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THE MARINE OBSERVER

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October, November, December

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

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

TROPICAL REVOLVING STORM

Arabian Sea

m.v. *Hazelmoor*. Captain R. G. Dickson. Glasgow to Jeddah. Observers, the Master and Mr. E. G. Stout, 2nd Officer.

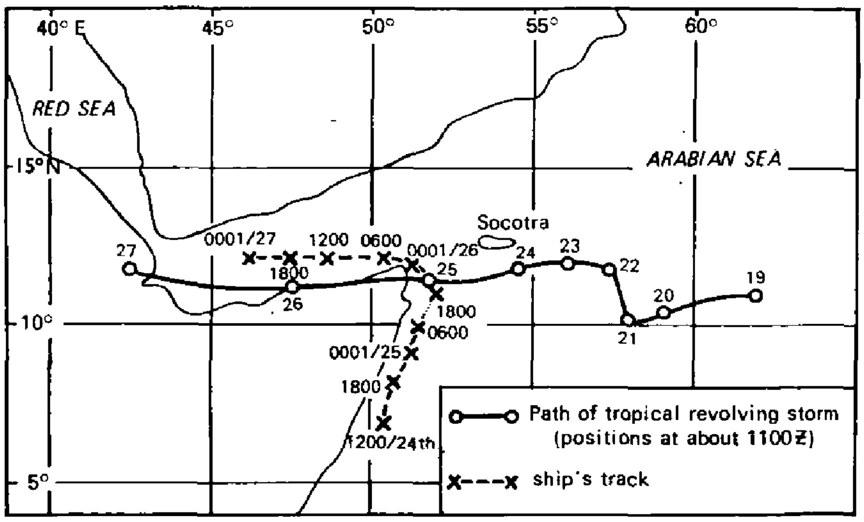
25th October 1972. No observations were made at 1200 GMT as the vessel was engaged on distress duty off the Somali coast in extremely heavy weather conditions. However, a careful watch was being kept on the barometric pressure and the following readings were logged, together with the wind direction and force.

GMT	GMT
0900: 999·0 mb SW, force 9	1115: 994·6 mb SW, force 12
0945: 998·0 mb SW'W, 9	1130: 995·7 mb SSW, 10–11
1000: 997·2 mb WSW, 9	1145: 995·7 mb SW'S, 9–10
1015: 996·6 mb WSW, 9	1200: 996·1 mb SW, 9
1030: 995·6 mb WSW, 11	1215: 996·4 mb SW, 8–9
1045: 993·9 mb WSW, 11–12	1230: 997·1 mb SW, 8–9
1100: 993·1 mb SW, 12	1315: 999·8 mb SW, 8–9

Position of ship at 1200 (approx.): 10° 24'N, 51° 42'E.

Note. The violent winds reported by the *Hazelmoor* were associated with a tropical revolving storm whose path, together with the vessel's track, is shown on the chart. This disturbance developed on 19th October in a position about 300 miles east of Ras Hafun and subsequently moved in a general westerly direction (*see* photograph opposite page 182). By the 25th, as revealed by the hurricane-force winds reported, it had reached cyclone strength after having passed south of Socotra. The storm then weakened a little as it accelerated westward to cross the coast in about longitude 43°E on the afternoon of the 27th; thereafter it quickly decayed. Further observations from the *Hazelmoor*'s logbook reveal that the vessel was still experiencing force 9 winds (from the north-east) at 0001 GMT on the 27th when observations ceased due to coastal navigation duties.

Though October to November is the peak period for tropical revolving storms in the Arabian Sea, the number affecting the western part of this sea is small, and then most of these



do not reach the longitude of Socotra. The occurrence of cyclones passing close to Socotra and into the Gulf of Aden is therefore a fairly rare event. Nevertheless in late October and early November 1971 another cyclone followed an almost identical track into the Gulf of Aden.

'TORNADO'
off West Africa

m.v. *Clan Maclaren.* Captain W.J. Howson. Antwerp to Port Elizabeth. Observer, Mr. A. J. Blackler, Chief Officer.

11th October 1972. At 0745 GMT a typical West African 'tornado' struck the vessel. It had been under radar observance since 0500 when it appeared at 64 miles ESE of the ship, lying NE/SW. Prior to the storm the weather was heavily overcast with much lightning, no wind, calm sea, swell nil, air temp. 28·0°C, wet bulb 26·0°, sea 28·8°, pressure 1015·5 mb. During the 10–15 minute storm there was torrential rain, a violent thunderstorm (affecting the radio), wind E'ly, force 8 and pressure 1019·2 mb. After the storm the wind dropped to variable, force 2; sky overcast until 1045 with light rain until 0930; barometer steady at 1019·0 mb; air temp. 23·0°, wet bulb 21·0°, sea 27·9°. Course 143°T at 14·75 kt.

Position of ship at 0800: 10° 25'N, 15° 52'W.

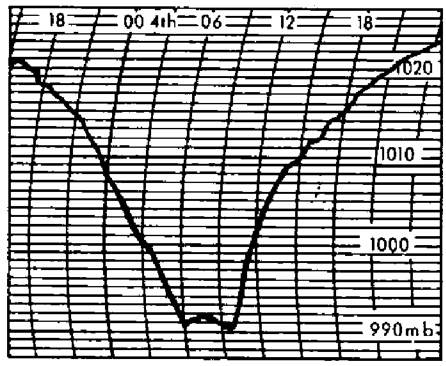
Note. The sequence of events is typical of the line squalls which occur in this region. They are known locally as 'tornadoes' though they bear little resemblance to the small-scale revolving storms to which this term is properly applied.

INTENSE DEPRESSION
Western North Atlantic

m.v. *Dart America.* Captain E. Irish. Southampton to Halifax, N.S. Observers, the Master, Mr. C. E. Walford, 2nd Officer and Mr. R. A. F. Edwards, Extra 2nd Officer.

4th November 1972. At 0001 GMT the vessel was at 45° 26'N, 51° 00'W on course 262°T at 20 kt. The wind was SE's, force 4–5 and pressure 1011·2 mb. At 0400, position 45° 16'N, 52° 58'W, the wind veered to S'ly and increased to force 8–9. Pressure had fallen to 999·6 mb and there was continuous moderate rain with overcast sky. At 0500 the wind veered to SSW, force 8 and at 0600 the vessel passed through a warm front; wind SW, force 8, pressure 990·0 mb and rising. At 0612 speed was reduced to avoid pounding in a very heavy SW'ly swell.

At 0950 the sky cleared and enabled star sights to be taken. Wind W's, force 6–7 and visibility improved to 10 miles. At 1010, in position 45° 04'N, 55° 26'W, the pressure had fallen again to 990·0 mb but then began to rise very quickly. The wind



veered sharply to NW and increased to force 10 with gusts to 65 kt. The sky became overcast with a layer of heavy C_L7 with squally showers as the vessel passed through the cold front. The NW'ly wind persisted at force 10 until 1200, causing the swell to turn from WSW at 1000 to NW at 1200 when the height increased to over 6 m, necessitating a further reduction in the ship's speed. Pressure had risen to 1000·6 mb. Air temp. 4·4°C, a drop of some 6 degC since 0400.

From the Halifax surface analysis fax chart for 0600 it would appear that the ship had passed very close to the centre of the depression which had a central pressure of 988·0 mb at 0600. This depression, having moved off the Nova Scotia coast during the afternoon and evening of the 3rd, travelling ENE at 20 kt.

The pressure continued to rise until, by 1600, it was 1011·8 mb, the wind having moderated to NW, force 7–8.

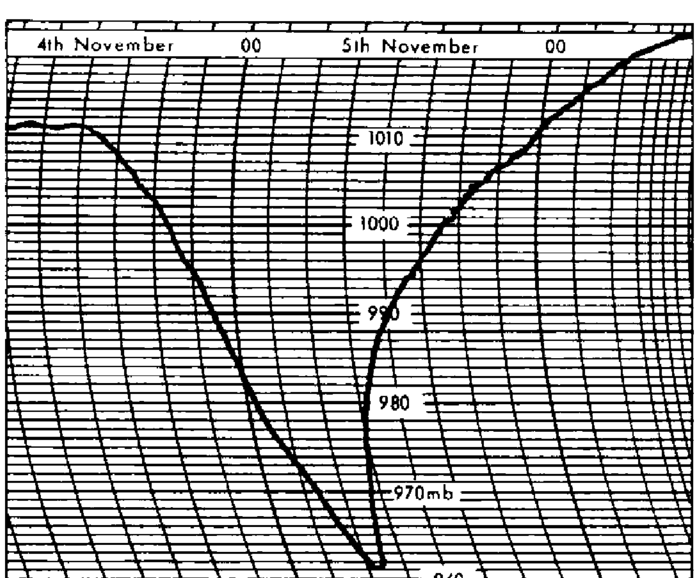
Position of ship at 1200: 45° 06'N, 56° 06'W.

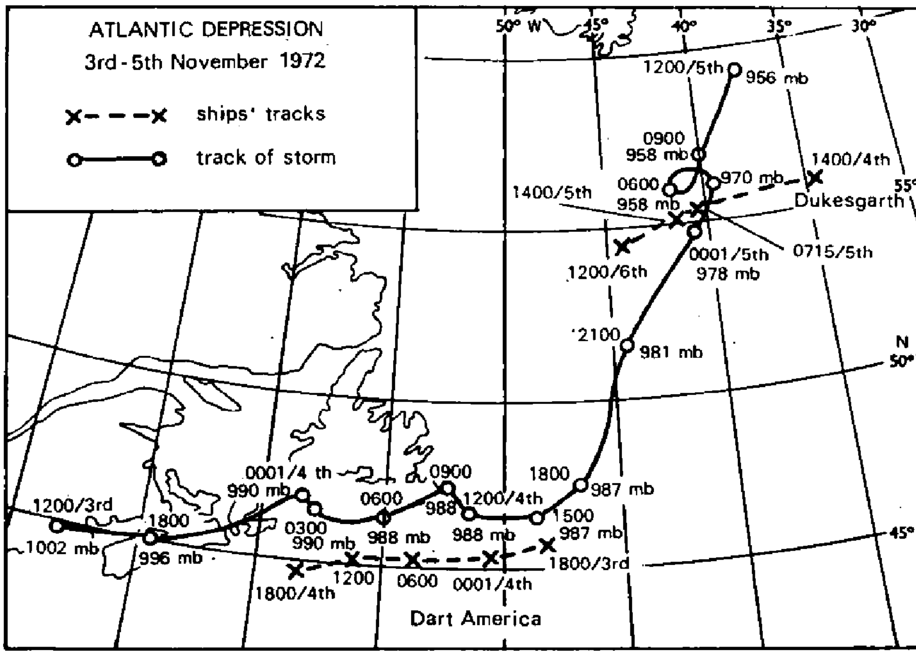
North Atlantic Ocean

m.v. *Dukesgarth*. Captain H. Gaffney. Birkenhead to Seven Islands. Observer, Mr. J. W. Thomson, 3rd Officer.

4th–6th November 1972. At 1400 GMT on the 4th, when the vessel was in position 55° 55'N, 35° 34'W, the wind was SW, force 4 and the air temperature 6·5°C but by midnight the wind had backed to SSE and the temperature had risen to 7·4°. At 0715 next day, in position 55° 14'N, 40° 28'W, the wind veered to W'N and increased quickly to force 10. The temperature fell to 0·6° and the pressure started to rise very rapidly as a depression crossed the vessel's path. At 1400 the wind was WNW, still force 10 with frequent, violent snow squalls and temperature 1·2°. The vessel hove to in position 55° 04'N, 41° 20'W in high seas and very heavy swell. By 1200 on the 6th the wind had steadied at WSW, force 7–8. Air temp. 3·6°.

Position of ship at 1200 on 6th: 54° 36'N, 44° 20'W.





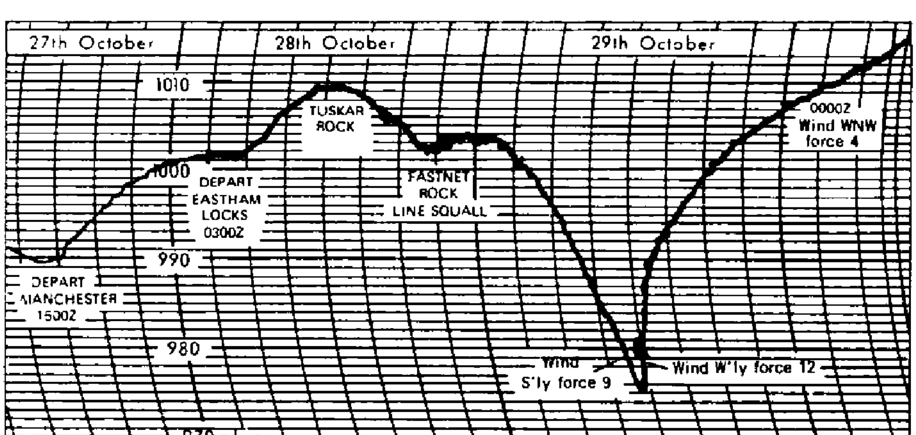
Note. The depression which affected both the *Dart America* and the *Dukesgarth* originally formed over Oklahoma in the early hours of 1st November and, after taking a curved path through Kansas and over the Great Lakes, the depression centre crossed Nova Scotia on the afternoon of the 3rd. The path from this point and the tracks of the two ships are shown on the accompanying chart. The depression continued in a general ENE'ly direction at about 35 kt, passing close to the *Dart America* on the morning of the 4th, before turning NNE in a position about 200 miles east of St. John's. It then accelerated to latitude 55°N and later slowed down and assumed a more erratic, but still generally NNE'ly course as it further intensified on the morning of the 5th. The depression path may even have described a circle in about latitude 56°N. At this intensifying stage it passed close to the *Dukesgarth*.

LINE SQUALL

Eastern North Atlantic

m.v. *Manchester Concorde*. Captain P. N. Fielding. Manchester to Montreal. Observers, the Master, Mr. A. S. Bashford, Chief Officer and Mr. J. P. McKenna, 3rd Officer.

28th–29th October 1972. At 2118 GMT, when the vessel was 2·6 miles due south of Fastnet Rock Lighthouse bound for Montreal, a line squall was observed on the radar. It started from 5 miles north of Galley Head in a line 230°T through Long Island Bay and out to sea for 36 miles, moving south-east. The sky was overcast with heavy rain showers; wind SW, force 7–8, pressure 1002·5 mb. The vessel was pitching in rough SW'ly seas and heavy swell. At 2130 the squall passed over the



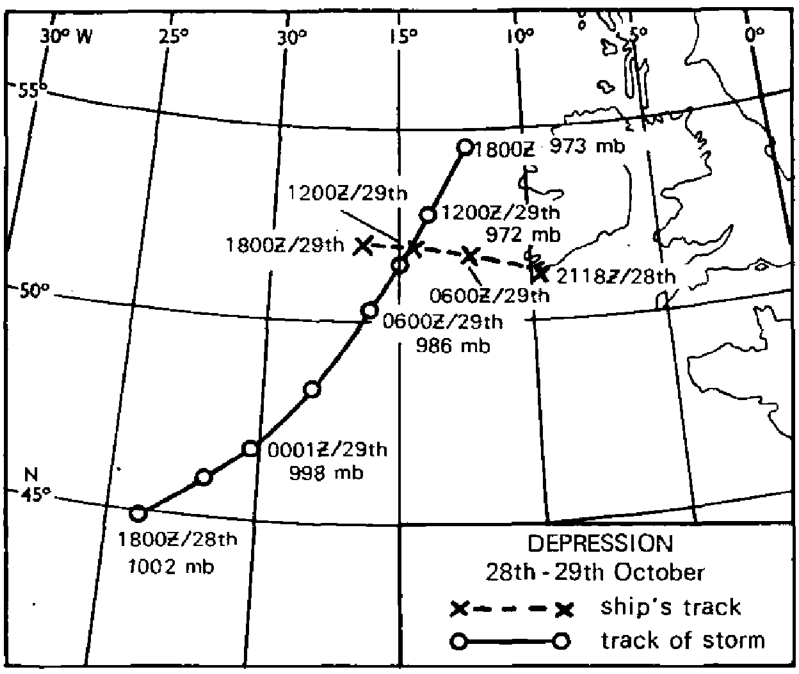
ship and the wind veered to W'ly, decreasing to force 5. Pressure was rising, the clouds dissolving, the sea and swell decreasing, but there was no change in the air temperature.

At 0700 on the 29th a line squall was observed on the radar in a line 280°/100°, heading north-east. According to the fax analysis chart this was a warm front. Wind SE, force 2–3 and increasing. At 0800 pressure was 990 mb and wind S'ly, force 7, increasing to force 10 by 1045. At 1130 the wind veered to W'ly and increased to force 12, with the pressure now 976·6 mb. At 1200 the pressure was 977·1 mb and rising rapidly. Air temp. 13·0°C. The wind was whipping spray off the waves in poor visibility and the vessel was making little headway. A TTT message was sent out to warn other vessels of the hurricane-force winds.

By 1230 the centre of the depression had passed over, the wind had decreased to force 10 and visibility had greatly improved. There was still a very rough head sea and heavy W'ly swell and at 1300 we passed a small fishing vessel running before it, displaying daylight fishing shapes! *She* did not seem to be having much bother with the weather. By 1600 the pressure had risen to 995·8 mb and the wind was WNW, force 7, decreasing slowly.

When the barometer was rising rapidly considerable pressure had to be applied to open the sliding doors at the bottom of the bridge stairs.

Position of ship at 1200 on 29th: 51° 47'N, 14° 33'W.



Note. The line squall reported by the *Manchester Concorde* was in fact part of a cold front associated with a depression off western Ireland. During the 28th a wave formed on this cold front in the region north of the Azores. This wave developed into a depression in the early hours of the 29th and deepened rapidly as it moved north-east towards Ireland. The associated warm front passed over the ship before 0800 GMT on the 29th (veer to S'ly winds) and the centre of the depression (972 mb) passed close westward of the vessel later that morning. The path of this depression, together with the ship's track are shown on the accompanying diagram. The pressure effect noted at the end of this report is probably the result of a local reduction of pressure caused by hurricane-force winds blowing over the ship's superstructure.

DUST CLOUDS

Indian Ocean

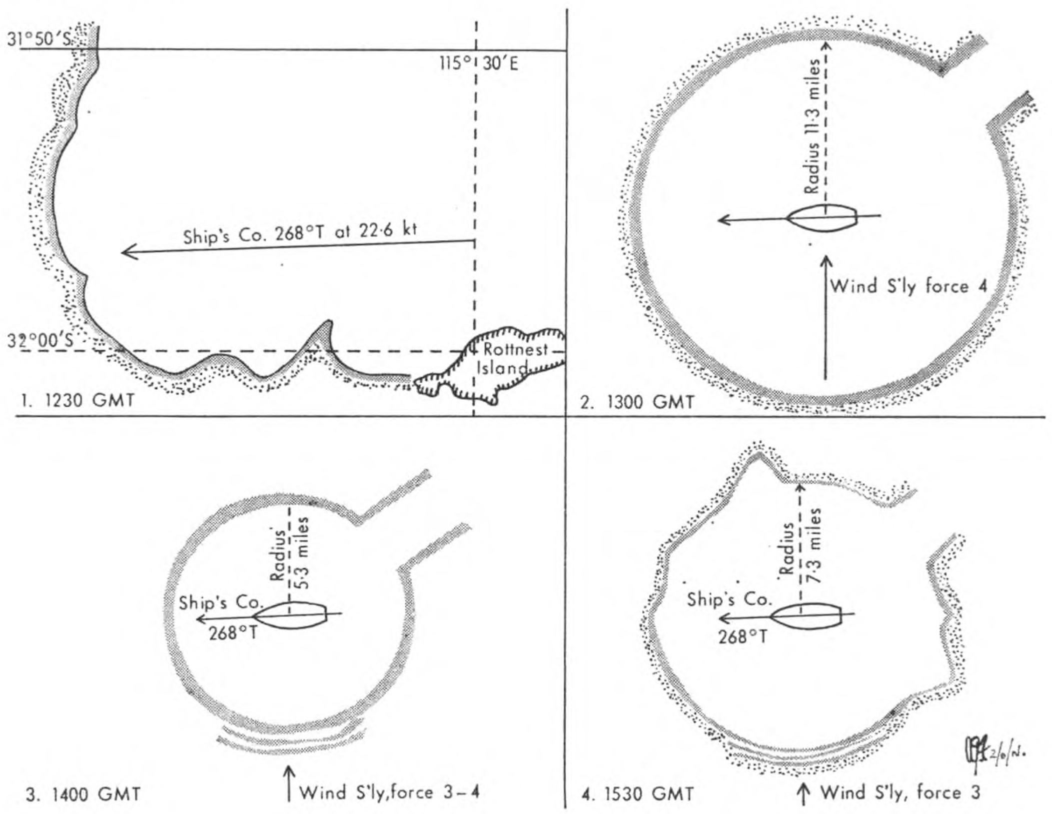
m.v. *Vancouver Island.* Captain B. Hill. Mackay to Cape Town via Torres Strait. Observers, Mr. L. Buchanan, Chief Officer and Mr. I. MacDonald, Cadet.

8th December 1972. At 0930 GMT low, thin, dust clouds passed over the ship when the nearest land was Australia's North West Cape, 500 miles to the south. They were noticed by the yellow/brown atmosphere and the dry, dusty smell in the air. Very fine dark-brown dust was deposited on the paintwork. The effects lasted about 20 min. Wind S'ly, force 2.

Position of ship: 13° 45'S, 112° 08'E.

m.v. *Jervis Bay*. Captain K. E. Howard. Fremantle to Flushing. Observers, Mr. A. J. Fee, 2nd Officer and Mr. R. B. Redhead, Radio Officer.

8th December 1972. The vessel sailed from Fremantle on a fine, clear, cloudless night. Air temp. 23·0°C, wet bulb 21·2°, sea 22·8°. Pressure 1015·5 mb and steady. Wind S'ly, force 3.



Sketches 1–4 show the radar pictures of dust particles encountered in the atmosphere. Although visibility was in no way impaired, dust could be felt on all exterior surfaces. The formation of the circle on the screen was gradual until 1300 GMT; from then on the band of dust became thicker and less speckled, establishing itself at a radius of 5·3 miles round the ship by 1400. For the following hour there was little change; the weather remained the same yet this circle seemingly continued to follow us. It was some 1½ hours later that the radius of the circle increased, the band became thinner and more irregular in shape before finally disintegrating at approx. 1545.

Our theory is that the vessel encountered a 'blanket' of dust some 50 miles away. The reflective properties of the particles varied according to the density of the dust cloud. The funnel-like gap shown in sketches 2, 3 and 4, caused by the ship's path through the 'blanket', appeared on the starboard quarter because of the wind direction at the time.

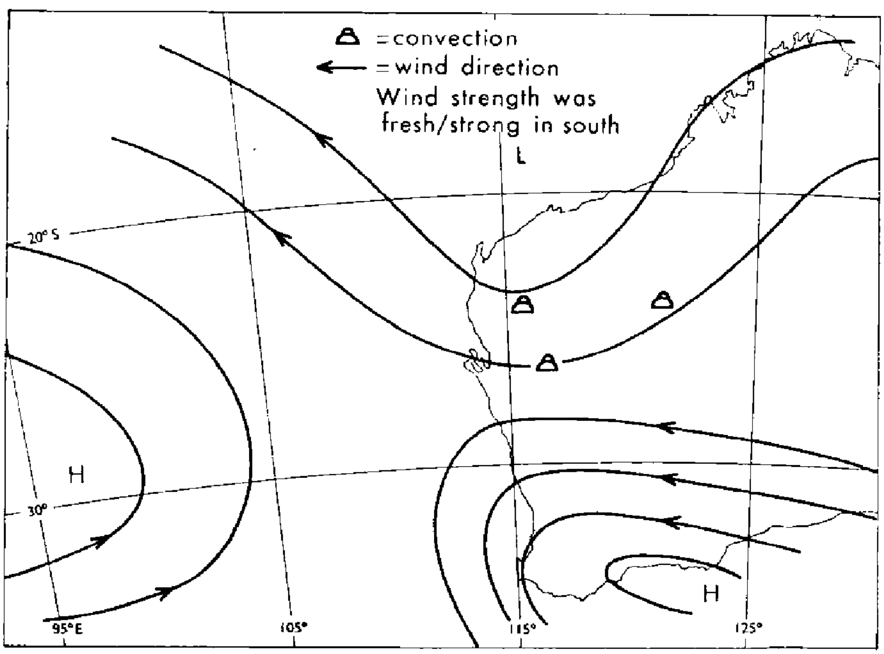
Position of ship (approx.) at 1230: 31° 57'S, 115° 30'E.

Note. The reports from the *Vancouver Island* and, later, the *Jervis Bay* were sent to the Commonwealth Bureau of Meteorology's Regional Office (Western Australia) in Perth and the following replies were received:

"The observation from the *Vancouver Island* of dust clouds on 8th December 1972 is interesting but puzzling. On 6th, 7th and 8th December clouds of what might have been dust appeared in satellite photographs of the north-west coast of Western Australia and adjacent waters. On the 6th these clouds lay above the coast near Port Hedland and on the 8th they were at the position given by the *Vancouver Island*. Unfortunately it is not possible to distinguish with certainty between dust and water clouds on satellite photographs.

"As usual during summer, a great deal of convective activity was occurring over land between 1st and 8th December. Dust raised from the surface could be carried to a height of 15,000 ft by convection and transported for a considerable horizontal distance before gravity caused it to reach the surface again. The puzzlement arises because there are no reports of blowing dust being observed in the north-west during the last week of November and the first week of December. There are large, sparsely-inhabited regions in the north of Western Australia and the dust could have been raised without being observed in such an area. However, both wind observations during this fortnight and satellite photographs suggest that such a large mass of dust should have been observed as it approached the coast. I am sorry we cannot be more helpful."

"Thank you for the interesting extract from the log of the *Jervis Bay*. There is little I can add to my original remarks. We were not able to find from satellite pictures any evidence of dust in her vicinity. However, you might be interested in this diagram which illustrates the type of meteorological situation which occurred over Western Australia during the first week of December 1972.



"The combination of strong convection in the trough and strong E'ly winds over the south of the state would be an effective mechanism for raising dust and transporting it out to sea. It would then gradually fall out of the atmosphere because of gravity and, to some extent, because of subsiding air associated with the high pressure system over the Indian Ocean.

"However, it is surprising that two ships at such different latitudes should have observed the dust at almost the same time. It would be good to know whether this was merely a coincidence and if other ships had observed the dust at other positions and times."

SMELL OF DISTANT LAND

Western North Atlantic

m.v. *Crystal Diamond*. Captain D. Patrickson. Ardrossan to Botwood, Newfoundland. Observers, the Master and Mr. R. Newton, 3rd Officer.

7th October 1972. At 0001 GMT whilst navigating towards the Newfoundland coast in moderate visibility with some fog patches, we noticed a faint but distinct scent of pine trees borne on the wind. At the time the vessel was over 200 miles from the coast but the phenomenon was noticed by all on the bridge. Wind W'S, force 2. Air temp. 4·8°C, wet bulb 4·8°. Pressure 1016·5 mb.

Position of ship: 50° 40′N, 49° 12′W.

Note. At the time of this report w'ly winds and a stable lower atmosphere, associated with a warm sector of a depression off Labrador, prevailed over the region between the Gulf of St. Lawrence about longitude 48°W. The air passing over the vessel traversed Newfoundland about 15 hours earlier.

CHANGES IN SEA TEMPERATURE

Western North Atlantic

m.v. *Victore.* Captain C. Newson. Birkenhead to Seven Islands. Observers, Mr. T. G. Tobiassen, Extra 2nd Officer and Mr. I. P. T. Mathias, Chief Officer.

11th November 1972. At 0001 GMT in position 53° 48'N, 47° 42'W the sea temperature rose from 4·6°C to 6·8° but at 1200 it dropped to 1·0°.

Position of ship at 1200: 52° 18'N, 52° 00'W.

Note. On the great circle Inishtrahull to Belle Isle a vessel would normally be expected to pass through a region of increasing sea-surface temperature centred roughly 300 miles from Belle Isle. With closer approach to the land a drop of sea temperature occurs as the vessel enters the eastern flank of the cold Labrador Current. The value reported by the *Victore* (+1·0°C) is close to a minimum extreme for November in the position quoted; this can be attributed to the abnormally heavy ice off Labrador and in Baffin Bay during the previous ice season.

DISCOLOURED WATER

Coral Sea

m.v. *Cape Sable.* Captain T. T. Edge. Christmas Island (Indian Ocean) to Lyttleton. Observer, Mr. B. R. Sharp, Cadet.

8th December 1972. At 0400 GMT large areas of sea were covered with orange-coloured particles in long lines which drifted with the current. The Torres Strait pilot who was on board said that the orange particles were dead coral washed off the reefs by spring tides. The local name for this phenomenon is 'sawdust'.

Position of ship: 21° 17'S, 149° 54'E.

BIRDS

Atlantic Ocean

s.s. *Argyllshire.* Captain G. S. Cochrane. London to Lobito. Observers, the Master and Mrs. G. S. Cochrane.

31st October–15th November 1972. A pigeon stayed with us for over two weeks whilst on passage from London to Lobito which I consider rather unusual in the habits previously noted in pigeons which have landed on various ships for resting purposes only.

Sometime after disembarking our pilot off Folkestone on 31st October a lone pigeon was observed on board, having flown round the ship several times before alighting. We thought no more about it as we expected the pigeon would leave shortly as the ship was only about 5 miles off the coast, which was visible, and the weather conditions were good, with no more than moderate winds.

Having entered the Bay of Biscay the following day we were quite surprised to see the pigeon still on board, apparently having adopted the boat deck as its base. We fed and watered it. As the days went by Willie (as my wife christened him) became very friendly to the extent of eating out of our hands.

On the second night out I found Willie perched outside so I brought him into my day cabin and placed him on an open bookshelf where he settled down quite happily for the night. Next morning at daybreak he found his own way out on to the boat deck. Same procedure next night; from then onwards Willie came through my hall into the day room, perched on the raised fireplace fender, preened himself for some time before flying up to the same shelf and settling down for the night, quite oblivious of my wife and me; we were very fascinated at the unconcerned attitude. I often watched Willie walking along from the boat deck entrance through my accommodation, ignoring us completely.

We called at Tenerife for bunkers on 5th November during daylight hours when we expected Willie would leave us. However, when we sailed in the early afternoon, we were quite amazed to see him reclining in the shade on the boat deck, taking no notice of the flocks of local pigeons which flew around the ship. During the 10-day passage from Tenerife to Lobito Willie very rarely took to the wing, evidently preferring to flop down in the shade on the boat deck close to my accommodation entrance. He stayed with us until our arrival at Lobito on the 15th when we saw him joining up with several locals. We felt quite sad at his departure. I have often wondered if, had we sailed during daylight, Willie would have come back.

I expect Willie came from a racing loft as he was ringed and bore the numbers 302 SHU NW PU N70 on the left leg and 89 on a yellow tape on the right leg. Perhaps you would be kind enough to trace the owner, if possible, and let me know the result.

Position of ship on 15th November: 12° 19′S, 13° 35′E.

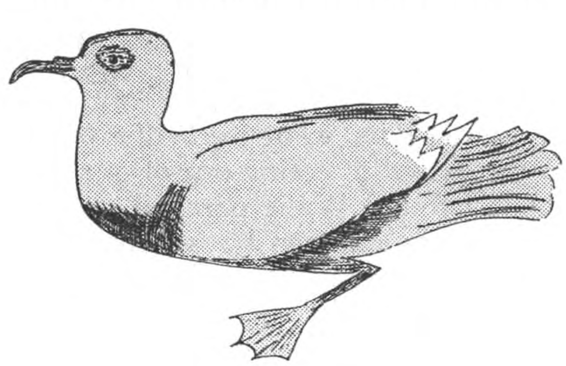
Note. Major L. Lewis, M.B.E., Secretary of The Royal Pigeon Racing Association, comments: "I was most interested to read of the exploits of Willie on the *Argyllshire*, but unfortunately the ring details are not accurate. We are able to recognize it as a pigeon from the North West region of the Scottish Homing Union but that is all. All (metal) rings registered at the Royal National Homing Union commence with the letters NU followed by the year of birth printed across the ring, followed by a serial letter and registration number, e.g. NU70A12345."

North Atlantic Ocean

m.v. *Booker Venture*. Captain J. Hogg. Trinidad to Greenock. Observers, the Master and Mr. P. A. Southworth, 3rd Officer.

6th November 1972. At 0800 GMT an unusual-looking sea-bird flew on to the boat deck and lay in a state of collapse in the starboard scupper. The Master went down to it and it offered no resistance as he picked it up, brought it into the wheel-house and berthed it in a disused binocular box with a little water and food. After overcoming initial shyness it drank a considerable amount of water but showed little interest in the bread-crumbs. Later (2200) some of these seemed to have disappeared and the bird was sleeping. The bird was only about 15–17 cm long and was charcoal-grey all over, apart from very small white patches at the wing-tips. Its curved beak had a single nostril on the top. Its webbed feet protruded from its side at an angle when it lay down. We thought that this bird must have come from the Azores Islands (being the nearest land) although none of us have seen the like of it before. Weather conditions at the time of its arrival were good, almost calm, air temp. 16°C and almost overcast.

At midnight that same night the bird took a final drink of water and vacated the binocular box and the wheel-house. It perched on the starboard teak rail for a few seconds and then flew off, heading south-west towards the Azores.



I am sure we should all be very interested aboard here to know the type of bird we harboured, so if you could assist with its identification we would be grateful.

(Captain R. McKechnie, who relieved Captain Hogg in command about six weeks later, wrote in the logbook: "Reading the above report and description, I would think the bird was a stormy petrel or, as known to seafarers, Mother Carey's Chicken.")

Position of ship (approx.) at 0800: 40° 48′N, 25° 54′W.

Note. The Storm-petrel is the smallest sea-bird, looking not unlike a large, square-tailed House Martin. 'Mother Carey' is a nautical rendering of *mater cara* or 'Dear Mother', in reference to the Virgin Mary.

Atlantic and Indian Oceans

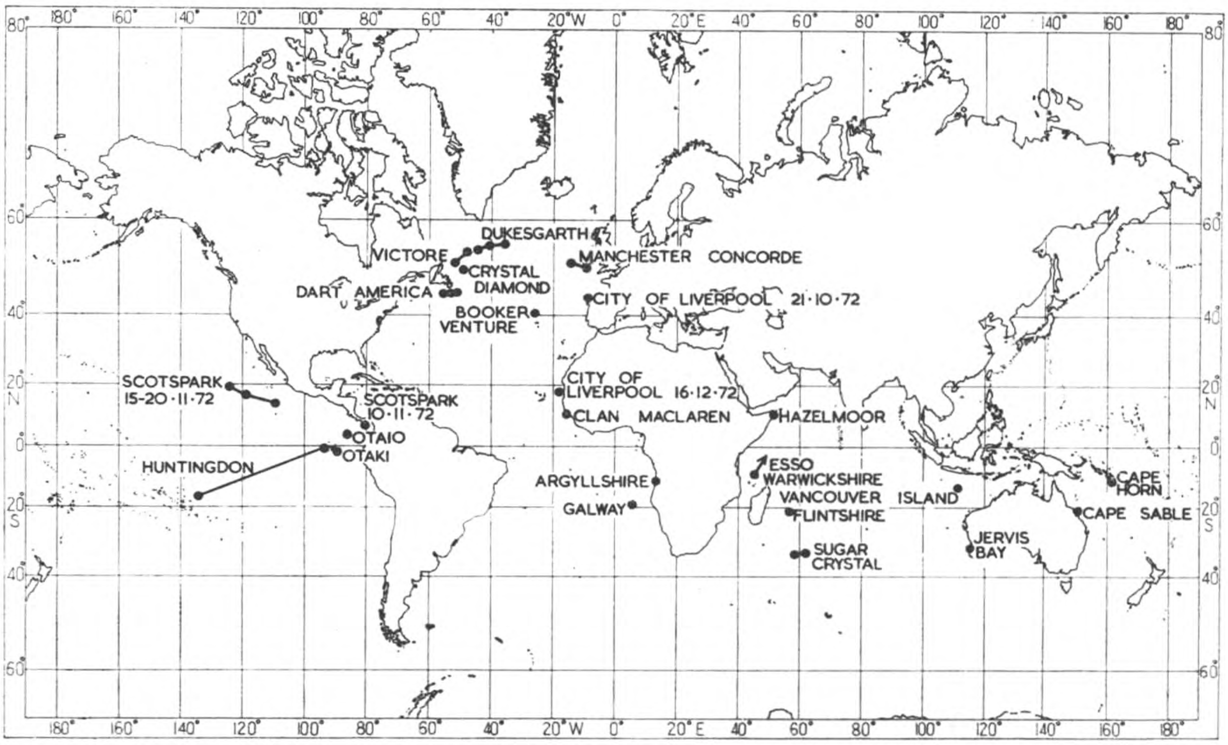
m.v. *City of Liverpool.* Captain J. I. Owen. U.K. to Beira and return. Observer, the Master.

21st October–16th December 1972. On 21st October, during an E'ly gale, a Turtle Dove landed on deck after striking a crane wire. Identification of this bird was made positive through a description given by Captain D. B. Jack of the *Devon City* in *The Marine Observer*, October 1972 and identified by Captain G. S. Tuck of the RNBWS. I found the bird to have a broken left wing and a damaged left leg, apart from which it was obviously exhausted. Kept warm, it managed to swallow some water that I dribbled carefully on to its beak before leaving it to rest in a darkened box padded with soft cloth. Whenever the bird stirred I persisted with water and then added glucose which it started to siphon up on its own as soon as it was strong enough to stand. The first food accepted was semolina which became the staple diet but, as it gained strength, it took to a variety of foods including broken rice grains, crumbled biscuits, corn on the cob and water melon. The left wing set slightly crooked but gradually she learned to fly again and potter about between day-room and bedroom at will, seldom going further afield than the door-mat at the lobby door.

The ship's staff soon became used to seeing her walking about my accommodation but visitors from ashore had to be forewarned as she was completely fearless by this time and walked between outstretched legs in the cabin completely without concern. At night she repaired to her perch, the handle of a semaphore flag secured between plant pots in the for'ard window, then the curtain was pulled across her to darken ship and to ensure her normal night hours. (It was when not put to bed whilst I was ashore in Cape Town one evening that she first started eating my plants, unruly child.) Much time was spent with her on my hand or shoulder and we frequently stood on the bridge wing together, both at sea and in port, without her making any sign of wishing to fly away. In Beira she became animated one day in the window of the day-room but this appeared to be because of pigeons on the shed roof near by.

She had been with me for six weeks when she suddenly began eating my cabin plants, firstly all the flowers of my African Violet, then she massacred a miniature Begonia down to a few miserable bare stalks before attacking three Coleus plants in like fashion. Rather late in the day I produced lettuce leaves and parsley, both of which she found to her liking, and the plants were removed to safety to try and acquire some new leaves! In Cape Town she sat by the open windows quite happily and similarly on the passage north whenever the windows were opened with the air conditioning switched off.

During a short engine stop north of Dakar on 16th December she suddenly flew across the room, perched momentarily at the slightly open window with her head bobbing in excitement until she ducked out of the opening and was off. Once clear she made a bee-line shoreward, her left wing held higher than the right to compensate for the old break but flying strongly. Presumably her winter quarters were in



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

that area and, if this is the case, how incredible the instinct that allowed her to travel all the way to Beira and back recuperating before recognizing her home and heading off without a backward glance; the trouble is that I miss her badly.

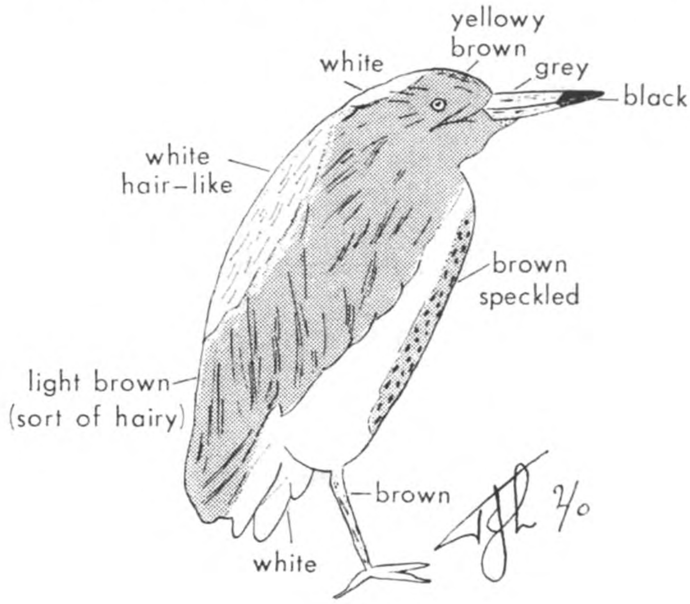
Position of ship on 21st October: 44° 01′N, 8° 58′W.

Position of ship on 16th December: 17° 45′N, 17° 45′W.

Indian Ocean

s.s. *Esso Warwickshire*. Captain H. Johnson. Mediterranean ports to Ra's Tannūrah and return. Observers, Mr. T. J. Lowe, 2nd Officer and Mr. J. Mason, Electrician.

11th November–20th December 1972. An unusual bird (see sketch) was seen on board after we had passed Comores. It was 38 cm long and, by the length of its legs, was obviously some sort of wader. When in flight the wings were like a curlew's but white in colour. It remained on board for about 24 hours but was very timid and I could not get close enough to photograph it.



At the same time a small brown and white hawk came on board. It was very tame. Mr. Mason caught it and kept it for a month, feeding it on raw meat. Even when taken outside it was reluctant to leave and he finally had to scare it away while the vessel was in Marsa el-Brēga (Libya). I will forward photographs of this bird when I get them printed next leave [*see* opposite page 183].

Position of ship at 1800 GMT on 11th November: 08° 54′S, 45° 16′E.

Note. Captain G. S. Tuck, D.S.O., R.N., Chairman of the Royal Naval Birdwatching Society, identified the bird in the sketch as a Squacco Heron (*Ardeola ralloides*) which breeds in Madagascar. The long hair-like plumes on its back are spread wide when the bird is engaged in courting or when agitated.

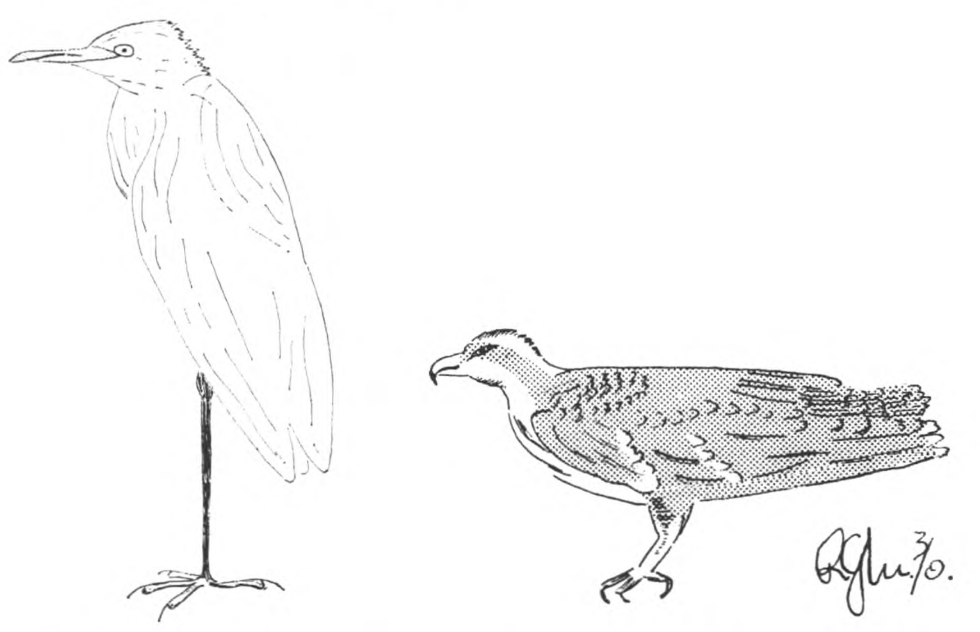
From the photograph Captain Tuck identified the second bird as an immature Sooty Falcon (*Falco concolor*). The adults have two colour phases, one all grey with black wing tips, the other almost black.

Eastern North Pacific

m.v. *Scotspark.* Captain D. T. Jackson. Balboa to Japan. Observer, Mr. R. G. Marshall, 3rd Officer.

15th November 1972. At 1200 GMT two white birds landed on deck (see sketch). They had black legs and light-orange beaks. The eyes were pale yellow with black pupils. The wing span was approx. 60 cm and their beaks were 8–10 cm in length. When alarmed they extended their necks about 10 cm and moved their heads from side to side.

Position of ship: 14° 00′N, 109° 30′W.



17th. While the ship was stopped a bird of prey circled the ship and came to rest (see second sketch). It had a white head with dark-brown flecks and two dark-brown flashes, one on each side, running from the beak, over the eyes and down the neck. The belly and chest were white and the back dark brown. The wings were dark brown on top with white tips on some of the feathers but the undersides were white with dark-brown tips. These dark tips ran in almost parallel lines along the length of the underside of the wings. There were alternate dark-brown and light yellow/brown stripes running across the tail which had white tips. The legs and talons were covered in a fluffy white down but the hooked claws were uncovered. Both the claws and the beak were black, the beak being about 5–7 cm long. Probable wing span between 120 and 150 cm.

Position of ship: 16° 18′N, 119° 06′W.

20th. At 0030 GMT a flock of white birds—the same type as the two on the 15th—landed on the ship from the north-east. After about 1¼ hr the birds left and headed towards the south-west.

Position of ship: 20° 00′N, 130° 54′W.

Note. Captain G. S. Tuck comments:

"The birds which came aboard on the 15th and 20th were the Common Egret (*Casmerodius albus*) and the bird on the 17th, so well described in detail, was an Osprey (*Pandion haliaetus*)." [See also the report from the *Huntingdon* and the photograph opposite page 182.]

Eastern North Pacific

m.v. *Otaio.* Captain F. G. Bevis. Balboa to Auckland. Observers, the Master, Mr. C. R. Dalzell, 3rd Officer and Mr. P. Clark, Cadet.

4th–5th October 1972. A sea-bird, which we think may have been a Bo'sun Bird [or Tropic-bird], was found during the hours of darkness on No. 4 hatch. The bird was in a state of exhaustion and appeared to be concussed as well. Its right eye had been severely damaged which we assumed was done on our own ship, thus explaining the condition of the bird.

It was taken in but we did not dare attempt to clean the damaged eye for fear of making it worse. The bird was held in front of a blower to attempt to revive it and after half an hour it started to wriggle. Within an hour it had revived but still seemed to be in a state of shock. It was placed outside in a sheltered spot with fresh water, pieces of bread and some sardines but, after pecking at the bread, it either passed out or fell asleep. In the morning it was found to have revived again and seemed to be much more lively as one of the Cadets found out when it pecked his finger. The idea was to keep it as long as necessary and give it to a vet in Auckland but when we checked at midday it had gone. No one saw it leave so it was assumed that it had managed to crawl to the side, a distance of only a few feet, and launch itself off.

Position of ship on 4th: 4° 32′N, 86° 22′W.

South Pacific Ocean

m.v. *Huntingdon.* Captain A. B. Stalker. Panama to Auckland. Observers, most of the ship's company.

30th October–6th November 1972. At 1800 GMT (1200 SMT) on 30th October a bird landed on the after-deck whilst we were in the vicinity of the Galapagos Islands. It is thought that the bird came from the direction of Isla Isabela. It showed no signs of distress when handled by members of the ship's company and showed no inclination to leave the ship. It was offered meat, fish and vegetables but was not seen to eat. When the vessel was abeam of Mangareva Island about a week later (6th November) it was placed on the arm of a crew member and was launched in the direction of the land to which it flew. None of the publications on board seemed to make any reference to this bird and it is requested that the Meteorological Office assists in identifying it. The enclosed photograph [originally in colour, *see* opposite page 182] was taken by Mr. R. Towns, E.D.H. and shows the relative size and markings.

Position of ship on 30th October: 00° 17′S, 93° 07′W.

Position of ship on 6th November: 23° 08′S, 134° 58′W.

Note. Captain G. S. Tuck comments:

"The bird in the photograph is an Osprey. The Osprey (*Pandion haliaetus*), over-all length 55–60 cm, over-all wing span 152–182 cm, is a large fish-eating hawk of unusually striking plumage which feeds exclusively on live fish, hovering with beating wings over water and plunging feet first to secure its prey below the surface in its talons. Ospreys are widely distributed throughout the world—Europe, Asia, Africa, North and Central Americas, West Indies and elsewhere.

"They occur principally inland over lakes, but also resort to estuaries and coasts. The bird on the *Huntingdon* was no doubt of the American race (*Pandion haliaetus carolinensis*), breeding throughout North America from Mexico northwards and also in the Bahamas and Cuba.

"The RNBWS has one or two records of Ospreys landing temporarily on ships' rigging at sea off Central America. That an Osprey has taken such a long sea passage (some 2,700 miles) and also appeared fearless of approach is probably unique. It would be interesting to know whether it was ever observed to attempt to catch fish at sea during the period.

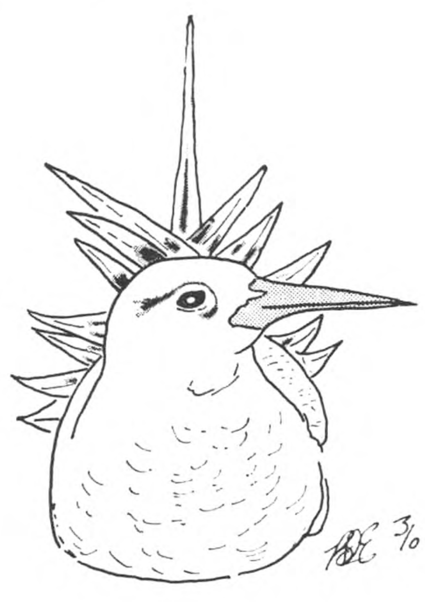
"One or two pairs of Ospreys have now gained a footing and breed in remote parts of Scotland."

South Pacific Ocean

m.v. *Cape Horn.* Captain J. Tattersall. Geelong to Nauru Is. Observers, Mr. B. D. Ellis, 3rd Officer and Mr. Davidson, G.P.1.

7th–10th December 1972. At 2300 SMT a bird flew into the port side of the bridge (see sketch). The look-out man, Mr. Davidson, picked up the bird which was in a state of shock. It spent the next three days in the accommodation; during the first two days it appeared very lifeless but on the third day it showed a remarkable change and ate some salmon and drank fresh water. It was then released 8 miles south of Nauru and headed straight for the island.

Position of ship on 7th: 11° 36′S, 162° 12′E.



Note. Captain G. S. Tuck identified this bird as an adult Tropic-bird. The diet of Tropic-birds usually consists mainly of flying-fish and squids!

Eastern South Pacific

m.v. *Otaki.* Captain J. H. B. Weston. Port Chalmers to Panama. Observers, Mr. H. M. Close, 2nd Officer, Mr. D. H. Moorhouse, 3rd Officer, Mr. T. W. King, 4th Officer and Mr. G. H. Williams, Radio Officer.

21st October 1972. At 1500 GMT, while passing about 6 miles south-east of Isla Española, two birds were seen to fly out to the vessel. They were later identified as Frigate-birds. They flew up and down quite low over the ship for a short period and then one of them became quite interested in the ship's main aerial, snapping at it in a curiously angry fashion but did not appear to be scraping anything from its beak. The bird continued this for about 20 min (the radio officer was not transmitting at the time) and then flew off. During that period it also had several snapping attacks on its mate.

Position of ship: 01° 30′S, 89° 35′W.

Note. Two Frigate-birds often work as a team, one swooping down to scatter flying-fish disturbed by the ship, the other hovering ready to pounce, but we cannot explain their interest in electronics!

INSECTS

Eastern South Atlantic

m.v. *Galway*. Captain A. R. Wood. Durban to Avonmouth. Observers, Mr. B. J. Wright, 3rd Officer and Mr. G. Russell, E.D.H.

2nd December 1972. At 2100 GMT a bright-green insect was observed walking very slowly across the South Atlantic chart in the direction of Luderitz Bay! It was about 6 cm long, wing span 10–12 cm. It had long antennae and its body tapered to a point. Wind SE, force 1–2. Air temp. 21·0°C, wet bulb 19·4°. It has since been reported that another of these was seen on deck yesterday.

Position of ship: 19° 12'S, 5° 55'E.

Note. Dr. D. R. Ragge, Deputy Keeper of Entomology, Natural History Museum, comments:

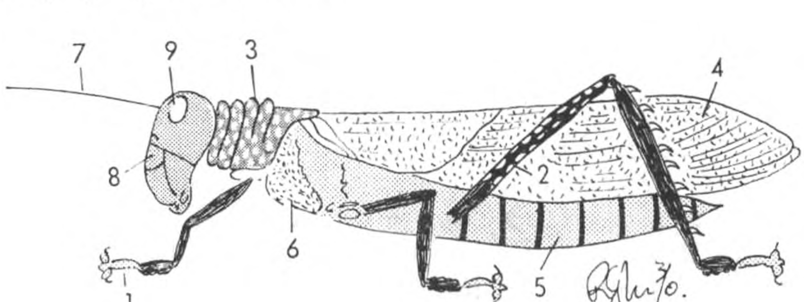
"The specimen from the *Galway* is the common African bush-cricket, *Homorocoryphus vicinus*, a species that often migrates for long distances and has several times been reported as landing on ships in the Atlantic Ocean. We are glad to have this specimen."

Eastern North Pacific

m.v. *Scotspark*. Captain D. T. Jackson. Balboa to Japan. Observer, Mr. R. G. Marshall, 3rd Officer.

10th November 1972. When the vessel was off Cabo Mala at Azuero Peninsula, Panama a large insect landed on deck. It measured 10·4 cm from front of head to end of body and a further 2·3 cm to the tip of the folded wings; wing span 20·3 cm; feelers 3·8 cm; depth of head 1·5 cm; from the underside of the body to the top of the folded wings 3·8 cm. Other details, referring to the numbered parts in the sketch, are as follows. Forefront of legs (1) coloured a bright reddish-orange. Rest of legs all black except for upper hind-legs (2) which were black with very light-yellow round splotches on them. The collar (3) was a dark coffee-brown with round, white markings. The head and collar were hard and 'armoured'. On the wings (4) the veins on the outer side were yellow with some black patches. The body was an orange-brown with black vertical stripes on the after part (5) and the fore part (6) was covered with small light-yellow hairs. The feelers (7) were black and appeared to be made up of numerous small sections. The head (8) was orange-brown and the eyes (9) were light grey and apparently composed of many smaller eyes in a cluster.

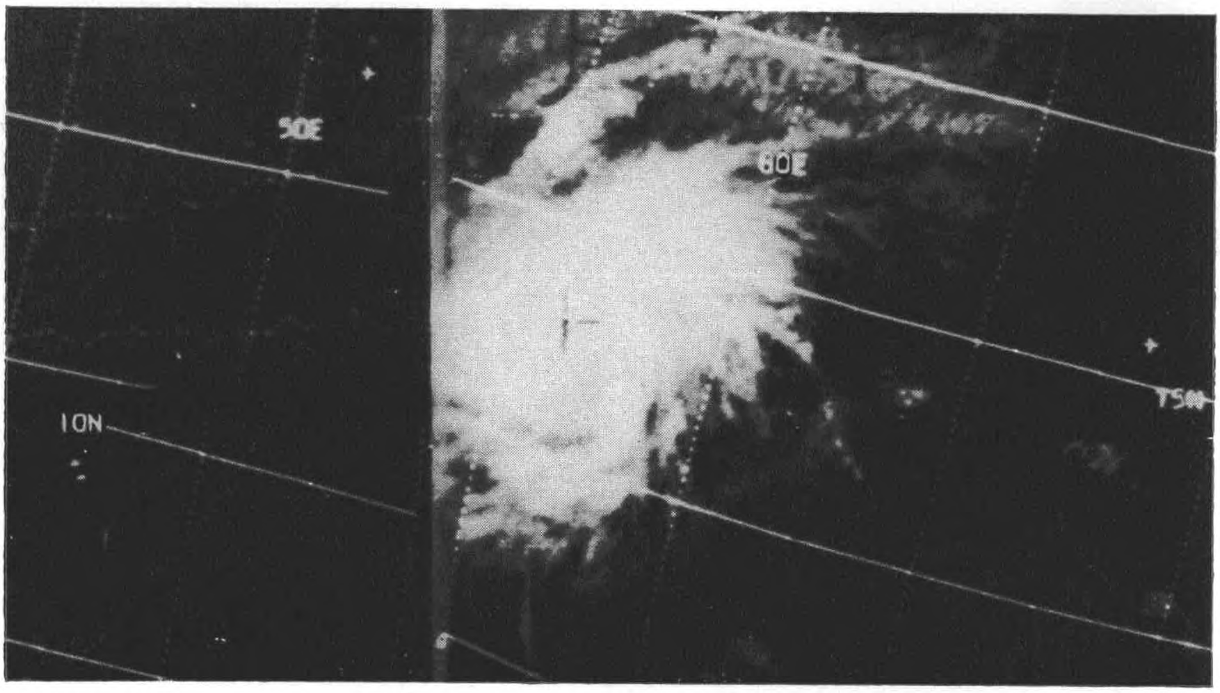
Position of ship: 7° 19'N, 80° 01'W.



Note. Dr. D. R. Ragge comments:

"The excellent drawing of the insect found on the *Scotspark* makes it quite clear that the species was *Tropidacris latreillei*, a very large South American grasshopper."

(*Opposite page* 182)

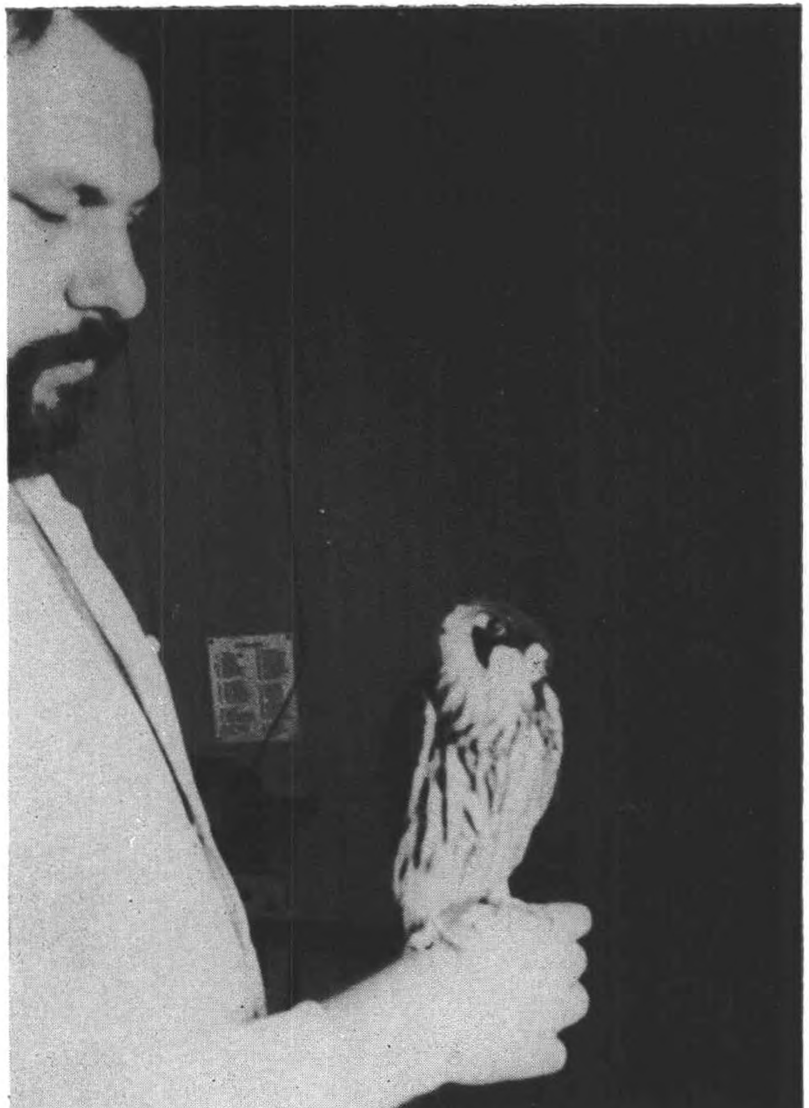


The tropical revolving storm which the *Hazelmoor* encountered later off the Somali coast, as seen from ESSA 9 satellite on 23rd October 1972 (*see* page 168).

Photo by R. Towns

The Osprey which stayed for a week on board the *Huntingdon* in the South Pacific (*see* page 180).

(*Opposite page* 183)



Photos by 2nd Officer T. J. Lowe

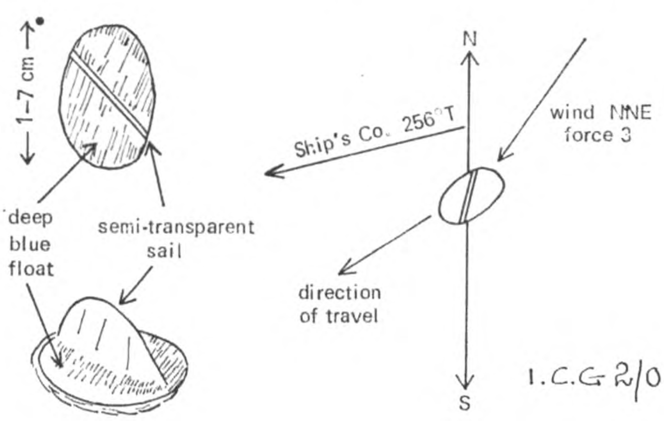
Mr. J. Mason, Electrician on the *Esso Warwickshire*, and the young Sooty Falcon he adopted for a month (*see* page 178).

MARINE LIFE

Indian Ocean

m.v. *Sugar Crystal.* Captain J. E. Leaver. Mackay, Queensland to Cape Town. Observers, the Master, Mr. I. C. Gravatt, 2nd Officer and Mr. T. L. J. Evans, 3rd Officer.

6th November 1972. From 0400 to 1030 GMT, on course 256° at 15·5 kt, the vessel steamed through an extensive shoal of 'by-the-wind sailors' (*Velella*). It is impossible to give an estimate of the size of the shoal as they were only visible along the ship's side in the wash but during most of the time as many as a hundred were counted per minute passing down one side of the ship, at other times several minutes would elapse without any being sighted. The float in all cases was a deep-blue colour and they varied in size from 1·3 cm to about 7·6 cm, the average being about 5·0 cm.



They were all oval in shape when observed from the bridge wing and the fin or sail appeared to be a light-blue line but, when observed from the main deck, the fin was seen to be semi-transparent. They all appeared to be left-handed animals going on a starboard tack (see sketch) and some of them were moving at a considerable speed, leaving a distinct trail in the white of the vessel's wake, a distance of 60 cm in 5 sec was not uncommon. Attempts to net a specimen were unsuccessful due to the speed of the ship and the swell which was running at the time. The wind throughout was NNE, force 3.

Position of ship at 0400: 33° 30′S, 60° 24′E.

Position of ship at 1030: 33° 51′S, 58° 25′E.

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

"We are grateful for this record of *Velella* which will be kept for future analysis. *Velella* cannot move under its own power and it is likely that the individuals seen by Captain Leaver and his officers were being blown along."

ACTIVE VOLCANO

Indian Ocean

m.v. *Flintshire.* Captain M. G. Thomas. Penang to London. Observers, Mr. R. I. Blackburn, Senior 2nd Officer and Mr. M. F. Tomlinson, 2nd Officer.

10th November 1972. At 1800 GMT, when the vessel was passing to the south of Mauritius on a course of 244°T at 21 kt, a reddish light was observed on the starboard bow. Examination of this, and later events, proved it to emanate from the southern end of Ile de la Réunion at a distance of approx. 90 miles. At 30 miles' distance the red light resolved itself into what appeared to be a volcanic eruption, having two centres of activity a short distance apart although at roughly similar heights (about 2,000 m) and a hot lava flow from the western of the two centres.

Smoke could be seen rising but it appeared to be drifting northwards. No violent activity was observed, the whole having the appearance of a gigantic bonfire. Visibility deteriorated after 2100 with the approach of a cold front.

Position of ship at 1800: 20° 50′S, 57° 22′E.

Note. Dr. C. W. A. Browitt of the Institute of Geological Sciences, Edinburgh comments:

"Thank you for the report from the *Flintshire*. It will be forwarded to the Smithsonian Institution, U.S.A. The Reunion Island activity commenced on 18th June 1972 and is being studied by a team of scientists headed by Dr. H. Tazieff, Directeur de Recherches au Centre National de la Recherches Scientifique, Paris."

AURORA

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

"Reports of aurora from British ships between 1st October and 31st December 1972 appear in abbreviated form in the accompanying list, many of the reports coming from the Weather Ships on duty at Station 'Alfa'. The *Duhallow* only appears once in the list, but *en route* between Deception Bay and Nordenham the ship was for some time in the auroral zone and between 7th–13th and 16th–21st October, whenever cloud conditions permitted observations, aurora was sighted between twilight and local midnight.

"The outstandingly active period of these three months occurred on the nights 31st October–3rd November, beginning with a sudden onset during the sixth 3-hourly period of 31st October. The earliest auroral sighting received here was reported by a BEA pilot from the Manchester area at 1700h. Observing conditions that night were poor in many areas—all-sky cameras in Northern Finland and Sweden were not in action for instance—but there are data to show large-scale aurora spreading from USSR (from 1700h) by way of the *Whitethorn* in the Irish Sea, the *Collin* and the *Weather Adviser* in the eastern Atlantic to the U.S. Weather Ship at 'Bravo', where daylight at 0830h U.T. prevented further observation. Auroral forms were overhead many degrees south of the auroral zone and there were reports of the red coloration associated with great auroral displays. The display was associated with a sunspot of notifiable size crossing the Sun's disk between 23rd October and 5th November.

"Once again we thank all those who have made out the reports and others who have ensured that the reports reach us here at the Balfour Stewart Auroral Laboratory in the University of Edinburgh."

Date (1972)	Ship	Geographic Position		Λ	Φ	I	Time (GMT)	Forms
25th Jan.	*Northern Reward*	70°00′N	17°00′E	120	68	+78	2100–0001	RA, P
26th	*Northern Reward*	70°00′N	17°00′E	120	68	+78	2030–2300	All forms
1st Oct.	*Weather Surveyor*	58°55′N	19°11′W	070	65	+72	2150–2400	RA, P, N
7th	*Duhallow*	58°42′N	24°00′W	060	66	+73	2330	HA
11th	*Weather Surveyor*	59°02′N	19°09′W	070	65	+72	0208–0500	All forms
		59°10′N	19°10′W	070	65	+72	2150	N
12th	*Weather Surveyor*	59°01′N	19°01′W	070	65	+72	2025–0400	HB, RA, P, N
15th	*Weather Surveyor*	59°00′N	19°00′W	070	65	+72	2249–2340	RB
16th	*Weather Surveyor*	59°00′N	18°50′W	070	65	+72	2305–2340	RA
17th	*Weather Surveyor*	59°00′N	18°50′W	070	65	+72	0200–0300	P
20th	*Weather Surveyor*	59°00′N	18°44′W	070	65	+72	0555	RB
30th	*Weather Adviser*	58°58′N	18°57′W	070	65	+72	0012–0030	RR
		59°00′N	19°00′W	070	65	+72	0315–0620	HA, HB, RA, RB
1st Nov.	*Whitethorn*	53°36′N	04°16′W	080	57	+68	0230–0315	RR, N
	Weather Adviser	59°00′N	18°48′W	070	65	+72	0400, 0500	RB
	Collin	57°21′N	18°52′W	070	63	+71	0530–0638	RR
2nd	*Weather Adviser*	59°00′N	19°16′W	070	65	+72	0400	N
20th	*Weather Monitor*	59°10′N	18°19′W	070	65	+72	2046–2105	RA, RR
27th	*British Reliance*	64°23′N	21°58′E	110	62	+75	1800–1810	HB
	Weather Monitor	59°06′N	19°54′W	070	65	+72	1850–2100	N
28th	*Weather Monitor*	59°07′N	19°39′W	070	65	+72	2330–2400	N
1st Dec.	*Weather Monitor*	59°06′N	19°38′W	070	65	+72	0055	N
2nd	*Weather Monitor*	58°55′N	19°21′W	070	65	+72	2350–0305	N
6th	*Weather Monitor*	59°11′N	19°33′W	070	65	+72	2350	N
22nd	*Weather Reporter*	59°02′N	18°54′W	070	65	+72	2000	RB, RR
23rd	*Weather Reporter*	59°02′N	18°54′W	070	65	+72	0200–0220	RB, RR
	Weather Reporter	58°59′N	18°32′W	070	65	+72	1915	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.

551.515.5:06

The GARP Atlantic Tropical Experiment*

By B. J. Mason, C.B., D.SC., F.R.S.
(Chairman, Tropical Experiment Board and Director-General, Meteorological Office)

Introduction

The Atlantic Tropical Experiment (GATE), scheduled for July, August and September 1974, will be the first major observational experiment of the Global Atmospheric Research Programme (GARP). Originally conceived as mainly a meteorological experiment, GATE is now likely to include a major programme of related oceanographic observations in an expedition of unprecedented scale and complexity that will test the ability of many nations to work together in a co-ordinated attack on a scientific problem of global importance. The success of GATE is vital to the credibility and support of longer-term international programmes such as GARP, the World Weather Watch (WWW), the Long-term and Expanded Programme of Oceanic Research (LEPOR) and the Integrated Global Ocean Station System (IGOSS) on which the future of meteorology and oceanography so largely depends. The purpose of the present article is to summarize the scientific objectives of GATE, to pose some of the fundamental questions that require an answer, and to indicate how these are likely to be tackled despite the many problems and challenges that lie ahead.

Objectives of GATE

The primary objectives of GATE are to extend our knowledge of those aspects of the meteorology of the equatorial belt that are essential for a proper understanding of the circulation of the atmosphere as a whole and, at the same time, to improve the understanding and prediction of weather in the tropics. Recognizing that the atmosphere of the equatorial belt behaves differently in many respects from that of middle latitudes, that fluctuations in the equatorial belt are linked with variations in the circulation in higher latitudes, and that it may not be possible to make accurate predictions of weather in middle latitudes for more than seven days ahead unless the influence of tropical disturbances is taken into account, the attainment of these objectives is of world-wide interest and concern. More specifically, these objectives are to study the structure and evolution of convective cloud systems in the tropical eastern Atlantic and to assess their role in transporting heat and moisture from the tropical oceans into the global circulation. It will also be necessary to discover to what extent the behaviour and transport properties of these cloud systems are determined by the large-scale disturbances in the tropics with a view to representing the former in terms of observable large-scale parameters in numerical models of the global circulation. The experiment should also provide observational data on which to build and test numerical models for the simulation and prediction of tropical weather.

Also of great scientific and practical importance is the genesis of tropical cyclones which often form as meso-scale systems in the larger-scale tropical easterly waves and the intertropical convergence zone (ITCZ). Again the release of latent heat by cumulus convection is thought to be of major importance in the formation of these intense disturbances.

Study of large-scale tropical disturbances

Most of tropical rainfall is produced by convective systems and there is little doubt that they are a major factor in the vertical transport of heat and water vapour,

* This article is reproduced from the *WMO Bulletin*, Vol. XXII, No. 2, April 1973, with the kind permission of the Editor.

and probably of momentum. Satellite observations show that, far from being random in occurrence, tropical convective clouds tend to form in large organized clusters, 100–1,000 kilometres across, and tend to be associated with the development of large-scale disturbances in the equatorial wind field such as the ITCZ and the troughs of the easterly tropospheric waves that often originate over Africa (and perhaps over the Indian Ocean) and maintain their identity while crossing the Atlantic. In fact, at least three distinct families of tropical wave disturbance have been identified, the easterly waves of wave-length 2,000–4,000 kilometres in the troposphere, mixed Rossby-gravity waves of 8,000–10,000 kilometre wave-length in the lower stratosphere, and a Kelvin wave of planetary scale in the upper stratosphere. One of the tasks of GATE will be to establish the characteristics of these waves over the tropical Atlantic and the African and South American continents in the belt between 10°S and 20°N, to determine their origin, structure, development, propagation, their energy sources, momentum and heat transfers, and relate these to the behaviour of the cloud clusters. The basic observations of the temperature and wind fields on this large A-scale will be provided by enhanced synoptic upper-air networks over Africa and South America, supplemented by soundings from ships in the Atlantic and by winds obtained from cloud movements as observed from a geostationary satellite. The proposed networks of upper-air land stations and of some 15 dedicated A-scale ships are shown in Fig. 1 (a).

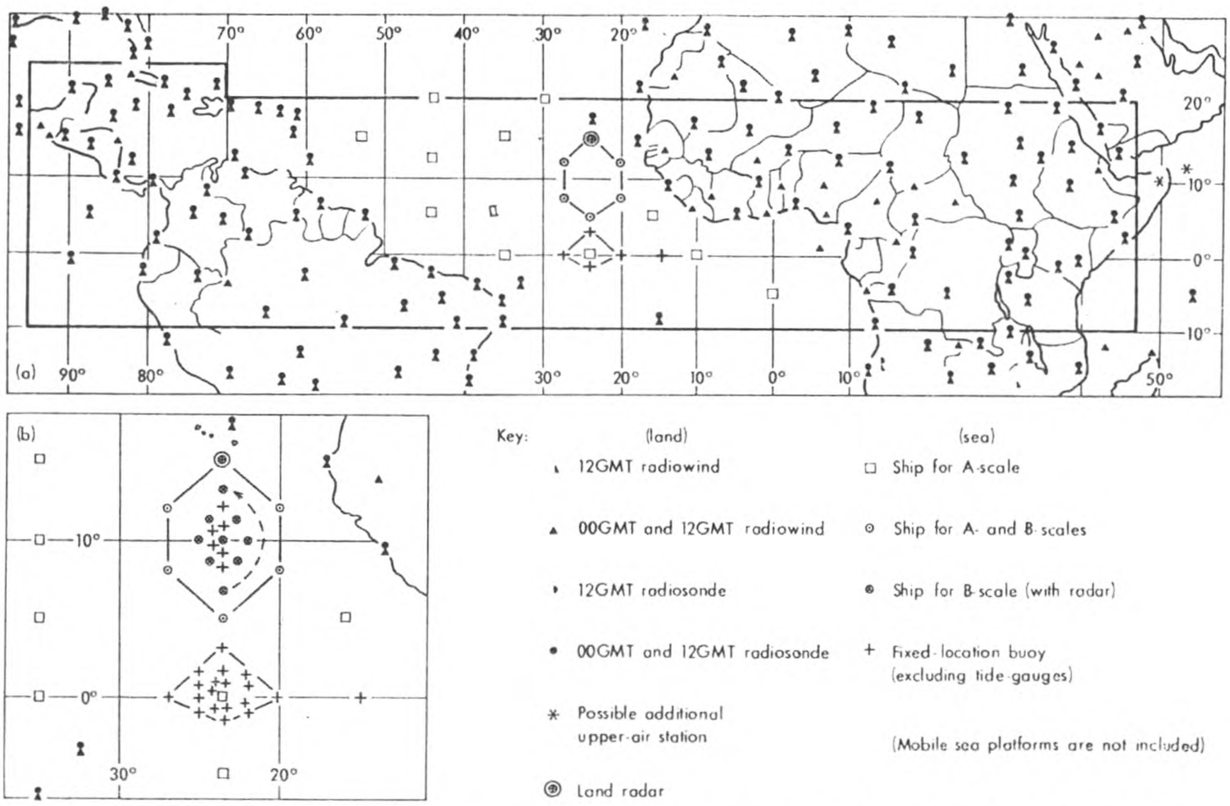


Fig. 1. (a) Proposed upper-air stations, ships and buoys for GATE (including the existing network; (b) B-scale area and oceanographic equatorial display.

Cloud clusters

A much finer network of observations is required to resolve the internal structure of the cloud clusters and the effects of these clusters on the circulation in their immediate environment including the production of compensating down-draughts, the convergence of wind and other fluxes into and out of the system at various levels, and the total release of latent heat. Satellite images of the clouds employing enhancement of the contrast to delineate active convective areas indicate that the clusters are composed of meso-scale convective units of up to 100 kilometres in diameter which, in turn, contain a number of cumulonimbus cells of 1–10 kilometer diameter, but a much more detailed picture of the internal structure and organization is required to produce a useful working model of a cloud cluster.

The plan is therefore to establish a special meso-scale network of observing ships in a 1,000 × 1,000 kilometre polygon some 1,000 kilometres off the coast of Africa, west of Dakar, in a region where satellite photographs lead us to expect a high frequency of cloud clusters, perhaps 20 during the proposed three-month period of the experiment. These ships will need to be equipped with radiosondes, and upper-wind-finding equipment—either radar or the new LOCATE system based on the Omega navigational aid which is expected to determine winds to an accuracy of $\pm$ 1–2 ms^{-1} averaged over 1-kilometre layers. The plan calls for 13 ships spaced some 200 to 400 kilometres apart in this meso- or B-scale network, which might be arranged as in Fig. 1 (b). Several of these ships should be equipped with C- or S-band radar to explore the internal structure of the cloud clusters and obtain quantitative estimates of the precipitation intensity in order to evaluate the release of latent heat.

A full understanding of the behaviour of cloud clusters and the transports of heat, water vapour and momentum arising from them will not be achieved without consideration of the fluxes of these quantities produced by the meso-scale convective systems (C-scale) and even by individual cumulus cells and smaller-scale motions on the D-scale. While it is not possible to measure these fluxes throughout the whole volume of a cloud cluster, sample measurements by aircraft of the motion field of these systems, their spectra of turbulence, temperature, liquid-water content and precipitation intensity should provide a valuable indication of the distribution and significance of such transports. The plan therefore calls for 9 instrumented long-range aircraft, 7 to operate in the lower and middle troposphere, and 2 to fly at higher levels (perhaps along flight tracks similar to those suggested in Fig. 2).

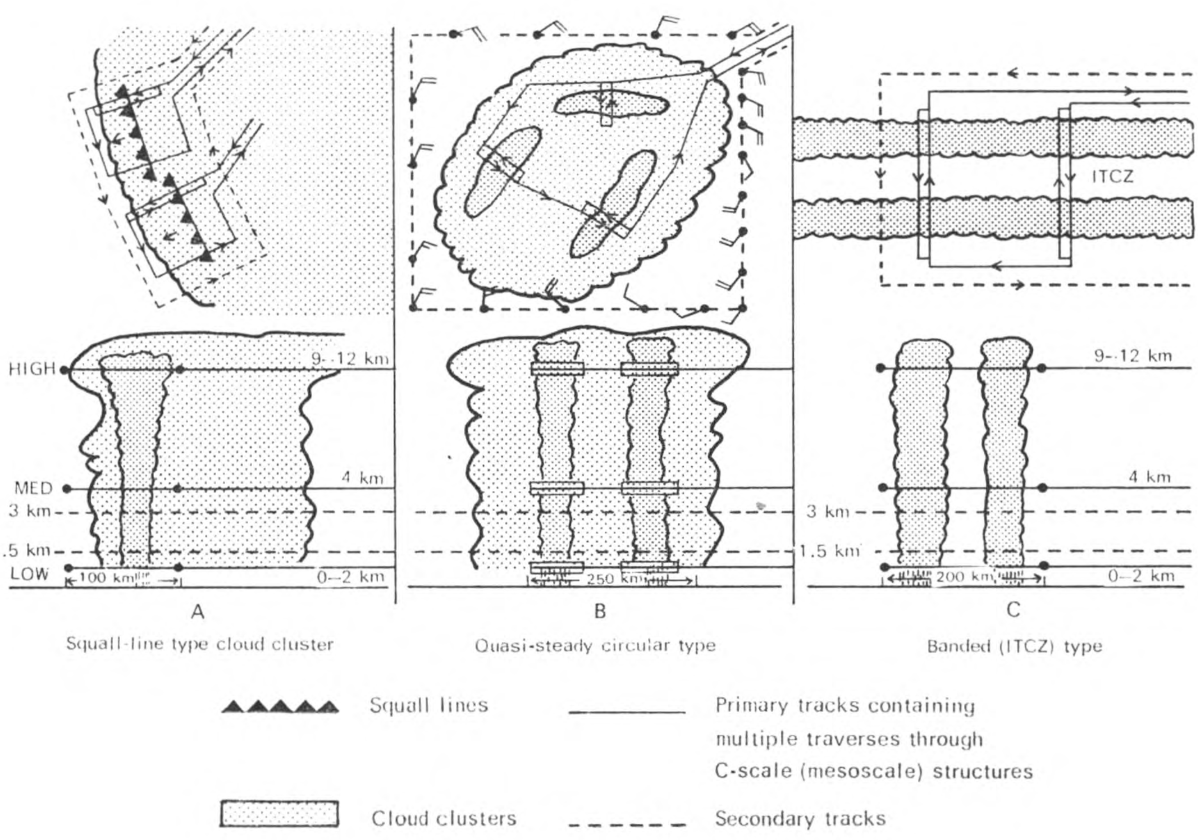


Fig. 2. Suggested schematic flight tracks through three types of cloud cluster.

Inter-action of cloud clusters and larger-scale disturbances

Recent analyses of satellite pictures have revealed that the axes of cloud clusters often tend to coincide with the trough lines of tropical waves and that the fields of divergence, relative vorticity and vertical velocity of persistent clusters coincide quite well with similar fields of the easterly waves. This suggests a close relationship between these systems with the clusters acting as the rain areas of the wave disturbances, but it remains a problem to explain why the lifetimes of the clusters (at most a few days) are so much shorter than those of the waves (1–3 weeks). Other cloud clusters, especially the banded type (see Fig. 2), form in the ITCZ in situations of pronounced wind shear but again the relationships and interactions between the clusters, the ITCZ and the waves are obscure and provide an important task for GATE.

Meanwhile, it has been suggested that convergence in the trade-wind boundary layer produces vertical motions at the top of the layer which, in turn, induce the release of latent heat due to the existing conditional instability. The resulting circulation amplifies as the vorticity increases at a rate determined by the linear dimensions of the circulation, the Coriolis parameter and the lapse rate of equivalent potential temperature, and leads to the formation of a narrow band of convection which may be identified with the ITCZ at some optimum distance from the equator. Alternatively, one may think in terms of the belt of high sea-surface temperature located several degrees from the equator promoting convective activity at these latitudes which, in turn, could excite the development of waves of frequency appropriate to the Coriolis parameter at that latitude. This provides a reasonable explanation for the production of the easterly waves which may then interact with the ITCZ and partially account for its observed variability.

Energy-exchange processes

Whatever the detailed dynamics of these disturbances, which must involve interactions between motions of different scales, their primary role is to link the tropical oceanic heat sources to the global circulation through a series of processes of energy exchange that may be summarized as follows. The absorption and storage of solar energy in the upper layers of the tropical oceans and its transfer to the overlying atmosphere, mainly by turbulent fluxes of water vapour evaporated from the sea surface; continued upward transport of energy through the atmospheric boundary layer by cumulus convection; the release of the accumulated latent heat by condensation in deep meso-scale convective systems and its distribution to higher levels and over wider areas in precipitating cloud clusters; poleward transport of the heat released in the clusters by the mean meridional Hadley circulation, upper tropospheric waves, and standing eddies to feed the global circulation.

This points to the need in GATE for supporting research programmes to determine convergence in the boundary layer from accurate measurements of winds on the B-scale network of ships, and to measure the boundary-layer fluxes of heat, moisture and momentum which occur in association with cloud clusters, both near the surface from ships and buoys and up to cloud base from aircraft and tethered balloons.

Since long-term control of the structure of the tropical atmosphere and its propensity for developing convective disturbances is exerted by the radiative flux divergence, it is highly desirable in GATE to obtain vertical profiles of the solar and infra-red radiative flux divergences and the upward and downward fluxes at both the ocean surface and the tropopause. Adequate measurements at the earth's surface can probably be made from the planned land and ship stations, but measurements at higher levels will require the use of satellites, balloons and aircraft. Since the radiative fluxes will depend strongly on the cloud cover and the water-vapour content of the atmosphere, these quantities should be measured independently—preferably from a satellite.

Numerical models

Numerical models to simulate and predict the behaviour of the tropical atmosphere are now being developed in several centres, notably in the U.S.A., the U.S.S.R. and the U.K., in anticipation of the data that will be provided by GATE. Recent experiments with models using a grid length of 250 kilometres and only rather rudimentary parameterization of the convective processes, have reproduced shear lines with strong convergence and precipitation areas with features similar to those of cloud clusters. These results hold the promise that, with much improved parameterization of the convective and boundary-layer transport processes that should follow from GATE, models with finer grids should be able to predict successfully the wave-like disturbances of the tropical wind field with the associated cloud clusters, in addition to taking proper account of their role in the energetics of the global circulation and in the production of forecasts for higher latitudes.

The oceanographic experiment

An international group of oceanographers working under the auspices of the Scientific Committee on Oceanic Research proposes to take advantage of the unprecedented concentration of ships to be assembled for GATE to carry out a parallel programme of observations to obtain independent estimates of the heat, moisture and momentum fluxes across the air-sea interface from measurements in the mixed upper layers of the ocean, and to investigate the response of the oceans to impressed atmospheric disturbances of various scales. On the A-scale, detailed studies are proposed on the structure and dynamics of the cold equatorial current which may have considerable impact on the atmospheric circulation. The B-scale array of ships would investigate the salinity and heat budgets. The response of the ocean to smaller-scale disturbances such as cumulonimbus, showers, etc. would be followed through their influence on surface and internal waves, vertical current shear, fronts in the thermocline and the transport properties of the mixing layer.

The establishment of such an oceanographic programme, which should provide additional resources besides making more intensive use of those already committed, is to be warmly welcomed, providing the integrity of the meteorological experiment is not seriously compromised. But given goodwill and co-operation on both sides, there is no reason why both experiments should not succeed and to their mutual advantage.

Available facilities and resources

The proposed network of upper-air sounding stations in the land sectors of the GATE area is shown in Fig. 1 (a). A major effort will be required to remedy the deficiencies, especially in wind-finding stations, by 1974 but encouraging progress is being made with the help of the WWW Voluntary Assistance Programme.

The proposed network of special observing ships is likely to be fully implemented. At the present time 19 full-time and 3 part-time ships have been firmly pledged while there is a high probability of obtaining 5 more full-time and 5 more part-time ships, and a further possibility of 3 more full-time vessels. This gives a possible total of 27 full-time and 8 part-time ships, from twelve countries, of which 7 will be fitted with radar. The main problem will now be to provide them all with the necessary equipment, especially accurate wind-finding apparatus, and with competent scientific personnel.

The aircraft position is rather less satisfactory. So far only 4 long-range aircraft have been firmly committed, all of which are likely to be fully equipped as advanced flying laboratories. It is highly probable that 3 more long-range and 2 medium-range aircraft will be forthcoming but, even so, there will be barely sufficient aircraft for the major tasks of surveying the B-scale area and making detailed measurements in and around cloud clusters. The most serious shortage is in jet aircraft with only one firmly committed so far.

Continual coverage of most of the area by a geostationary satellite, which is vital to the success of the whole enterprise, seems assured, and additional coverage will be provided with three or more polar orbiting satellites carrying both cloud-imaging and temperature-sounding devices.

Most of the ships and aircraft will operate from Dakar as a base, where excellent harbour, airfield and other facilities are being made available by the Government of Senegal.

Planning, co-ordination and management

Ultimately it will be necessary to weld these very impressive resources into a closely integrated and co-ordinated international expedition working as a single team that must be greater and more effective than the sum of its national component parts. In particular it will be necessary to ensure compatibility and comparability between the different national observing systems in order that instrumental differences shall not mask the properties of the atmosphere that they are designed to measure. This points to the need for prior inter-comparisons and calibrations of the observing systems. The adoption of agreed procedures and standards of quality control will also be necessary for the processing, analysis and dissemination of the data. Much of this work will have to be done in national centres but final validation, collation and preparation will be an international responsibility.

These, and many other difficult problems of planning, management and logistics are mainly the responsibility of the International Scientific and Management Group (ISMG) which has worked very hard and successfully during the past two years to produce a fairly detailed Experiment Design Proposal* that has been accepted by the Tropical Experiment Board as a blueprint for GATE. A great deal more detailed planning is required particularly as far as the aircraft and oceanographic programmes and the data-management plan are concerned, but a substantial team has now been assembled at Bracknell for these tasks. The ISMG will also have an important supervisory and co-ordinating role during the operational phase of the experiment, and will be ultimately responsible for producing the data in a final form suitable for use by scientists throughout the world.

Concluding remarks

With the dates already fixed and major resources already committed by participating governments, the Atlantic Tropical Experiment is under way and will almost certainly go ahead much as described in this article. The problems, scientific, technical, logistical and organizational, are formidable but the challenges are irresistable and the opportunities immense. GATE will provide a real test of the ability and determination of the international meteorological community to conduct such a large and complex experiment which, if successful, will almost certainly be followed by others of similar scale, to say nothing of the first GARP Global Experiment which, at the end of 1974, will be only two years away.

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* *GATE Report No. 1* (1972), published by WMO, Geneva.

(*Opposite page* 190)

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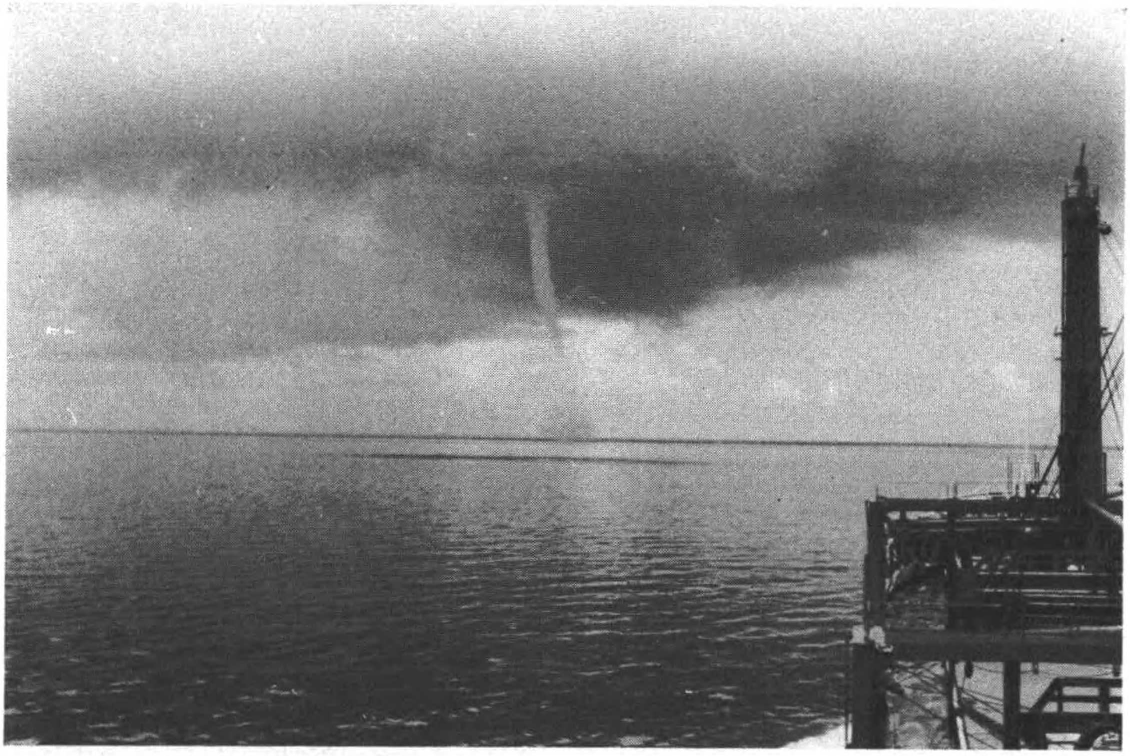
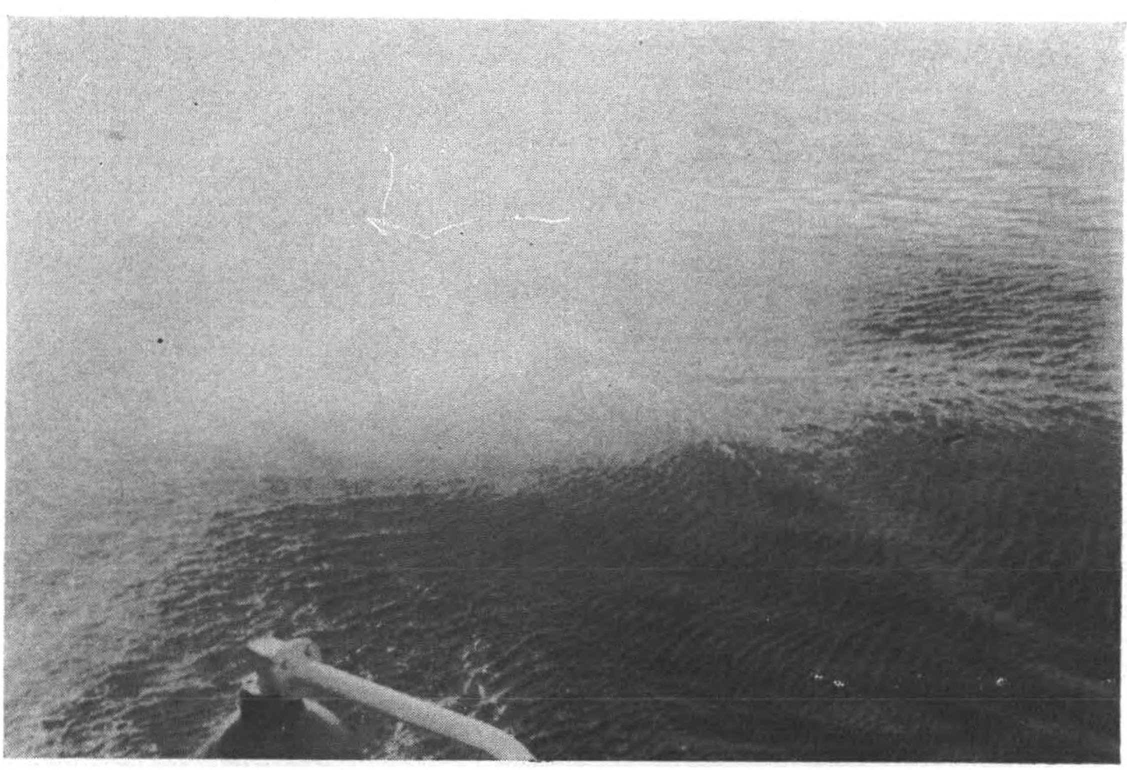
he *Sea Star of the Hebrides* before setting sail from London on her voyage round the world (*see* page 199).





Photographs of a waterspout taken by Captain W. E. Owen, Master of the *Loi Kim*, in t
South China Sea (6°32′N, 119°13′E) on 9th August 1972.

551.501.1:551.507.2

Logbooks

By Lt.-Cdr. L. B. Philpott, D.S.C., R.D., R.N.R.
(Nautical Officer, Marine Division, Meteorological Office)

A shipmaster of no little voluntary observing experience recently suggested to the author in a letter that it would be a good idea if some of the earlier articles which appeared in *The Marine Observer* regarding errors in ships' meteorological logbooks could be revised and repeated for the benefit of the newer generation of observers.

The writer is now in his twenty-third year of scrutinizing ships' meteorological logbooks and in that time estimates that he has been through the best part of 26,000 a number which would, if placed end to end in the open position, float in the London River from the Royal Albert Dock entrance to Greenhithe Pier. There are inevitably days when he feels that this would be a pleasant exercise, choosing a day when the ebb-tide is running strongly, but such a mammoth scrutiny would really indicate that he has seen everything in the way of errors which can be made. Many of these errors will have been notified to the master of the ship in the pertinent one of the 26,000 letters of thanks which were written in that time. These letters have always been intended not only to thank but to help and encourage, never to criticize, and with the same idea of helping and encouraging it is felt that many ships would benefit from knowing of the various errors and omissions which other ships have made over the years. If these could be remedied the net result would be a saving of time and trouble both afloat and ashore and a smoother working of the voluntary observing organization as a whole. Let us then, for the third time in twenty-three years, run through the present-day meteorological logbook.

Dates, Times and Positions

It is very important that the year of the observation shall be entered. Happily, the omission of this is much more rare than it was a few years back but it is worth mentioning that the importance of this lies firstly in the fact that meteorological logbooks from ships on distant stations are sometimes a year or more old by the time they reach us and much time can be wasted trying to find out in which year the observations were made if it is not stated. Secondly, although the observations will have long since been put on to punched cards or magnetic tape, the logbook itself may be referred to many years hence, when the knowledge of the year will be essential but even more difficult to determine if it has not been originally entered. The meteorological logbook which was in use until January 1964 provided for the month, the day of the month and the day of the week to be entered and, if the actual year had been omitted, reference to a calendar would soon give it to us. But the code in use today provides only for the day of the month (1st, 2nd, etc.) to be stated. Then, if the observer has not given us the year in his meteorological logbook, we are completely adrift; a reference to *Lloyd's Voyage Record* is often a help but this frequently depends on our knowing the day of departure or arrival at a port which, in turn, is another prevalent omission from the meteorological logbook!

Occasional mistakes are made in the entering of Q_c (quadrant of the globe) when crossing the Greenwich meridian or the meridian of 180°; this mistake is difficult to spot when such a ship is making a small difference of longitude between the observations and a wrong appraisal here could mean the misplacing of an observation by several miles.

Weather and Visibility

Incompatibility between the figures entered for VV and those for ww is not uncommon, its most frequent form being where a VV of 94 (visibility 1,100 yards) is entered against a ww of 41–49 (varying degrees of fog but all giving a visibility of less than 1,100 yards). Here we are in no position to say which of them was correct, so both of them have to be discarded. This type of mistake can, however, arise when shallow fog (ww = 11 or 12) is being considered. Now shallow fog refers to fog which is not deeper than 30 feet and it follows then that if the height of the bridge is more than 30 feet (and in the great majority of ships nowadays it is considerably more) the observer may still have a long visibility. When shallow fog is reported, the visibility required is, of course, the visibility actually in the fog and, if the observer is above it, then there seems nothing for it but to get someone to go down to test it. But if this is impossible, then we would much rather that two solidii should be entered in the VV column than either the visibility at bridge height or a guess at the visibility in the fog, always remembering that *a blank space or a solidus is better than a doubtful observation.* In a loaded container ship we can visualize the impossibility of anybody getting down to fog level. In such a case a solidus is a must.

Whilst on the subject of visibility it may be mentioned that some ships have omitted an entire observation because they are in fog. This, of course, is very understandable and the very last thing we ask is for an officer to divert his attention from his proper job at such a time. However, the lack of observations of fog and poor visibility from ships at sea is causing us some concern because it will affect the picture of the seasonal distribution of fog over the oceans and, to pursue the matter to an absurdity, our atlases might show less fog in the North Atlantic than in the tropics simply because the density of traffic in the North Atlantic would prevent an officer from making an observation of any sort, whereas in the tropics in mid-ocean the possible presence of traffic would not be such a strong deterrent. To overcome this anomaly we would suggest that when fog or reduced visibility makes it imprudent to make a full observation the officer on watch might make a mental note of the visibility at the synoptic hour and write it into the meteorological logbook when he is relieved on watch. Nothing in the instrumental line could be added, of course, but if he could remember the wind and weather at the time that also would be useful in the book. Perhaps, too, it would be worthwhile sending a shortened radio weather message, late though it would be.

Past Weather

This is defined as weather in the past six hours, using the highest code figure except where the phenomenon is confined to the past hour. Thus it will be seen that the officer coming on deck for the 4 to 8 watch, anticipating the synoptic hour in say 15 minutes' time, will need to know the general pattern of the weather not only during the previous watch but also during the last two hours or so of the 8 to 12. Any officer coming on watch naturally asks his predecessor what the weather has been like but he needs to remember also the other two hours in the First Watch.

Pressure

The simple reading of a simple instrument calls for very little comment but we have occasionally noticed that the slide correction, though correctly entered in the 'as read' column, has been wrongly applied. More frequent is a mistake in the slide correction itself and this, we feel, arises from officers not setting the slide before every reading. A ship which is bound north or south at, say, 20 knots will make a considerable difference of latitude between two synoptic hours, thus should the latitude correction always be attended to before each reading. Then again if a ship bunkers or loads or discharges she may suffer a large change in draught, entailing a correspondingly large change in height of eye. Please, therefore, be careful to see that the height of eye is correctly set on the slide before making the first observation after leaving port or, indeed, at any time when the draught may alter at sea through consumption of bunkers, running up or pumping out a tank, etc.

Temperatures

Here again, there can be little difficulty in reading a simple instrument. But lack of care and regular maintenance of the instruments can undoubtedly cause errors in the temperatures themselves no matter how carefully they are read. Please remember always to hang the screen to windward, to change the muslin and wick frequently, to keep the reservoir topped up with distilled water and never to let the wick hang in a bight. Please remember also to make a note in the Remarks column when the muslin and wick have been changed; weekly is normally enough but more frequently in spraying conditions.

When we asked for the temperatures to be read to the decimal point, which happily most ships are now doing, we did not imply that anything so small as a thermometer graduation could be divided up by eye into ten equal parts and then read off as such. But, where the mercury reaches just a shade above the graduation, that will be point one; a little more than a shade but not as much as a quarter would be point two; just a shade below a graduation would be point nine and so on.

A number of ships, whilst reading the dry bulb to the decimal point, have then only read the wet bulb and the sea temperature to the whole degree. This is a pity since for climatological research purposes, e.g. when investigating the exchange of energy between the sea and the air, it is necessary for the meteorologist to calculate the dew-point and air-sea temperature difference as accurately as possible. Large errors may occur unless the dry bulb, wet bulb and sea temperatures are all read to the nearest tenth of a degree. Thus it is most desirable that in any one observation all three temperatures should be read to the decimal point. But there must be quite a number of occasions when it is unreasonable to expect either of the screen temperatures to be read closer than to the whole or half degree; we visualize the dark night on a Western Ocean passage or round Cape Horn, for instance, with the screen correctly hung to windward and the observer himself facing the wind. In these uncomfortable circumstances, both screen temperatures will perforce have to be read to the nearest whole or half degree only and the sea temperature should be read to match them. In short, all actual temperatures in any one observation should be read to the same position as each other, even if that is the nearest whole degree. We would ask officers to bear in mind, however, that if in any observation it is impossible to read the temperatures closer than to the whole degree, that does not preclude temperatures in subsequent observations being read to the decimal point.

Clouds

There are more errors concerning clouds than any other phenomenon and the most widespread is the one which we would least expect; it goes without saying that the total amount of cloud can never be less than the amount of low cloud, but it is surprising how many ships have recorded a lower figure under N than under N_h. One of these figures is obviously wrong but in the warmth and comfort of our office chairs we cannot say which; therefore both have had to be thrown out which is a pity because one of them was probably correct.

When there is no low cloud present, but a certain amount of medium cloud, many books have recorded a nought under N_h. This error is also very prevalent though the code lays down that, where no cloud is present, the figure under N_h shall refer to the amount of medium cloud. Thus in a sky which has no low cloud but which is overcast with medium cloud, N_h will read 8, not 0. N_h can only properly be 0 when there is neither low nor medium cloud present.

The 0 which will appear under C_L in all circumstances where no low cloud is present is sufficient to tell the forecaster, or other person using the radio weather message, that N_h refers to the amount of medium cloud and not to the amount of low.

Cloud heights are a perennial source of trouble and the only advice we can give officers on this is firstly to study the types, classify them into the three classes of cloud, low, medium or high, and remember that low clouds have their bases below 6,500 feet, medium clouds between 6,500 and 18,000 feet and high clouds above

18,000 feet, then, with experience and perhaps practice around a mountainous coast, one gets to know what each type looks like within the limits of its range; it can never be more accurate than that. We would commend observers to read Chapter 5 of the *Marine Observer's Handbook*.

Waves

There are many pitfalls, too, in this observation and by far the most prevalent error has been found to be the recording of sea and swell waves whose characteristics are so similar that it seems likely that only the one phenomenon is involved. The impression which the writer gets from these observations is that the observer has noted a sea wave with its direction, period and height and then, perhaps just when he has made up his mind about it, he sees the inevitable recalcitrant wave, with a direction 20° or so and a height a foot or so different from the general run, so he puts it down as swell. We must emphasize that it is only when a clear distinction can be made between sea and swell that we want them both recorded. Perhaps the most difficult case of this sort is given by a westerly wind blowing in the Southern Ocean. This would produce a westerly sea on a more or less permanent westerly swell. The difference of period between the two systems might enable the observer to separate them, but if no such clear distinction can be made the observer has to judge whether the waves are sea or swell, i.e. if they are caused by the wind then blowing they are sea; if not, they are swell. If they are clearly swell waves then they must be entered and transmitted as the second of the groups commencing with a figure 1; the first one would read 100/0. If they are clearly sea waves (which will always have a direction approximating to that of the wind) there will be no need either to enter this second wave column or yet to send a second wave group.

As ships' bridges get higher, the observation of wave heights gets harder; possibly the best estimation would be obtained from watching how high up the ship's side the wave crest comes (not forgetting, of course, that the ship herself is probably rolling). But what one loses on the swings one gains on the roundabouts for, as the bridges get higher, the ship herself becomes longer, making the wave period somewhat easier to determine. Undoubtedly ships' officers are having a struggle with this one but we commend those who have boldly written in the Remarks column something like "Too dark to observe waves", for assuredly once again a blank space is always better than a doubtful observation.

Ice

Happily this is a group which seldom has to be used more than occasionally and, perhaps, because of this the casual encounter with ice has often gone unrecorded in the meteorological logbook and has consequently not been included in the radio weather message.

The ice report at the back of the meteorological logbook should also be completed, not only when ice has been sighted but also when the ship has passed through the ice areas in the season without sighting any ice. The omission of the ice group from the radio weather message could be serious for it is obvious that any efficient weather bulletin should contain an ice statement where pertinent but this is impossible unless the forecasters themselves have some knowledge of the prevailing ice conditions in the area. This information could conceivably come from an aircraft of the Ice Patrol or even from a satellite but something is lacking in the coverage if ships do not divulge their information.

The group recording Ice Accretion, which was added to the meteorological codes a few years ago, has seldom been used. We hope that this is because few ships have been troubled by this evil event. But when we see in a meteorological logbook that a ship in a high northern latitude has reported a gale-force wind from a northerly direction, a sub-freezing air temperature and snow as her present weather, we find it very difficult to believe that there was no ice accretion there also. Once again, we are warm and dry in our offices and we are in no position to say what it is like out there but we went through many a Western Ocean winter and we do feel that our suppositions are reasonable. The tragic losses of the *Lorella* and *Roderigo* in January 1955 have been succeeded by others, British, Icelandic and Canadian, whilst a number of other trawlers, including several German ones, have been imperilled. The timely reporting in the radio weather message of this phenomenon so that due warning may be given to other ships in the vicinity could mean the saving of lives; it is as important as that. Ice accretion is not confined to Arctic waters by any means; in *The Marine Observer* of January 1957 we published a report from the m.v. *Marna* in 57°N, 3°E, on passage from Granton to Porsgrunn in February 1956, of ice which formed on the fore part of the vessel and "gradually thickened as the voyage progressed. The shrouds which are normally 3 inches in diameter were increased to approximately 14 inches." This observation was subsequently incorporated in the Admiralty *North Sea Pilot* Volume IV, page 64. Ice accumulation may also be reported simply by ICING followed by a plain language statement of the situation.

Remarks column

The heading to this column shows the kind of observation which should be recorded here, e.g. shifts of wind, time and duration of precipitation, etc., but all too many ships seem not to want to know about the column at all. We have asked for certain entries because they are really important for research purposes though the information given in the actual observation is adequate for the forecaster, i.e. in the radio weather message, and adequate for the punched card or magnetic tape which each observation eventually becomes. For instance, where two successive observations show a large shift of wind between them, it is most desirable to know at approximately what time this wind shift took place, whether it was a gradual shift and, above all, which way did the wind shift. Again, if one observation shows heavy continuous rain (ww = 65) and the next one shows slight rain showers (ww = 80), it helps the research worker to know approximately at what time the rain ceased or became showers. The Remarks column comes in here.

Examples of other things which could with advantage, but seldom are, entered in the Remarks column are the dates of changing the muslin and wick, the date on which an instrument becomes unserviceable and a change is made to another (particularly desirable when it becomes necessary to change from bucket to intake for sea temperatures) and times, always GMT, of arrival and departure from ports, canal transit, etc. Visits from a Port Meteorological Officer in a foreign or commonwealth port should always be noted and most definitely if he supplies any instruments to replace breakages, etc.

Wider observations can be entered in the Additional Remarks pages and the Log extracts in *The Marine Observer* bear testimony to the variety of subjects in which observers are interested. It may be stated that nothing is ever wasted and, however non-meteorological an observation may be, there is always someone somewhere interested in it and we know who that someone is. But unhappily there are some observations which are of very little use because of their incompleteness. For instance a meteor needs a time, a bearing and a duration of flight together with, if possible, its position relative to a fixed star; a rainbow needs an angular measurement both vertical and horizontal; an item of natural history, e.g. a bird or a fish, needs a drawing, preferably a coloured drawing, or a photograph and this should be taken, if possible, alongside some finite object, e.g. a foot rule or a man's hand, but so often these niceties are omitted. More than once an observer has reported steaming through a patch of discoloured water, taking a sample of it and then throwing it away "because nothing unusual was detected". This can only unhappily be called a pure waste of time because only a microscopic examination by an expert could determine whether there was anything unusual in the specimen and, even if there were nothing unusual, he would still be interested in it; it should certainly not be thrown away. Specimens are nowadays only too hard to come by.

There have, over the past few years, also been a number of narratives which have said that a specimen of an insect, or butterfly, etc. has been caught and would be handed to the Port Meteorological Officer at the next port; so many times that specimen has never been handed in! Then there is the photograph also; "Photographs were taken and will be forwarded in due course" frequently runs the narrative but the photographs seldom arrive! When photographs are submitted we would appreciate also the negative, strictly on loan, so that extra copies may be made.

We would commend all observing officers to read Chapters 8–12 of the *Marine Observer's Handbook*, 9th Edition. These chapters contain information on phenomena likely to be seen at sea, together with hints on observing them and data which should accompany the observation in order to give it the greatest scientific value.

A brief note of the weather condition at the time should always be included, but it must be fresh information. The phrase "meteorological data as in book", which we often see in the Additional Remarks pages, is not of any real value and may indeed be quite misleading if the observation is not made near a synoptic hour.

Ocean currents

We are always glad to have ocean current information, the more the better, but regrettably some officers are still giving themselves far too much work by entering currents which overlap in time, e.g. one noon-to-noon current with a star-to-star current within it. It is always the short-period current between true fixes which is the most acceptable and the noon-to-noon current, assuming the noon position to be the morning sight run up to a noon latitude, should only be entered if there are no short-period currents to cover the elapsed time.

Another way in which officers create unnecessary work for themselves is by entering currents which they label merely FAV or ADV. We would take the former to mean a current which was setting from abaft the beam and the latter to be a current which is setting from before the beam; each one would therefore have a tolerance of very nearly 180° which is a long way from the accuracy required for the Ocean Current Atlases where we need a tolerance of about 10°, not more. All such currents have to be discarded, unfortunately.

Chapter 7 of the *Marine Observer's Handbook* lays down the sort of current which is acceptable and why we have to reject certain types of current.

The radio weather message

Ideally, all four synoptic observations should be transmitted by radio to the appropriate meteorological office through one of the detailed stations listed in the *Marine Observer's Guide*, Part IV.

Unfortunately most voluntary observing ships and indeed most British merchant ships carry but one radio officer and thus we are quite unjustified in expecting four transmissions daily, at any rate punctually.

The British Meteorological Office is in a particularly unhappy position in this respect for in the eastern North Atlantic, both the 0001 and 0600 observations fall outside the single radio officer's watch; he is just coming on watch at the time of the 1200 and just going off watch when the 1800 observation is made. Thus, of the four observations, only the 1200 can both be made and transmitted during his watch. But the 1800 observation can still be fresh when it reaches the forecaster if it is made early enough for it to be sent before the officer goes off watch. This is quite permissible and GG should remain at 18 unless the observation has to be made before 1730, in which case it should be altered to 17.

Weather in the eastern North Atlantic is subject to so many variations that the Bracknell forecasters are reluctant to miss even one observation. The 0001 and 0600 observations should therefore always be transmitted in this area. It is too much to expect a radio officer to transmit during his watch below though we have noticed with gratitude that sometimes the 0001 observation has been transmitted with little delay from a single radio officer ship. But we would like both these observations to be sent along to the radio room and the radio officer asked to send them as soon as possible after he comes on watch at 0800. We do realize, of course, that the 0001 observation will be more than eight hours old by the time it gets to Bracknell and the 0600 will be more than two hours old and, in fact, the weather in one may be quite different from the weather in the other. But, to a forecaster, a view of the weather in retrospect is of considerable value and the number of Western Ocean meteorological logbooks which have come in recently showing all four observations to have been transmitted in this way is a healthy sign of the awareness of observing officers of this fact.

Many logbooks received during the year have not given us any details of the despatch of radio weather messages; we always like to have this information so that we can tell if the messages are going to the right people at the right time and, above all, if the radio officer is experiencing any difficulty in getting them through. We do come across such difficulties from time to time and if we can be given full chapter and verse of them we can communicate with the meteorological service concerned and they, having been cheated of observations which were originally meant for them, will lose no time in getting after the radio service in their own country to find out why. But we must have details; generalized complaints are of no use at all.

In the past year, also, three or four radio officers have complained that Freetown 9LL has refused to accept their radio weather messages. This does not surprise us because this station went out of business, as far as meteorological traffic is concerned, as long ago as 1968. This was announced in *The Marine Observer* at the time and all our publications and relevant ones published by the Admiralty were amended. We do hope that no more radio officers will waste their time in trying to raise a station which has been off the list for so long.

General remarks

There seems to be a growing tendency to overwork the solidus. This is really intended to complete a five-figure group where one of the elements has not been observed; if information for the whole of any of the first six groups is not available the groups should be reported by five solidii. But if no information is available for any of the bracketed groups following $D_sv_s$app the whole group may be omitted and no solidii or other adjustments are necessary. We mention this because there have been a few logbooks lately where several groups of five soldii have been entered to finish the observation (including the Ice Accretion group and the ice group being thus reported by a ship in the tropics!). We do hope that this plethora of solidii was not transmitted or it would make the message very costly as well as involving the radio officer in unnecessary work.

Further advice on the use of the solidii will be found in the bottom half of page 3 of the *Ships' Code and Decode Book.*

More and more ships are now happily continuing their observations well into the Channel or even across the North Sea but we still want many more to do it. We remember only too well the demands on an officer's time and the requirements of safe navigation around the coasts and we do therefore realize that we cannot expect the observations to be quite as meticulous here as they might be out at sea. But they are still vital to the provision of an efficient meteorological service for shipping and coastal sea areas and it is often only a ship's observation which can give the forecaster a clue to an ugly meteorological development approaching our shores and thus give him the opportunity of warning other ships and coastal communities where life and property may be threatened. We hope that no officer will hold back from making an observation in the belief that the meteorological observing stations ashore, staffed though they are by professional meteorologists, can adequately cover the sea areas as well, for that is very far from the case. It must often happen that a full observation is not possible in coastal waters but we are always glad to have a short one which might perhaps be only a sea temperature or an observation of fog or shortened visibility. Every little helps.

WITHDRAWAL OF U.S. COAST GUARD CUTTERS FROM OCEAN WEATHER STATIONS

The Ocean Weather Ship Service was founded as a result of International Agreement signed in London in the summer of 1946, under the auspices of the International Civil Aviation Organization (ICAO). Originally 13 weather stations were to be established in the North Atlantic but at the Second Conference in 1949 it was decided, for economy reasons, to reduce the number of stations to 10. At the Fourth ICAO Conference on North Atlantic Ocean Stations, held in Paris during February 1954, a new Agreement was signed to secure the continued provision, financing, maintenance and operation of Ocean Station vessels in the North Atlantic and thereby to contribute to the safety, regularity, efficiency and economy of air navigation in that region. The primary purpose was for the provision of surface and upper air data for direct operational use in the preparation of the route and terminal forecasts required for each flight. This new agreement allowed for 9 stations to be located in the following positions:

A	62° 00'N	33° 00'W	B	56° 30'N	51° 00'W
I	59° 00'N	19° 00'W	C	52° 45'N	35° 30'W
J	52° 30'N	20° 00'W	D	44° 00'N	41° 00'W
K	45° 00'N	16° 00'W	E	35° 00'N	48° 00'W
M	66° 00'N	02° 00'E			

Stations B, C, D and E have been manned continuously by U.S. Coast Guard Cutters though Station B has been the joint responsibility of Canada and the U.S.A. A number of European and other countries whose airlines operate regular flights across the Atlantic make financial contributions to the five European Operating States, Norway, Sweden, France, Netherlands and the United Kingdom, who between them man Stations A, I, J, K and M.

Due to the age of one of the Netherland's ships it became necessary to withdraw her from service in 1971 and, since July of that year, Station A has only been manned for periods of 24 days at a time, leaving the Station unmanned for another period of 24 days. When searching for means of financing a replacement ship to fill the gap created by this withdrawal the U.S. Government generously offered to the European Operating States a U.S. Coast Guard Cutter of the class used as Weather Ships in the western part of the Atlantic. However, conversion of the ship for use by civilian crews, operational and financial problems prevented any of the European States from accepting this offer and consequently Station A could no longer be manned full time.

During the Seventh ICAO Conference on North Atlantic Ocean Stations, held in Paris during March 1972, the United States made it known that they would cease to man Station E after 30th June 1973; also Norway and Sweden, who together operate two ships on Station M, confirmed that due to the age and deteriorating condition of their ships it would be necessary to withdraw one ship on 30th June 1974; their ships will then be 33 years old. It was therefore agreed that Station A would not be manned after June 1974. The major outcome of this Conference was the recognition that Civil Aviation's needs for the technical services performed by the Atlantic Weather Ships for meteorological services was now appreciably reduced from the 1954 requirement and the World Meteorological Organization was requested to consider taking over the co-ordinating and administering role from ICAO and to open a new North Atlantic Ocean Station Agreement as from 1st July 1975, the day after the existing Agreement should terminate.

On 20th March 1973 the Government of the United States gave notice of their intention to withdraw from the North Atlantic Ocean Station Agreement with effect from 30th June 1974; their schedule for discontinuing the stations is as follows:

30th June 1973	Station D
30th June 1973	Station E
31st December 1973	Station C
30th June 1974	Station B

Many may mourn the loss of these stations from the Atlantic as they did more than simply provide platforms from which meteorological observations could be made. For a quarter of a century their services have included search and rescue operations, assistance with communications, radio navigational guidance to aircraft, relaying of weather reports from merchant ships, relaying of AMVER reports, the release, servicing and recovery of meteorological buoys and making oceanographical and other scientific observations. The United States employed 11 ships under the 1954 Agreement to man their Stations and the cost of doing so must have been extremely heavy so there can be little wonder that their policy to withdraw was solely for budgetary reasons. These United States Coast Guard ships have rendered most valuable services which are undoubtedly appreciated by those who fly over and steam across the Atlantic and the meteorologists taxed with the difficult problem of providing reliable weather forecasts for those in the Atlantic area.

At a recent meeting of leading European meteorologists in Geneva it was stressed that there is no satisfactory alternative observing system yet available that can replace the North Atlantic Ocean Stations which provide data now essential to meteorological services for the North Atlantic, Europe and North America. These meteorologists now wish to participate in a new North Atlantic Ocean Station Agreement under the aegis of the World Meteorological Organization in order that the acquisition of meteorological data from the network of Ocean Stations covering at least the eastern part of the North Atlantic may continue and weather-sensitive industries such as shipping may further benefit.

G.A.W.

N.B. Voluntary Observing Ships on the North Atlantic who have been in the habit of passing OBS messages via U.S. Weather Ships will wish to note the dates of discontinuing operations on Stations B, C, D and E.

SEA STAR OF THE HEBRIDES—ROUND-THE-WORLD VOYAGE

One of the latest recruits to the Voluntary Observing Fleet is the *Sea Star of the Hebrides* (*see* photograph opposite page 190) which sailed from London on 25th June at the start of her voyage round the world which will last for about two-and-a-half years.

The 90-foot ketch will be crewed by former students of the United World Colleges (UWC) and is expected to sail more than 30,000 miles during her voyage. Quite a large proportion of this distance will be through waters well away from the usual shipping routes, indeed in areas little frequented by any craft at all. This is one of the reasons why the Meteorological Office has issued the *Sea Star* with instruments because data from those remote parts of the world will be most valuable. Another reason for having tested instruments aboard is to enable the crew to conduct daily scientific tests with particular emphasis on ocean pollution.

More than 200 former students, male and female, will in turn crew the *Sea Star* during her long voyage. The student crew will be changed every four weeks but a permanent crew will remain throughout the whole voyage: the Skipper, Mr. Pete

Williams, a very experienced ocean yachtsman and his wife, the navigator Lieutenant Brown, R.N., an engineer/radio operator and a cook.

The *Sea Star*, although over 15 years old, is a well-found craft and is equipped with some very useful navigational aids including radar, D/F and H/F single sideband R/T. Her signal letters are 2 CAP. Her twin diesel engines are capable of producing power to enable the ketch to achieve speeds in excess of 10 knots but Mr. Williams hopes that for most of the passages the wind will provide the motive power, enabling his international crew of students to gain proficiency in handling *Sea Star*'s canvas.

The UWC's first college, Atlantic College in Wales, recently received 15 Chinese students for the two-year course and it is hoped that the Chinese mainland will be one of the countries visited by the *Sea Star*, thus maintaining "the truly international spirit of the venture", as the UWC President, The Earl Mountbatten of Burma said at the official cast-off.

We wish the *Sea Star* and her crew *bon voyage* and look forward to receiving her meteorological logbooks with entries from those little-frequented waters.

G.V.M.

FIRE ON BOARD CAUSED BY LIGHTNING

Lloyd's List of 5th February 1973 mentioned that on 3rd February the s.s. *British Energy* (B.P. Tanker Co. Ltd.) had been struck by lightning which had caused a fire on board. Unhappily this was not recorded in her meteorological logbook and, on mentioning this in my letter to the ship, I received the following from the 2nd Officer, Mr. J. V. Vincent, in a letter written from the Persian Gulf on 2nd May.

"As you correctly state in your letter, this ship was indeed struck by lightning which resulted in a fire. This incident was over two months ago and the officer who was actually on watch at the time is now on leave. The following, therefore, are just general comments concerning the incident rather than any form of eye-witness account.

"The vessel at the time of the incident was approximately 12 miles north-northwest of Cap Bengut on the North African coast bound for Porto di Augusta, Sicily. The weather at the time was as follows: wind north, force 6–7, temperature 11·3°C, pressure 1018·5 mb, very low cloud over the coast with heavy rain and very frequent lightning. The lightning had been visible throughout the night but had been concentrated mainly over the coast. At 0500 GMT the Chief Officer and the Apprentice had just taken bearings and had gone into the chart room to fix the ship's position. About a minute after this they heard a loud, dull crack which was followed by a roaring noise and the whole ship being lit up. No one actually saw the lightning strike the ship and no mark was found on the foremast which carries the gas-vent pipe (the venting gas from which was ignited). It is thought that the lightning struck the actual gas vent and the heat of the impact ignited the escaping gas from the cargo of crude oil. It took three hours to put out the resulting fire which was similar in nature to the burn-off flares at a refinery. During the three-hour period the ship's company was mustered in the after part of the vessel with the boats swung out as a precaution in the event of the fire getting out of hand. Throughout the fire the weather situation did not change and everyone commented on the fact that the lightning was so intense that one could almost feel it. It was also noticed that, with the cloud only being at a height of 200 feet or so, the lightning emerged from the cloud and seemed to travel more horizontally than down to the sea as if looking for something to earth on. This may have been imagination though.

"With the fire out, we cleared the coast to stay out of the weather as much as possible. It is a generally accepted fact that this part of the world is very bad for this sort of thing during the early months of the year but, by standing out a little further off the coast, some of the bad weather can be avoided."

L.B.P.

ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM APRIL TO JUNE 1973

The charts on pages 202 to 204 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]

April

Excessive ice conditions persisted off eastern Canada, southward of the Davis Strait. Off Newfoundland the ice edge is located about 150 miles beyond the extreme limit. A north-westerly wind anomaly in the Greenland Sea maintained the Jan Mayen Tongue and established the excess through the Denmark Strait. Ice conditions in the Barents and White Seas and in the Baltic remained much less than normal due to warm winds from a southerly point. In the north-eastern part of the Barents Sea the ice edge is located about 200 miles beyond the extreme minimum limit.

The International Ice Patrol reported up to 480 bergs south of latitude 48°N on the Grand Banks. The average number for the whole season (February to July) is 213; on average, 74 bergs are sighted in April.

May

Despite a fresh south-easterly wind anomaly off Newfoundland, sea-ice persisted much further south than usual. In response to near normal atmospheric conditions, the ice edge returned towards its normal position over the greater part of the Greenland Sea, though in the north, where warmer conditions prevailed, the deficit continued. Further east, in the Barents Sea, a large deficit continued due to the prevalence of warm south-westerly winds.

Over 360 bergs were reported south of latitude 48°N at the end of the month.

June

Excessive ice conditions over Hudson Bay were largely due to the effect of a very cold winter over that area. During this month conditions off Labrador returned to near normal as a result of a period of strong easterly winds in the middle of the month. Warm south-easterly winds late in the month account for the deficit over the greater part of the Greenland Sea, while a warm south-easterly anomaly over the northern Barents Sea maintained the large deficit in that region.

By the end of this month, iceberg sightings south of latitude 48°N on the Grand Banks of Newfoundland had dropped below 100. Estimates based on the progress of this season so far indicate that the 1973 iceberg season may even exceed in severity the record season of last year.

R.M.S.

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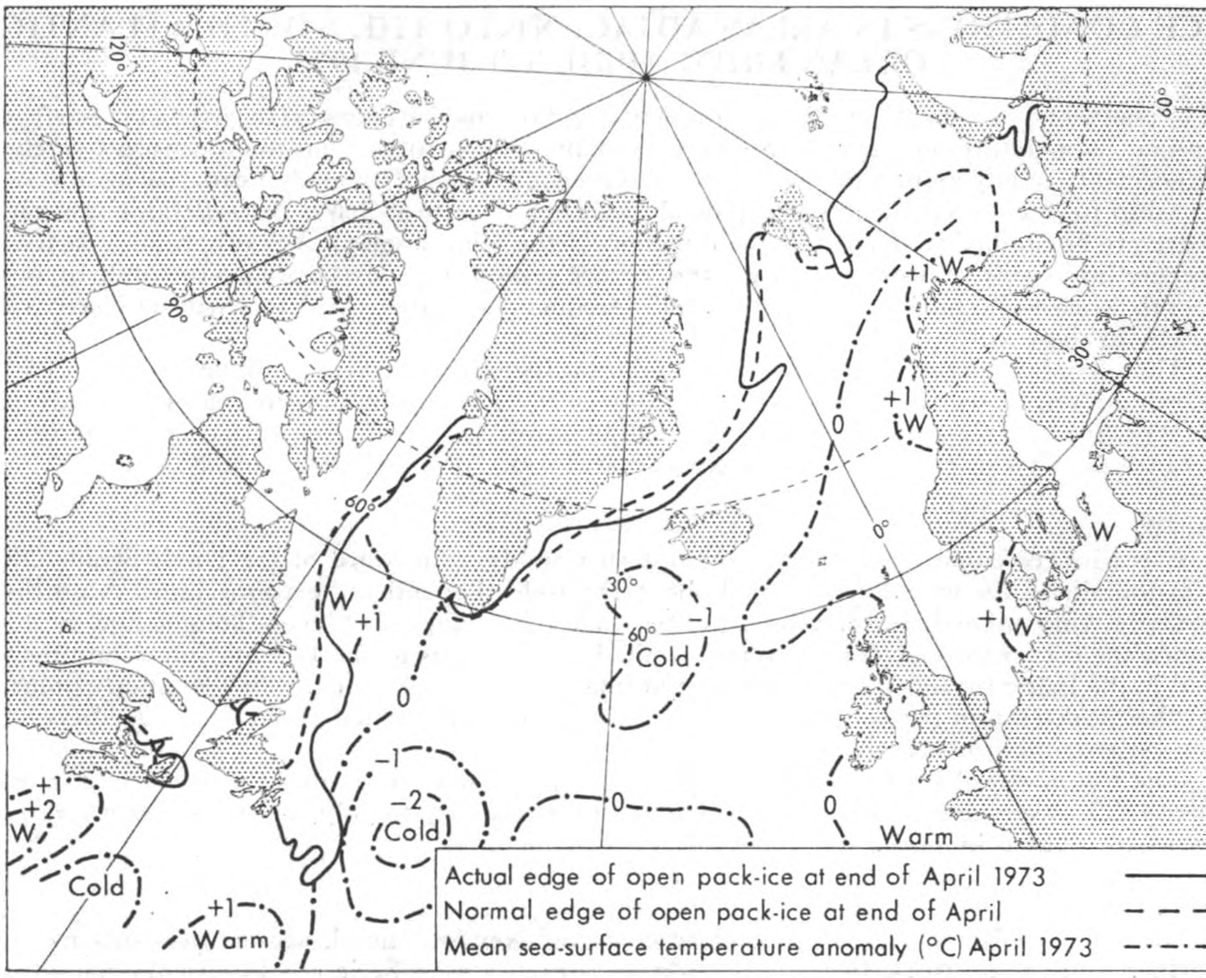
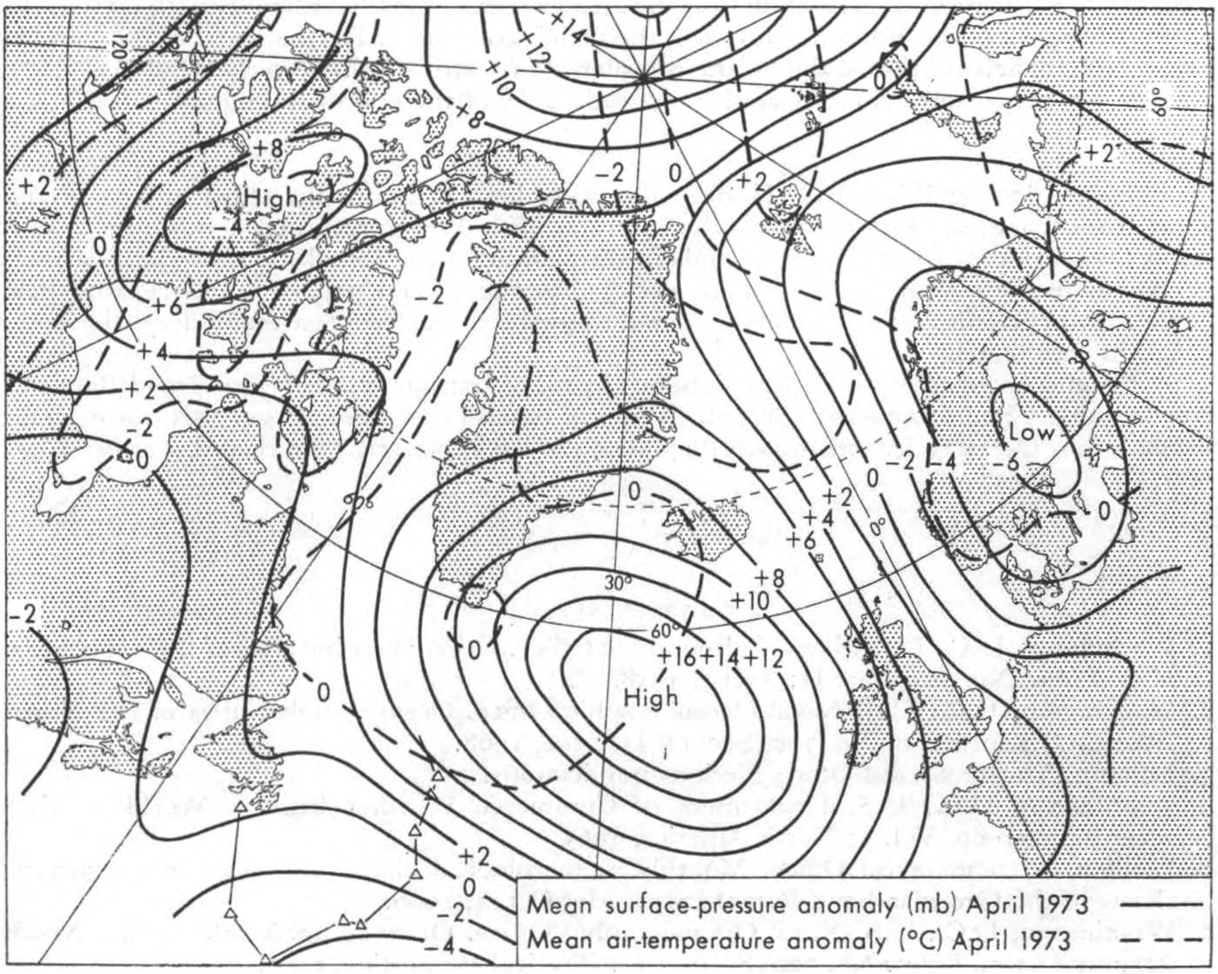
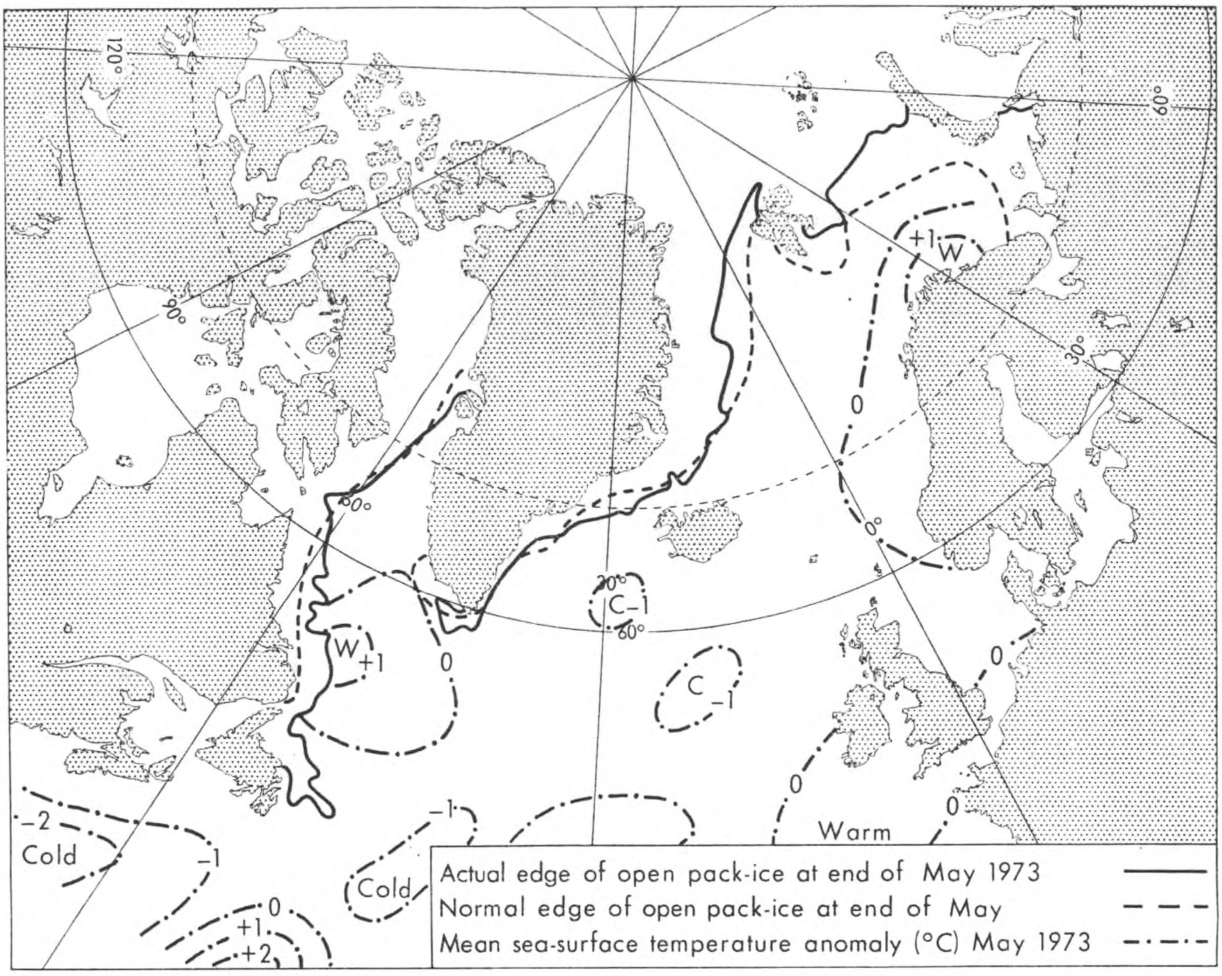
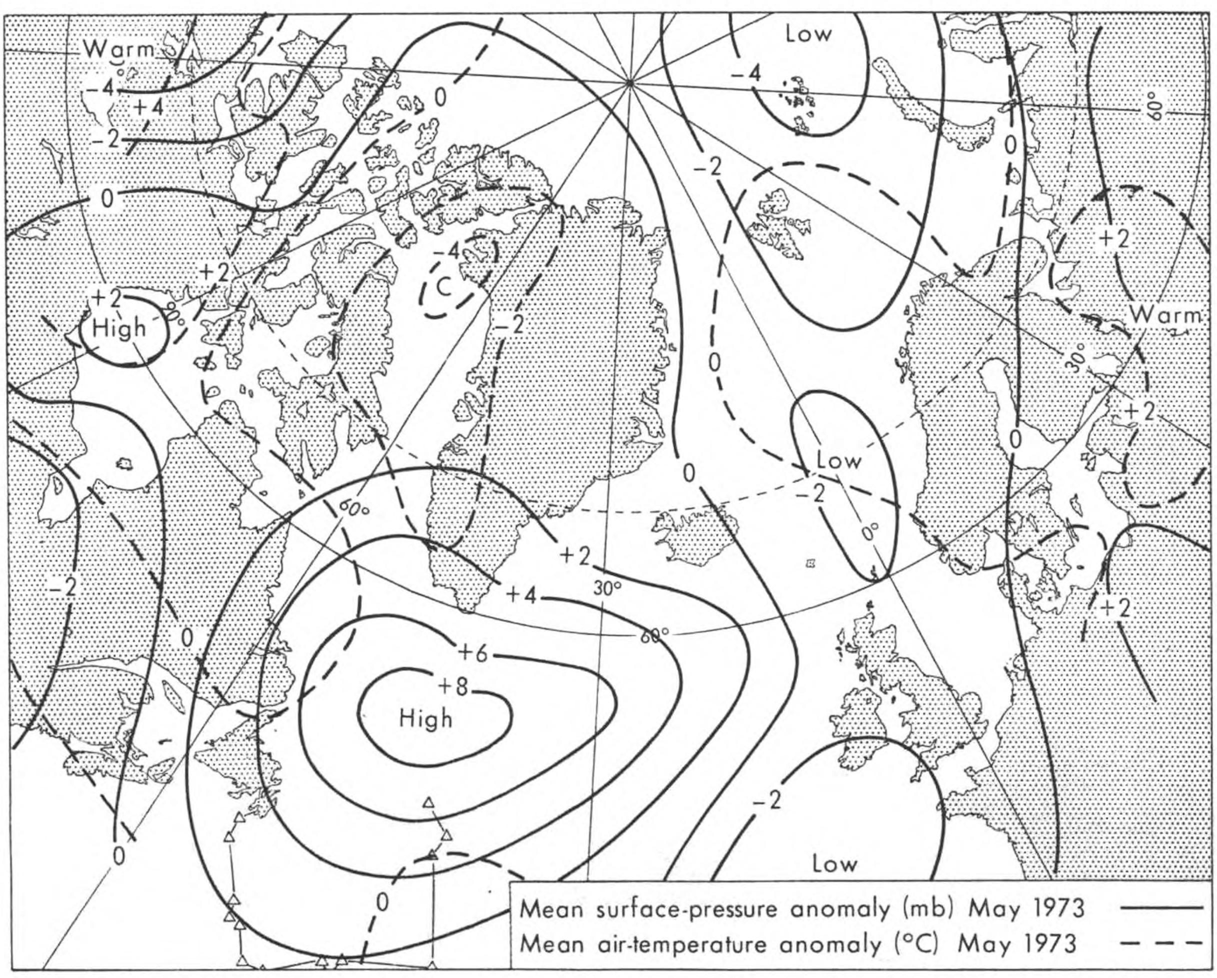
6. Washington, D.C., U.S. Naval Oceanographic Office. Oceanographic atlas of the North Atlantic Ocean. Pubn. No. 700, Section II: Physical Properties, 1967.


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

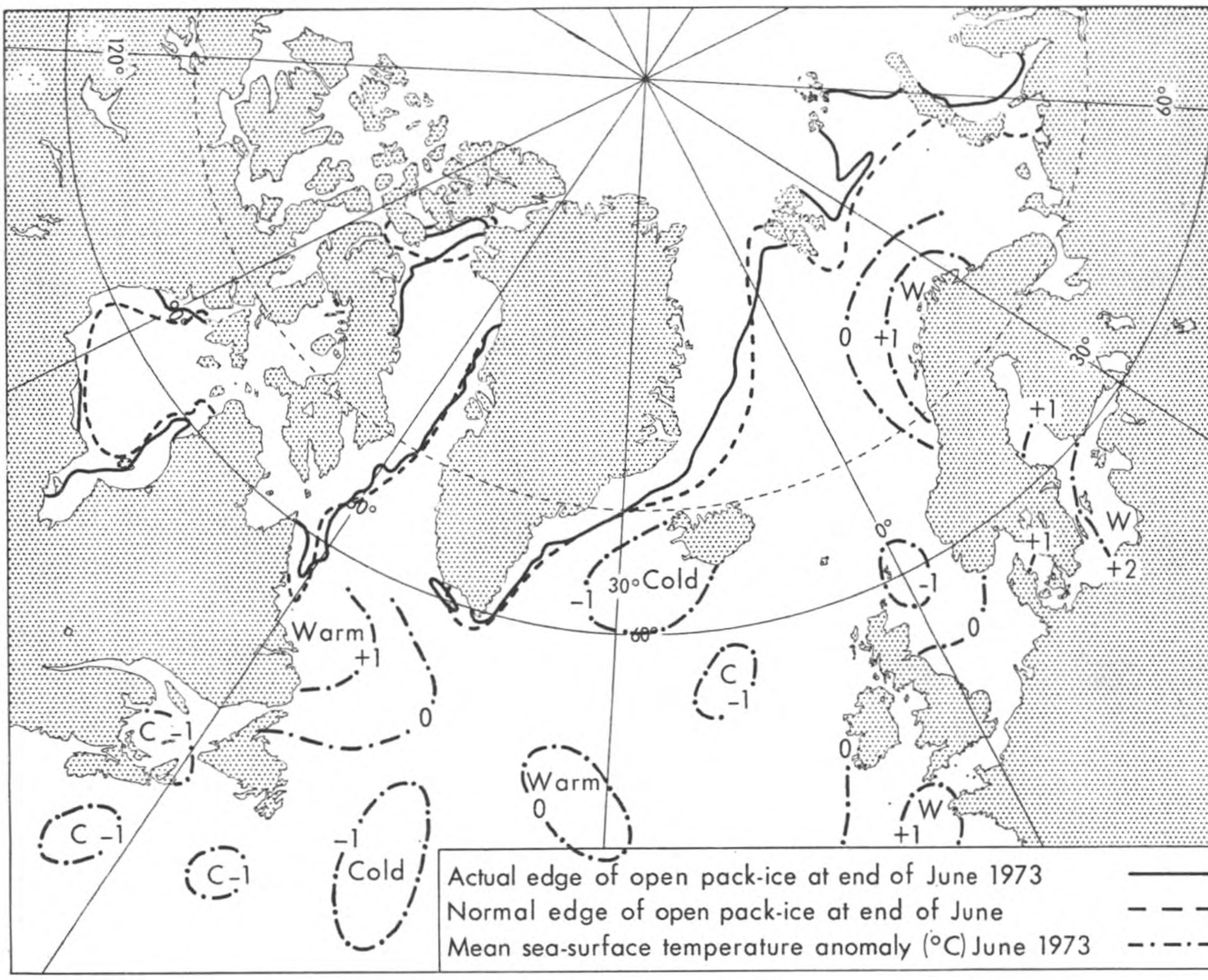

Mean surface-pressure anomaly (mb) April 1973
Mean air-temperature anomaly (°C) April 1973
High
Low

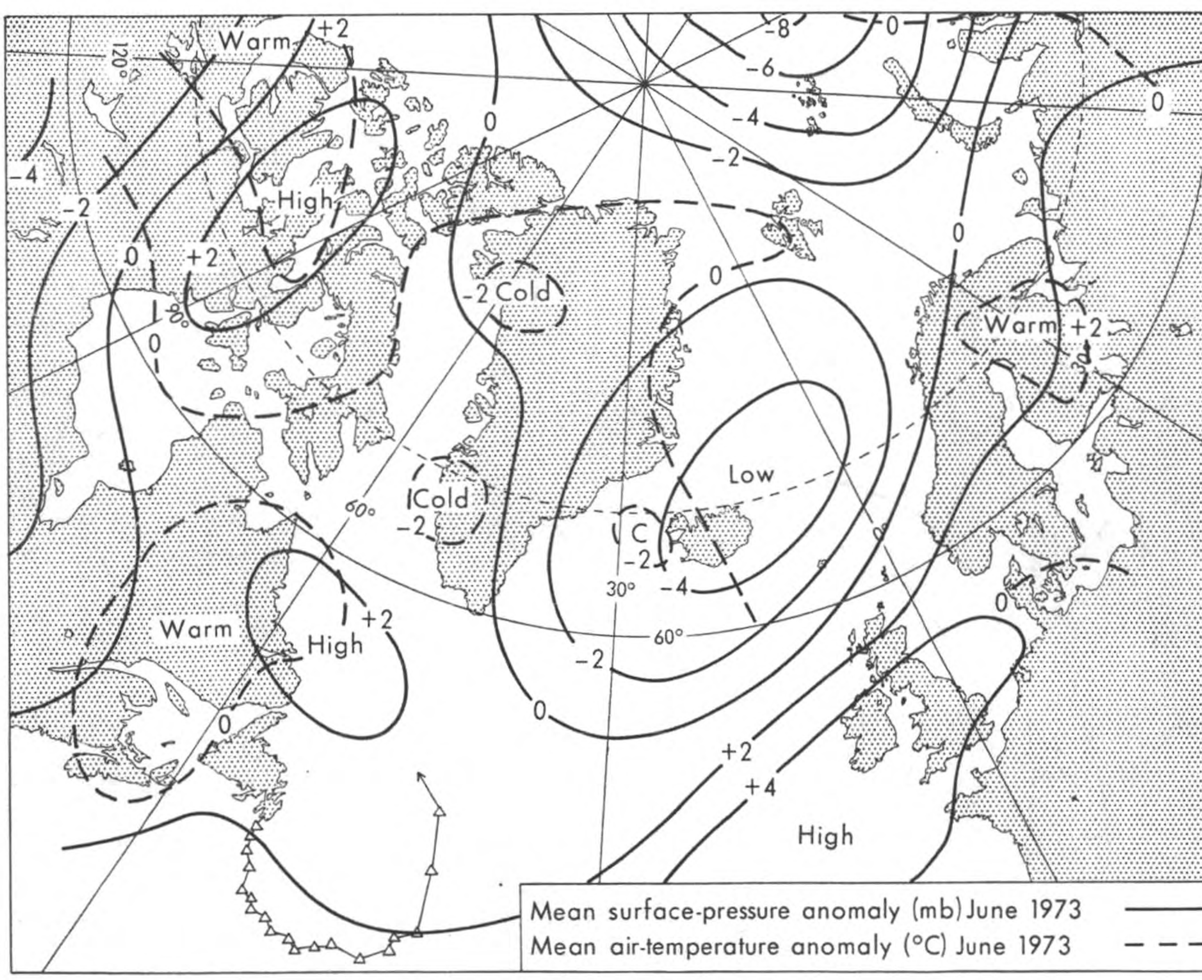


Warm
Cold
Cold
W
+1
C-1
C
-1
-2
0
+1
+2
120°
90°
60°
30°
Actual edge of open pack-ice at end of May 1973
Normal edge of open pack-ice at end of May
Mean sea-surface temperature anomaly (°C) May 1973



Warm
Warm
Low
Low
Low
High
High
C
-4
+4
-2
0
+2
+6
+8
60°
30°
Mean surface-pressure anomaly (mb) May 1973
Mean air-temperature anomaly (°C) May 1973


Actual edge of open pack-ice at end of June 1973
Normal edge of open pack-ice at end of June
Mean sea-surface temperature anomaly (°C) June 1973
Warm
+1
0
Cold
-1
C
W
+2
30°
60°
120°


Mean surface-pressure anomaly (mb) June 1973
Mean air-temperature anomaly (°C) June 1973
High
Low
Warm
Cold
C
+2
+4
0
-2
-4
-6
-8
30°
60°
120°

Baltic Ice Summary: April–June 1973

No ice was reported at the following stations during the period: Riga, Klaipeda, Ventspils, Tallin, Mariehamn, Turku, Mantyluoto, Vaasa, Bredskar, Sundsvall, Kalmar, Skellefteå, Göteborg, Visby, Emden, Lubeck, Hamburg, Bremerhaven, Kiel, Flensburg, Stettin, Gdansk, Stralsund, Rostock, Aarhus, Copenhagen, Oslo, Kristiansandfjord.

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

Station	April									May								
	Length of Season		Ice Days			Navigation Conditions			Accumulated Degree Days	Length of Season		Ice Days			Navigation Conditions			Accumulated Degree Days
	A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I
Leningrad	1	13	13	4	0	2	3	0	273	0	0	0	0	0	0	0	0	—
Pyarnu	1	10	10	0	4	2	3	0	43	0	0	0	0	0	0	0	0	—
Viborg	1	22	22	20	0	3	6	13	—	0	0	0	0	0	0	0	0	—
Helsinki	1	3	3	0	0	0	0	0	137	0	0	0	0	0	0	0	0	—
Oulu	1	23	23	23	0	0	23	0	595	0	0	0	0	0	0	0	0	—
Roytaa	1	22	22	0	13	0	22	0	—	5	11	6	0	3	0	5	0	—
Lulea	1	30	30	30	0	0	30	0	590	1	16	16	7	0	0	7	0	420
Stockholm	1	1	1	0	0	1	0	0	—	0	0	0	0	0	0	0	0	—

CODE:

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

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

AUSTRALIAN EXCELLENCE AWARDS

(From the Director of Meteorology, Australian Bureau of Meteorology)

The following ships and ships' officers were selected to receive Excellence Awards for 1971–72.

Ship Awards

m.v. *Chakdina*, P. & O. Lines of Australia Ltd.
m.v. *Wongala*, Tucker Shipping Pty. Ltd.
m.v. *Cape Don*, Department of Shipping and Transport, Australia

Personal Awards

Captain A. J. Johnston	m.v. *Ariake*, P. & O. Lines of Australia Ltd.
Captain Titchmarsh	m.v. *Kanimbla*, Union Bulkships Pty. Ltd.
Mr. D. Ellsmore	Radio Operator, m.v. *Ariake*, P. & O. Lines of Australia Ltd.
Mr. K. Hicks	2nd Officer, m.v. *Nimos*, Containers Pacific Express Line
Mr. L. R. Lestury	Radio Operator, m.v. *Al Mahrosa*, Kuwait S.S. Co. Ltd.
Mr. P. Beyfus	2nd Officer, m.v. *Beroona*, Western Australian State Shipping Commission

Book Review

In the Wake of the "Torrey Canyon", by Commandant L. Oudet. (Translated from the French by F. George.) 216 mm × 134 mm, pp. 71. The Royal Institute of Navigation. Distributors: Hollis & Carter Ltd., 9 Bow Street, London WC2E 7AL, 1972. Price: £1·00.

Once again Commandant Oudet has contributed a valuable addition to the library of maritime matters with the publication by the Royal Institute of Navigation of this excellent book. The author, admittedly drawing on facts of the *Torrey Canyon* disaster disclosed by Richard Petrow in his book *The Black Tide*, has nevertheless produced a study which looks at the incident within the wider sphere of maritime operations.

The book is divided into two parts and the author's conclusions. The circumstances which led to the grounding of the *Torrey Canyon* on the Seven Stones rocks and the subsequent Commission of Inquiry, about which the author makes some very critical remarks, comprise Part I. In Part II, under five 'lessons' drawn from the disaster, Commandant Oudet discusses maritime jurisdiction, safety at sea, flags of convenience, navigation and the pollution of the sea.

The author very eloquently and forcefully makes a case for the shipmaster, not only for the unfortunate Captain Rugiati, Master of the *Torrey Canyon*, but for justice for all masters whose ships sail the oceans of the world and who bear the responsibility for their ships and cargo. This book should be essential reading for every master and navigating officer sailing under whatever flag, because what Commandant Oudet has to say in these 71 pages is of prime importance to all of them. It is also of importance to all those whose business it is to manage, organize and make decisions on procedures associated with maritime commerce and practices because the author highlights many defects which still exist in the sphere of the industry. In short, this is a valuable book for all of us.

G.V.M.

Personalities

RETIREMENT.—CAPTAIN A. CRAWFORD retired from a sea career lasting 45 years when he brought the *Southampton Castle* into Southampton in April.

Archibald Crawford was born on the Isle of Arran and made his first voyage in 1928 as an Apprentice with P. Henderson and Co. in their *Amarapoora*.

He passed for 2nd Mate in 1932 and subsequently joined George Nisbet and Co. for a spell of 3½ years where he served as 3rd and 2nd Officer in their *Blairbeg* and *Blairesk*.

Captain Crawford then moved to Clan Line Steamers as 4th Officer in the *Clan Chisholm* in 1937. He stayed with the Cayzer Irvine Group for the remainder of his career and obtained his first command with them, the *Herminius*, in 1958.

In 1943 he was 2nd Officer in the *Clan Campbell* which survived an enemy air attack in the Western Mediterranean and which subsequently picked up survivors from the *Rhona* which had been bombed and sunk.

Captain Crawford's record of voluntary observing goes back to 1953 when he was in the *Clan Brodie*. Since then he has, in 16 years, sent us 29 meteorological logbooks, 11 of which have been classed Excellent.

We wish him health and happiness in his retirement in Glasgow.

D.R.MCW.

RETIREMENT.—CAPTAIN A. N. HIRST has retired after 46 years with the Silver Line.

Austin Newton Hirst was born at Sunderland in 1912; he was a great-grandson of S. T. Austin, Shipbuilder of that port and founder of the present-day firm Austin & Pickersgill Ltd.

In 1927 he signed indentures with Messrs. S. & J. Thompson Ltd., later to become the Silver Line, and joined the *Silverguava* for her maiden voyage. He completed his indentures during the voyage and, in August 1931, returned home as her acting 4th Officer.

He passed for 2nd Mate in 1931 and joined the Cunard *Bantria* as 3rd Officer, the ship then being under the management of S. & J. Thompson.

Captain Hirst passed for Master early in 1939, was promoted Chief Officer in 1940 and attained his first command, the *Silvermaple*, in 1951.

Captain Hirst describes his World War II as uneventful though at one time his ship was kept in the Persian Gulf on stand-by to evacuate the civilian population of Basra and district, which in fact was not required due to the timely arrival of H.M.S. *Emerald* and British troops. Later on he picked up the survivors of a torpedoing in the North Atlantic.

After the War, in 1952, he had a similar experience when he rescued the entire crew of the s.s. *Romana* which had foundered in the Atlantic.

After forty years' service, Captain Hirst received a gold watch from the Silver Line.

Captain Hirst's connection with voluntary observing goes back to 1929 when his ship was associated with the United States Weather Bureau but his connection with the British Office dates from 1946 when we received his first meteorological logbook from the *Silveroak*. Since then he has in thirteen years sent us 17 meteorological logbooks and received an Excellent Award in 1953.

Captain Hirst is a Vice-President of the Mercantile Marine Service Association. We wish him health and happiness in his retirement.

L.B.P.

Notice to Marine Observers

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

Headquarters.—Captain G. A. White, Marine Superintendent, Meteorological Office (Met.O.1a), Eastern Road, Bracknell, Berks. RG12 2UR. (Telephone: Bracknell 20242, ext. 2456.)

Captain G. V. Mackie, Deputy Marine Superintendent. (Telephone: Bracknell 20242, ext. 2543.)

Lieut.-Commander L. B. Philpott, D.S.C., R.D., R.N.R., Nautical Officer. (Telephone: Bracknell 20242, ext. 2461.)

Mersey.—Mr. W. G. Cullen, Master Mariner, Port Meteorological Officer, Room 709, Royal Liver Building, Liverpool L3 1HN. (Telephone: 051–236 6565.)

Tyne.—All enquiries to Mr. W. G. Cullen above.

Thames.—Mr. J. C. Matheson, Master Mariner, Port Meteorological Officer, Movement Control Building, South Side, Victoria Dock, London, E16 1AS (Telephone: 01-476 3931.)

Bristol Channel.—Mr. D. J. F. Southon, Master Mariner, Port Meteorological Officer, 2 Bute Crescent, Cardiff CF1 6AN. (Telephone: Cardiff 21423.)

Humber.—Mr. W. A. McCrindle, Master Mariner, Port Meteorological Officer, c/o Principal Officer, Dept. of Trade and Industry, Trinity House Yard, Hull HU1 2LN. (Telephone: Hull 223066, ext. 27.)

Clyde.—Mr. H. M. Keenan, Master Mariner, Port Meteorological Officer, 118 Waterloo Street, Glasgow G2 7DN. (Telephone: 041-248 4379.)

Forth.—All enquiries to Mr. H. M. Keenan above.

Southampton.—Captain D. R. McWhan, Port Meteorological Officer, Southampton Weather Centre, 160 High Street below Bar, Southampton SO1 0BT. (Telephone: Southampton 20632.)

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[*Subjects of* Book Reviews, Editorial, Notice to Marine Observers, Photographs *and persons named in* Retirement *and* Obituary *notices are indexed under these general headings.*]

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