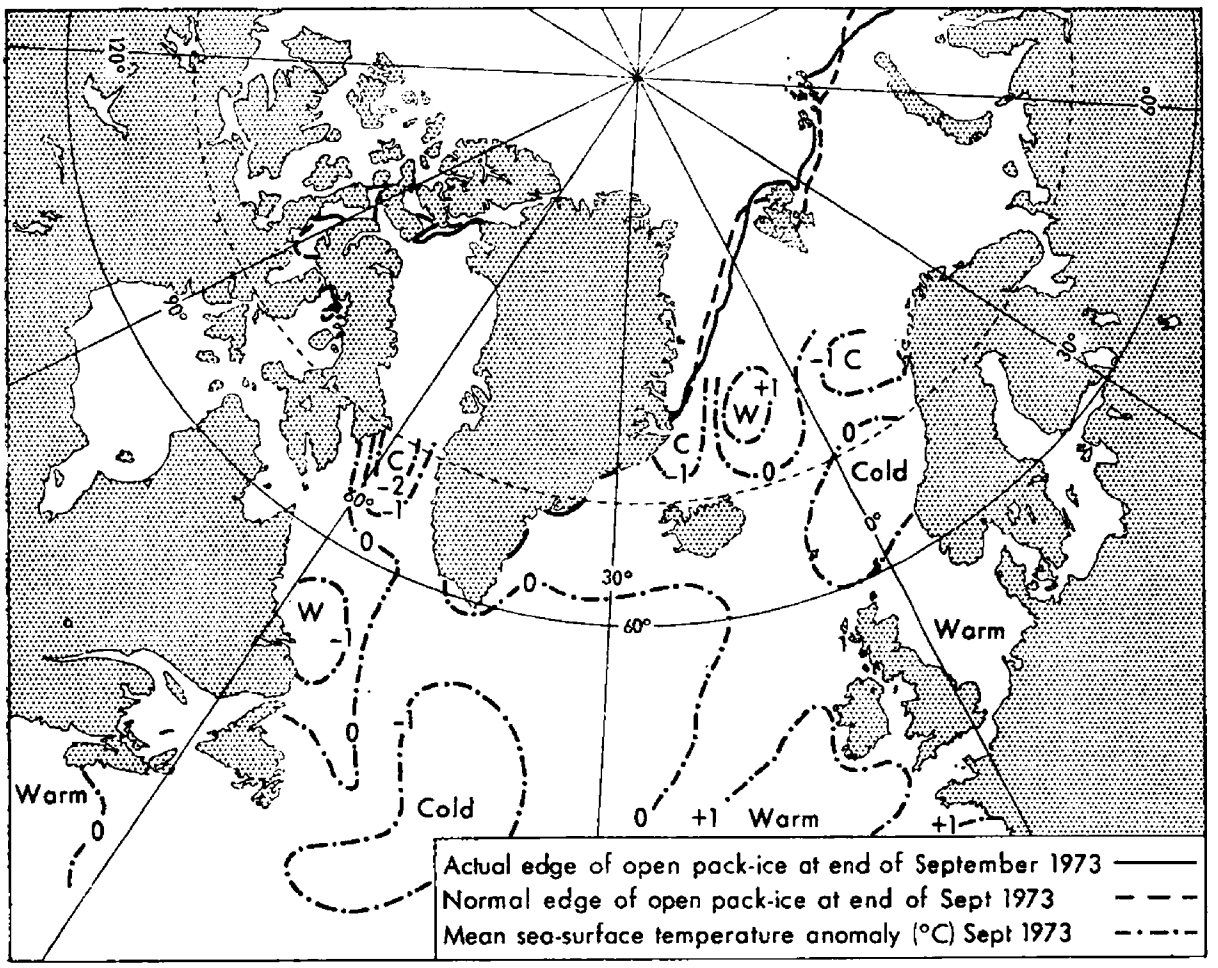
L.B.P.

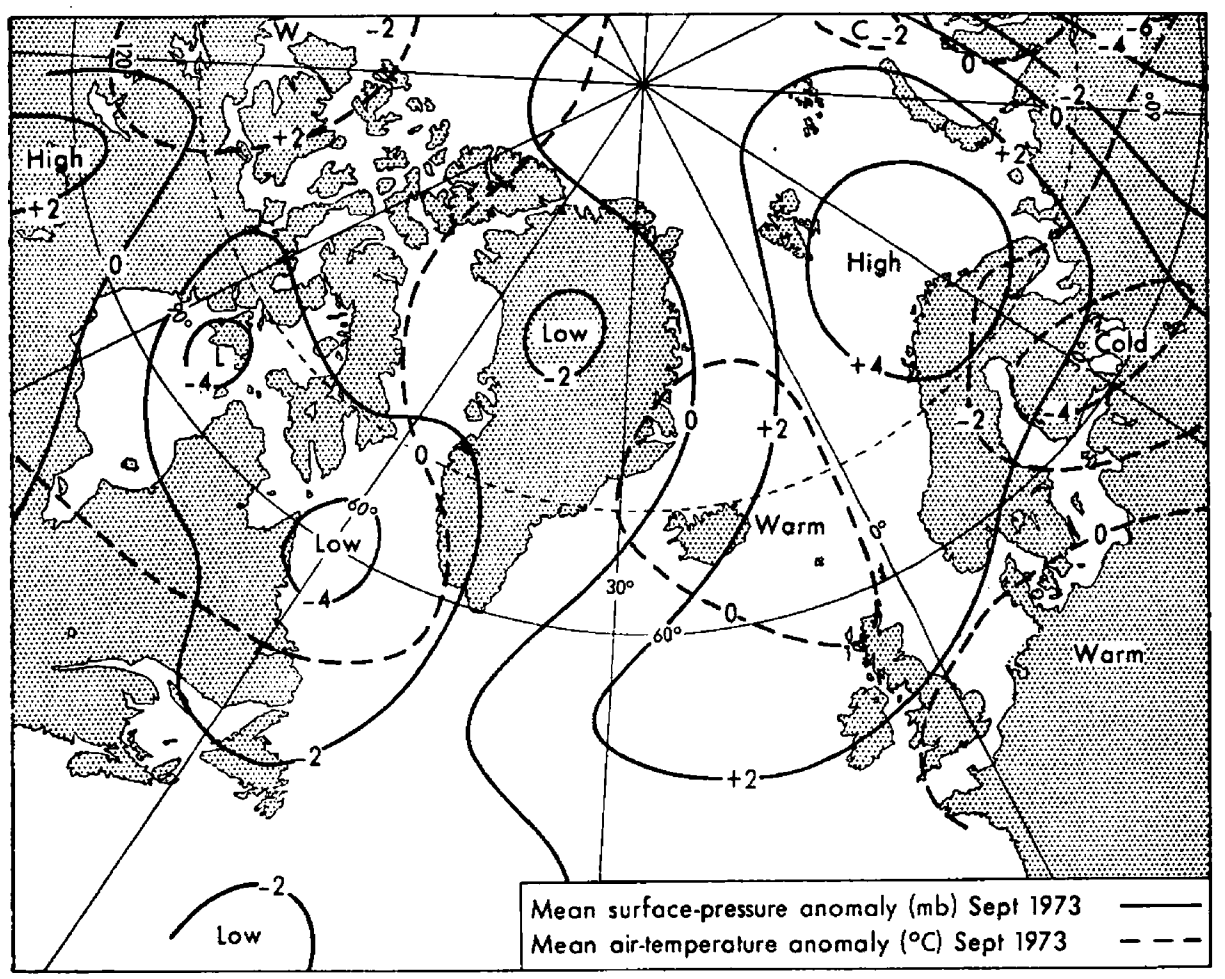

Actual edge of open pack-ice at end of July 1973
Normal edge of open pack-ice at end of July 1973
Mean sea-surface temperature anomaly (°C) July 1973


High
Low
High
High
Mean surface-pressure anomaly (mb) July 1973
Mean air-temperature anomaly (°C) July 1973


Actual edge of open pack-ice at end of August 1973
Normal edge of open pack-ice at end of August 1973
Mean sea-surface temperature anomaly (°C) August 1973


Warm
Low
High
Low
High
Mean surface-pressure anomaly (mb) August 1973
Mean air-temperature anomaly (°C) August 1973


120°
90°
60°
30°
0°
W
C
Cold
Warm
Actual edge of open pack-ice at end of September 1973
Normal edge of open pack-ice at end of Sept 1973
Mean sea-surface temperature anomaly (°C) Sept 1973


High
Low
Cold
Warm
Mean surface-pressure anomaly (mb) Sept 1973
Mean air-temperature anomaly (°C) Sept 1973

Personalities

RETIREMENT.—CAPTAIN W. J. LAW, R.D., retired from a sea career lasting 47 years when he brought the *Queen Elizabeth 2* into Southampton in August 1973.

William James Law was born in Liverpool and made his first voyage in 1926 as a midshipman with Alfred Holt and Co. in their *Perseus*, one of the old 'goal-post' ships.

He passed for 2nd Mate in 1930 and soon afterwards joined Stanley and John Thompson (Silver Line) as Junior 3rd Officer in their round-the-world service ship *Silveryew*. He remained with the Silver Line until 1936 when he came ashore for a year to study and pass for Master and Extra Master.

Captain Law then joined the Cunard Steamship Company and sailed in the *Samaria* as Junior 3rd Officer. After making several voyages in this vessel he commenced Naval training, having been accepted into the R.N.R. as a Lieutenant, and was serving in H.M.S. *Newcastle* at the time of the Munich crisis in 1938. He then returned to Cunard and was serving in the *Ausonia* when war was declared and the Admiralty decided to make the ship an Armed Merchant Cruiser. The newly-appointed Captain Mark Pizey (later Admiral Sir Mark Pizey) invited him to stay on as one of the watchkeeping lieutenants and he remained in her, escorting Atlantic convoys, until 1941 when he was transferred to H.M.S. *Princess Beatrix* as First Lieutenant.

H.M.S. *Princess Beatrix* was one of the first 'commando ships', later to be known as L.S.I.s, and she exercised with various commando units as far afield as Freetown although most of Captain Law's time in her was spent at Inverary. After one or two small raids he finally took part in the Dieppe raid in 1942. Following that he was appointed to command H.M.S. *Invicta*, the well-known cross-channel steamer, now fitted out as an L.S.I. In her he continued the work of training various army units which would subsequently be engaged in the Normandy landings. (He was deeply involved in the Combined Operations Command and much involved in planning techniques, etc.)

H.M.S. *Invicta*'s soldiers were among the first to be landed on the Normandy coast in 1944 and subsequently Captain Law was busily engaged carrying troops to the Juno, Sword, Omaha and Utah beaches and later to the artificial harbour at Arromanches. Then he took the ship to Cherbourg, to Le Havre and finally to Ostend where he did a regular cross-channel service to Tilbury.

In late 1945 Captain Law left the Royal Navy and returned to Cunard. In 1954 he was appointed to his first command, the *Samaria*, and during the following years he alternated between command of all the 20,000-tonners and Staff Captain of the *Queen Mary* and *Queen Elizabeth*. During the period 1959–64 he was in command of the 'new' ships *Carinthia*, *Saxonia*, *Ivernia* and *Sylvania* on the Canadian service.

During 1964 Captain Law had a period in command of the cruise liner *Caronia* and in 1966 and 1967 was permanently in command of her. In 1967 he was appointed relief Master of the *Queen Mary* and *Queen Elizabeth* for a period of twelve months until, with the passing of these ships, he took command of the *Franconia*.

Captain Law came ashore for a spell in 1970 in connection with the building of the new cruise liner *Cunard Adventurer* and this period of shore service was interspersed with a number of voyages in command of *Queen Elizabeth 2*. He was the first Master of the *Cunard Adventurer* but left the ship in 1972 to take command of *Queen Elizabeth 2* as her permanent Master.

During his period in *Queen Elizabeth 2*, Captain Law has taken the ship to a number of new ports, including several which it was never anticipated that such a big ship would be likely to visit—Athens, Messina, San Juan, Hamburg, Oslo, Copenhagen and the Norwegian fjords.

In 1965 Captain Law was R.N.R. Aide-de-Camp to Her Majesty the Queen.

Captain Law's association with the Meteorological Office goes back to 1934 when

he was 3rd Officer of the *Silverwalnut*. Since then he has sent us 58 meteorological logbooks, 20 of which were classed as Excellent. He received Excellent Awards in 1935, 1938, 1961, 1963 and the Special Award of a barograph in 1970.

We wish him good health and happiness in his retirement.

D.R.McW.

Notice to Marine Observers

IRAN COASTAL RADIO STATIONS

As part of its programme to develop a marine meteorological service, Iran wishes to increase the number of ships' reports from surrounding sea areas such as the Persian Gulf and the Sea of Oman. Iran has therefore informed the World Meteorological Organization that the following radio stations will now accept ships' weather reports free of charge. Messages should be addressed to METEO TEHRAN.

Khorramshahr. Position 30° 20'N, 48° 22'E. Call sign EQK. Class of emission: A1, A2. Receiving frequencies: watch 405–535 kHz, working 405–535 kHz. Transmitting frequencies: call 445 kHz, working 445 kHz. Hours of operation: 0001–2400 GMT. Power 1 kW.

Bandar-Abbas. Position 27° 12'N, 56° 17'E. Call sign EQI. Class of emission and receiving frequencies as for Khorramshahr. Transmitting frequencies: call 430 kHz, working 430 kHz. Hours of operation and power as for Khorramshahr.

Fleet Lists

Corrections to the list published in the July 1973 number of *The Marine Observer*.

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

GREAT BRITAIN (Information dated 1.10.73)

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

NAME OF VESSEL	MASTER	OWNER/MANAGER
Chesterbrook	J. MacCormick	Comben Longstaff & Co. Ltd.
Falaise	M. Hurd-Wood	British Railways Board

The following vessels have been deleted:
St. Patrick, Spray, Westminsterbrook

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

SKIPPER	RADIO OPERATOR	TRAWLER OWNER/MANAGER
N. G. Beavers ..	A. J. Nettleship	Hudson Bros. Trawlers Ltd.
T. Burnett	C. Bird	Boyd Line Ltd.
R. Hawker	H. C. L. Taylor	Newington Trawlers Ltd.
J. N. Kerr	R. Spall	Ross Trawlers Ltd.
A. V. Meech	P. R. Hickson	Northern Trawlers Ltd.
C. H. Pitts	C. Bird	Boyd Line Ltd.

GREAT BRITAIN (*contd.*)

The following ships have been recruited as Selected Ships:

Name of Vessel	Date of Recruitment	Master	Observing Officers	Senior Radio Officer	Owner/Manager
Avon Forest	28.9.73	N. C. Kerr	P. Haysom, R. Mannering, J. Cowie	S. A. White	Harrison (Clyde) Ltd.
Benarkle	20.3.73	L. G. Powell	C. S. Mackay, J. J. Price, M. Quance		Ben Line Steamers Ltd.
Benvorlich	31.5.73	J. S. Schofield	J. N. MacNish, T. Mackenzie		Ben Line Steamers Ltd.
Booker Viking	30.5.73	E. G. Puddifer	A. J. Balfour, A. Atkin, M. T. Corner	D. C. Macrae	Booker Line Ltd.
Briarthorn	30.8.73	W. Alderdice	J. Mair, G. Caldecote		S. William Coe & Co. Ltd.
British Beech	3.5.73	E. W. Twemlow	R. M. Treverton, C. Brandon, A. Chamberlain	J. Saphier	B.P. Tanker Co. Ltd.
British Cygnet	14.9.73	D. M. Rundle	R. Morton, D. Anderson, T. Stone, J. A. MacHardy	—. MacDonald	B.P. Tanker Co. Ltd.
British Guardsman	17.8.73	R. F. Adams	D. C. Wilson, D. E. Ward, N. D. I. MacDonald	D. E. Dale	B.P. Tanker Co. Ltd.
British Ivy	8.8.73	D. C. Goodwin	A. W. Everett, A. Edwards, A. P. Urquhart	G. M. McFaul	B.P. Tanker Co. Ltd.
British Kennet	14.5.73	A. D. Downie	R. F. A. Batt, D. Wallace, C. Kelly, E. Ritchie	P. J. Trant	B.P. Tanker Co. Ltd.
British Tamar	13.7.73	J. W. Guy	A. R. Duggins, T. H. Shaw, P. W. Hillier	G. Hammond	B.P. Tanker Co. Ltd.
British Vine	21.5.73	J. K. Miller	T. J. Boden, F. B. Whamond, M. F. Robinson	J. L. Pearson	B.P. Tanker Co. Ltd.
Cape Leeuwin	23.8.73	I. J. I. Barclay	J. Pyper, A. Anderson, A. Weir	J. Budden	Lyle Shipping Co. Ltd.
City of Montreal	26.9.73	G. H. Salter	C. Harding, C. Bunt, A. Suddaby	O. C. T. Whitehead	Ellerman Lines Ltd.
Cuthbert	6.6.73	P. Clark	A. Nazim, M. R. White		Booth S.S. Co. Ltd.
Degema	7.8.73	W. A. Fitzgerald	W. Martin, H. Wood, J. Muir	J. Noonan	Ocean Transport & Trading Ltd.
Gene Trefethen	20.6.73	O. U. Maas	V. Uremovic, C. T. Watson, M. Kuehnel	D. A. Barry	International Ore Carriers Ltd.
Halifax Star	20.4.73	J. R. Howarth	A. J. Brown, D. MacNeil, B. J. Eckworth	K. A. Wyer	Blue Star Line Ltd.
London Harmony	18.7.73	G. F. Jacobs	J. L. Atkins, P. D. Green, R. C. Mortimer	R. S. Melton	London Overseas Freighters Ltd.
Majestic	23.8.73	D. T. Mouldey	P. A. Joss, B. J. Ramshaw, M. Eden-Smith	R. M. Roughan	Shaw Savill & Albion Co. Ltd.
Maranga	26.9.73	J. D. Noyon	P. Howland, J. Hopkins, E. J. O'Sullivan	A. MacEachan	Whitco Marine Services Ltd.
Merchant	8.6.73	W. L. Ashton	P. R. R. Warburton, G. S. Laird, D. Davies	D. Cross	T. & J. Harrison Ltd.
Manchester Vigour	3.5.73	O. N. Selwood	D. Cowell, T. P. Mather, L. Clark	I. Charlton	Manchester Liners Ltd.
Manchester Zeal	27.6.73	T. B. Hancock	K. Whittaker, G. Shadbolt, W. Moss	J. C. Kane	Manchester Liners Ltd.
Naworth	20.9.73	G. Bowman	N. Van-Den-Bok, F. Brannigan, D. Hayes	M. Sheehy	R. S. Dalgliesh Ltd.
Ortega	13.7.73	C. W. Alison	S. Bell, M. Knight, E. Jones		Pacific S.N. Co. Ltd.
Rudby	6.6.73	C. B. Tingle	N. Jenkins, I. McKidd	P. P. Rooney	Sir R. Ropner & Co. Ltd.
Trentwood	26.4.73	G. B. Dawson	H. Cuthill, J. Williams, C. E. Graham	M. L. Foulkes	International Ore Carriers Ltd.
Wild Avocet	9.5.73	J. F. Milner	M. H. Pritchard, W. Killackey, D. MacDonald	L. A. Sutton	P. & O. S.N. Co.
Wild Cormorant	23.7.73	R. M. Michael	D. Garrett, G. Dickson		P. & O. S.N. Co.

The following Selected and Supplementary Ships have been deleted:
Benrinnes, Bernard, British Patrol, British Reliance, British Valour, Chelsea Bridge, Cherrywood, Clarkeden, Dalhanna, Dunadd, Dunblane, Duncraig, English Star, Hudson Trader, Humilaria, Nicolas Bowater, Northella, Pennyworth, Silversand, Stolt Tudor, Westminster Bridge.

BRITISH COMMONWEALTH

AUSTRALIA (Information dated 19.9.73)

The following have been recruited as Selected Ships:
Ariane (Consolidated Shipping Co.)
Ataluma (Dept. of National Development, Australia)
Boogalla (Western Australia State Shipping Service)
Corabank (Bank Line Ltd.)
Iron Endeavour (Broken Hill Pty. Co. Ltd.)
Lalandia (Scanaustral East Asiatic Shipping Co.)
Mulbera (P. & O. Lines of Australia)
Mundoora (Union Bulkships Pty. Ltd.)
Nyanda (Western Australian State Shipping Service)
Sprucebank (Bank Line Ltd.)
Tauloto II (*Tonga Government Line*)
Weirbank (Bank Line Ltd.)
Wyvern (Karlander (Australia) Pty. Ltd.)
The following ships have been deleted:
Chakrata, Kangaroo, Koolama, Nanchang, Samos, Sariba.

HONG KONG (Information dated 10.9.73)

The following ships have been recruited:
American Ming (United States Line)
Tredan (Mercury Shipping Co. Ltd.)
The following ships have been deleted:
Hoi Wong, Jacob Jebsen.

INDIA (Information dated 1.9.73)

The following ships have been upgraded to Selected Ships:
Akbar (Mogul Line Ltd.)
Jag Vijay (Great Eastern Shipping Co. Ltd.)
The following ships have been upgraded to Supplementary Ships:
Jalamokambi (Scindia S.N. Co. Ltd.)
State of Meghalaya (Shipping Corporation of India Ltd.)
The following ships have been recruited as Supplementary Ships:
Devaraya Jayanti (Jayanti Shipping Co. Ltd.)
Jalayamini (Scindia S.N. Co. Ltd.)
Kanishka Jayanti (Jayanti Shipping Co. Ltd.)
Lal Bahadur Shastri (Shipping Corporation of India Ltd.)
Mahabhakti (South East Asia Shipping Co. Ltd.)
Mahabir (South East Asia Shipping Co. Ltd.)
Sagardeep (Shipping Corporation of India Ltd.)
Vishva Prayas (Shipping Corporation of India Ltd.)
The following have been recruited as Auxiliary Ships:
Höegh Pilot (Ley Höegh & Co.)
Laccadives (Shipping Corporation of India Ltd.)
Meena Udyog (Deep Sea Fishing Centre)
The following ships have been deleted:
Cosmos Pioneer, Jag Ratna, Saudi, State of Andhra, Vishva Darshan.

NEW ZEALAND (Information dated 11.9.73)

The following has been upgraded to a Selected Ship:
Holmdale (Union S.S. Co. N.Z. Ltd.)
The following have been recruited as Selected Ships:
Athelviscount (Union S.S. Co. N.Z. Ltd.)
Erne (Union S.S. Co. N.Z. Ltd.)
Hamilton (Union S.S. Co. N.Z. Ltd.)
Parera (Union S.S. Co. N.Z. Ltd.)
Pukeko (Union S.S. Co. N.Z. Ltd.)
Tangaroa (N.Z. Government)
Union Aotearoa (Maritime Carriers Ltd.)
Union South Pacific (Union S.S. Co. N.Z. Ltd.)
Union Trans Tasman (Maritime Carriers Ltd.)
Wanaka (Union S.S. Co. N.Z. Ltd.)
Wenchow (China Navigation Co. Ltd.)
Zaida (P. & O. (N.Z.) Ltd.)
Zira (P. & O. (N.Z.) Ltd.)
The following have been recruited as Supplementary Ships:
Golden Bay (Tarakohe Shipping Co. Ltd.)
Titoki (Anchor Shipping & Foundry Co. Ltd.)
The following ships have been deleted:
Tavenui, Tofua.

ERRATA

The Marine Observer, October 1973, p. 194, third line from end of first paragraph on Waves: *for* "a figure 1; the first one would read 100/0." *read* "a figure 3; the first one would read 30000."

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