The Met.Office

The Marine Observer

A quarterly journal of Maritime Meteorology

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prepared by the Marine Division of the
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A QUARTERLY JOURNAL OF MARITIME METEOROLOGY PREPARED BY THE MARINE DIVISION OF THE METEOROLOGICAL OFFICE

VOL. 64 **No. 323** **JANUARY 1994**

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COVER PHOTOGRAPH: Meteorological equipment on R.R.S. *Discovery* photographed by Mr T.J. Boult during the 1992/93 Antarctic season.

Letters to the Editor, and books for review should be addressed to the Editor, *The Marine Observer*, Met. Office (OM), Scott Building, Eastern Road, Bracknell, Berks RG12 2PW.

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Editorial

As the years pass and outlook matures, the unexpected comes as less of a surprise than hitherto, and in the mariner's case there is perhaps an enhanced expectation of the unexpected.

It was therefore with more amusement than surprise that the writer learned by chance from *Marriners*, the house journal of Marr's of Hull, that our Branch Director, Marine Superintendent Captain Gordon Mackie, recently ran aground in the vessel in which he was the senior officer present at the time. The craft concerned was the jolly-boat with outboard from our Ocean Weather Ship *Cumulus*, and the occasion was his return to the shore after witnessing verification trials of radiosonde equipment on board the weather ship in Stornoway's Broad Bay. Rather than proceed with *Cumulus* out to Ocean Station 'Lima' in mid-Atlantic for the following few weeks, he commandeered the only available craft for disembarkation to the Isle of Lewis: he ended up having to paddle himself the last few yards to the beach.

Heavy weather experienced by *Cumulus* also featured in the United States' National Weather Service quarterly *Mariners Weather Log* under the heading 'Monster of the Month' for January 1993. On this occasion we had not been pre-empted as the report confirmed statistics published in the July 1993 edition of this journal, noting that our weather ship had measured a pressure of 972 mb in southerly winds of 45 knots on 9 January on station in 57°N, 18°W. The lowest pressure on record for that storm, 916 mb as it moved across the Faeroe Islands, apparently caused envy amongst our American cousins as it was less than that recorded for their Hurricane Andrew. The U.S. periodical also reported that OWS *Polarfront*, maintaining her regular vigil off Norway's north-western shores on 8 January, had battled 49-ft seas in a 59-knot south-westerly in 66°N, 02°E.

As the Marine Superintendent has been closely involved with the introduction of GMDSS since its birth, it was of interest to read in an internal circular that the Global Maritime Distress and Safety System is being introduced to Royal Navy ships, to comply with IMO regulations to automate and improve emergency communications for the World's shipping industry, i.e. all convention ships over 300 grt and all passenger ships are required to comply with the GMDSS standards.

HM ships have the duty under International Convention to assist in search and rescue operations wherever possible: it is Naval Staff Policy that they should comply as far as practicable with the GMDSS regulations. Naval ships are therefore to be equipped with Emergency Position Indicating Radio Beacons (EPIRBs), Search and Rescue Transponders (SARTs), Waterproof Portable [VHF] Radios (WPRs) and NAVTEX. Equipment carried will be determined by the ship's area of operation in accordance with the rules for IMO sea areas A1 to A4. This is obviously the correct policy for ensuring co-operation on safety measures between shipping for commercial and defence purposes, and it is hoped that other navies of the world are following suit.

The Met. Office *Charter Standard For The Public*, which was promulgated in mid-1993, contains many laudable aims and targets, some of which are pertinent to mariners and their mentors.

We aim to serve the public by providing:

Up-to-date weather information and forecasts. This confirms the commitment of the Met. Office to provide weather information and forecasts through radio and television, newspapers, telephone and facsimile services.

Warnings. Gale warnings and marine forecasts will be provided by radio. Warnings of severe weather will also be issued through radio and television and to emergency organizations such as the police and fire services.

Advice in emergencies. Provision of warnings of coastal flooding to the National Rivers Authority and the police, also weather advice for the statutory authorities regarding pollution emergencies caused by the release of toxic chemicals into the atmosphere, oil spills and nuclear accidents.

Weather and climate information. Maintenance of the National Meteorological Library and Archive at Bracknell which you may visit free of charge, and development of low-cost publications containing basic weather and climate information for schools and the general public. [Masters and observing and radio officers are reminded that the Marine Division is housed in the same building as the Archive, and they are welcome to contact us to arrange a visit.]

To enable us to achieve this we will:

Operate around the clock. To keep forecasts up to date, the Met. Office operates 24 hours a day, every day of the year.

Monitor the weather continuously. Maintenance of a comprehensive U.K. network of observing stations (including voluntary observing ships). Access to observations from all other parts of the globe through our membership of the World Meteorological Organization. If we do not know what is happening today, we cannot forecast for tomorrow.

Play a leading role internationally. To play a full part in the development of meteorological science and operations through international collaboration. The Met. Office is a world centre for the provision of forecasts to civil aviation.

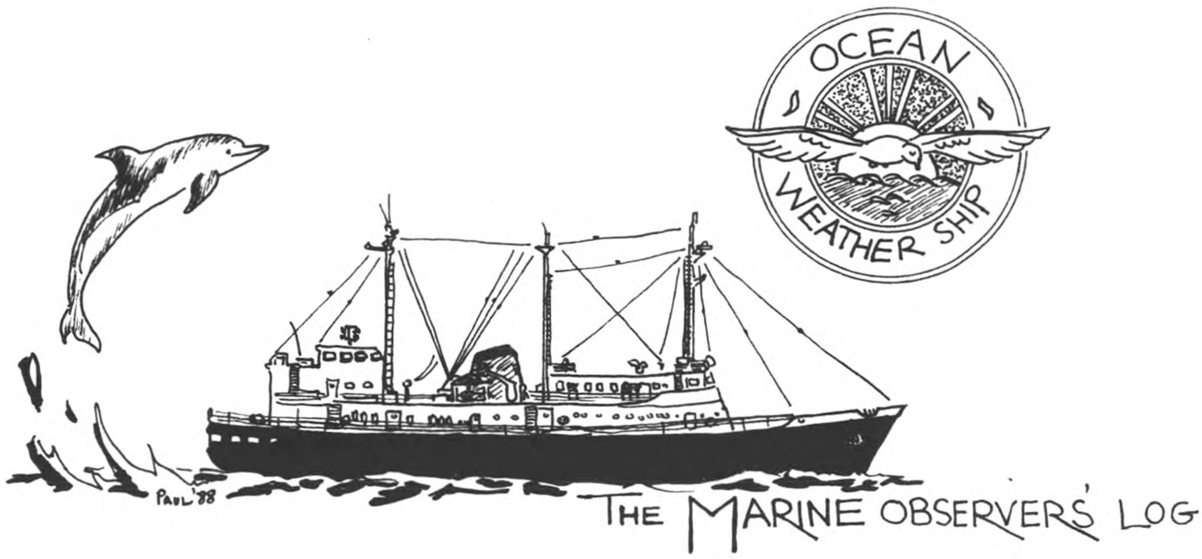
To measure how well we are doing we will:

Ask you in public surveys. These are conducted regularly by independent consultants among representative samples of the public. They give you an opportunity to comment on Met. Office performance and say how they could be improved, and what new ones you would like. The Office welcomes your opinions and criticisms and will react positively to them.

To conclude, marine observers may be aware that the Executive Council of the World Meteorological Organization has agreed that their annual World Weather Day for 1994 should recognise the role of the observer. This is something that is very dear to our hearts in the U.K., with our large number of voluntary observers, which include synoptic, climatological and rainfall observers on land, but particularly the great band of the Corps of Voluntary Observers at sea.

The date set for WMO World Weather Day is 23 March 1994 but throughout the whole year we aim to recognise the efforts of our voluntary marine observers of all ranks, whose co-operation in regular observing benefits the Met. Office and therefore the national good, as well as benefiting all nations who receive the fruits of their efforts. At the start of this special year of recognition of your continuing vital contributions to the forecasting and understanding of the weather, we send thanks and wish you success and satisfaction with your lot in 1994.

J.F.T.Houghton



January, February, March

The Marine Observers' Log is a quarterly selection of observations of interest and value. The observations are derived from the logbooks of marine observers and from individual manuscripts. Responsibility for each observation rests with the contributor. All temperatures are Celsius unless otherwise stated. The standard international unit for barometric pressure is the hectopascal (hPa) which is numerically equivalent to the millibar (mb).

SEVERE DEPRESSION

Eastern North Atlantic

m.v. *Providence Bay*. Captain D. Tracey. Norfolk, Va. to Savannah. Observers: the Master and ship's company.

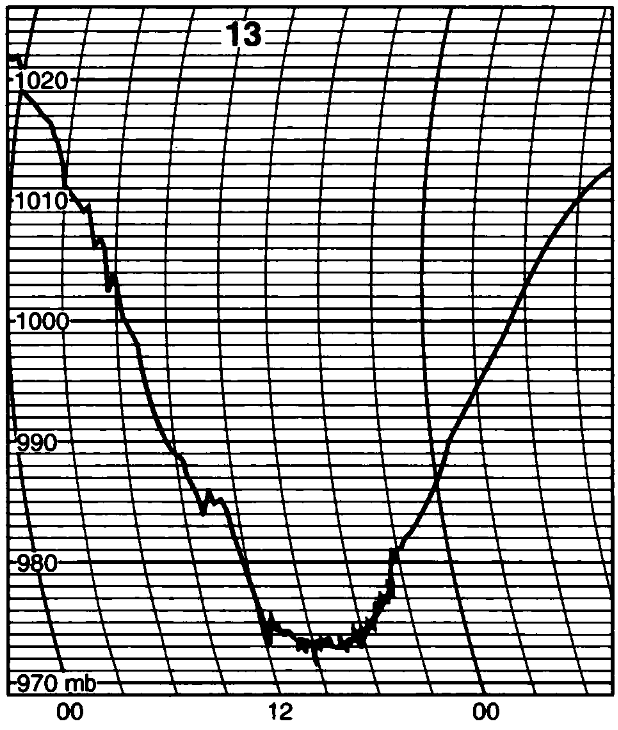
13–14 March 1993. Whilst on passage a storm later described by the United States Weather Bureau as 'The storm of the century' was encountered. The storm originated in the Gulf of Mexico then devastated the eastern seaboard of the United States as it travelled northwards. The observers were able to confirm this simple statement because they were 'fortunate' enough to be in it.

The vessel departed Norfolk at 0630 UTC on the 13th having received warnings by SATCOM, radiotelex and NAVTEX of severe weather conditions on the eastern seaboard. The Master and First Officer concluded that as winds in excess of 90 knots were forecast, it would be prudent to take the vessel to sea rather than risk becoming a permanent monument on the beach, somewhere in Norfolk harbour.

Pressure fell rapidly but by 1300 the wind was still only force 4, although heavy rain showers were being experienced. Between 1400 and 1700 the wind steadily increased to force 9–10 and veered from E'ly to SSE'ly accompanied by very rough seas and a heavy south-south-easterly swell and torrential rain showers.

The following observations were made during the 13th and 14th and the barograph trace shows the pressure changes experienced.

Date/time (UTC)	Wind Dir'n	Wind Force	Temperature Air	Temperature Wet	Pressure (mb)	Speed made good (knots)
13th 1400	E	9	12.2	12.0	988.5	13.5
1500	SE×S	5	13.0	13.0	985.3	10.5
1700	SSE	9/10	19.0	19.0	972.9	8.5
1800	SSE	11	18.2	17.9	973.3	4.5
1900	SSW	10	18.2	16.5	973.4	5.2
2000	SSW	11	–	–	973.2	5.4
2100	SW	11	–	–	973.4	4.8
2200	SW	12	–	–	974.0	2.4
2300	SW	12	–	–	975.8	2.4
14th 0000	SSW	12	10.2	9.6	975.5	2.4
0100	SSW	12	10.6	9.8	978.9	1.4
0200	WSW	11	7.9	6.3	983.4	1.6
0300	SW×S	11	7.0	6.0	984.8	2.0
0400	WSW	11	6.8	5.5	985.8	2.7
0500	W×S	11/12	6.3	4.9	988.6	2.6
0600	WSW	10	4.0	3.0	991.6	2.6



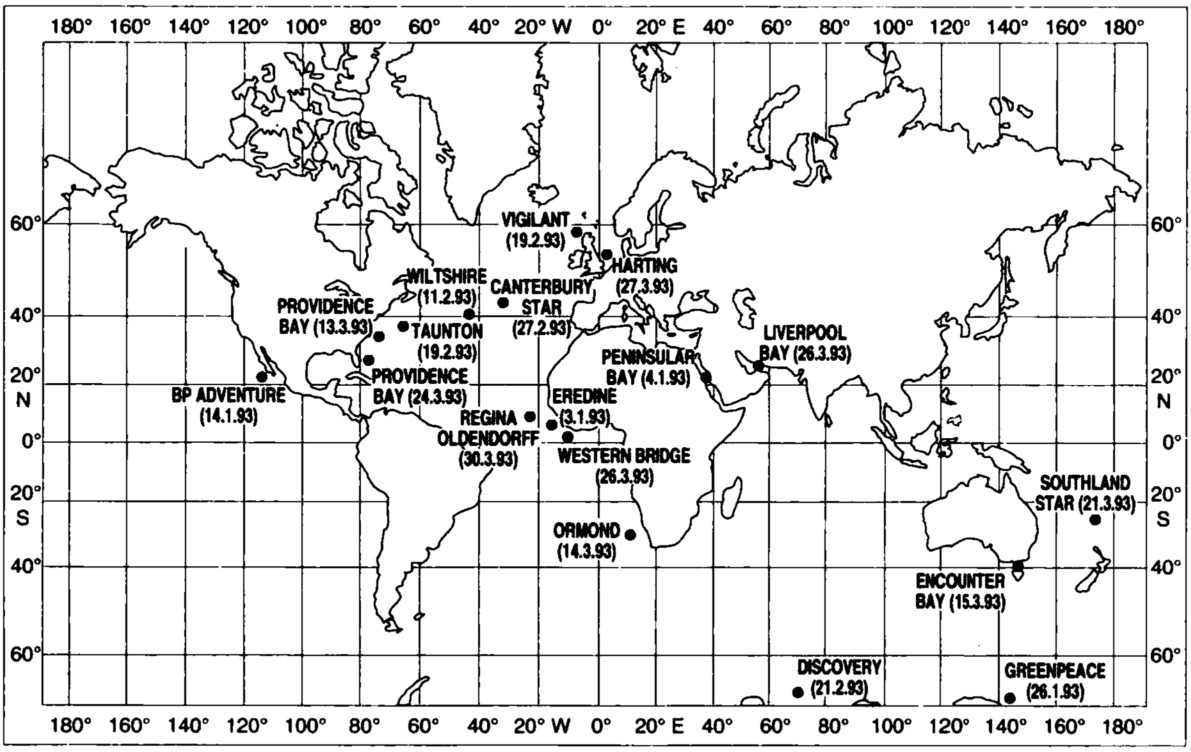
During the course of the afternoon and evening the wind increased to force 12 as the seas and swell progressively reached phenomenal proportions. The vessel's speed had been gradually reduced to ease the motion, turning enough r.p.m. to maintain steerage way. Nevertheless, the vessel continued to pitch very heavily and roll violently from time to time; 40 degrees was the 'best' noted by the observers while hanging on and dodging the unguided missiles. The Third Officer tried to emulate Eddie 'the Eagle' Edwards but fortunately, the wheel-house door was closed and only his pride was dented. The observers tried to recall if there was a theory of large container ships losing stability in very heavy seas; they decided that any names were irrelevant, but the theory could be right.

By this time, the vessel was some 30 n.mile south-east of Cape Hatteras making good a speed of 1.4 knots, steering 240° and making good 150°. The services of the GPS and LORAN systems were appreciated, the observers knew where they were even if they could not see where they were going.

Between 0600 and 1700 on the 14th the weather gradually moderated as the storm tracked to the north and the *Providence Bay* headed south to sunnier climes, only to find snow in the southern states and the tennis in Florida wiped out. In conclusion, it had been a rather bumpy ride and the vessel is claiming the patent for the design of the new roller-coaster for Alton Towers.

Position of ship at 0100 UTC on the 14th: approximately 35° 00'N, 75° 00'W.

Editor's note. An article on the 'Storm of the Century' appears on page 29 of this journal.



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

SEA SMOKE AND WATERSPOUT

Western North Atlantic

m.v. *Taunton*. Captain J.H. Lacey. Rotterdam to Hampton Roads. Observers: the Master and ship's company.

19 February 1993. At 1600 UTC wisps of sea smoke indicated the vessel's entry into the area of influence of the Gulf Stream as the sea temperature rose to 18°, the air temperature being 6°. Two hours later the sea smoke was much more dense and was accompanied by frequent showers of rain, hail and occasionally of snow, all associated with a strong N'ly wind.

At 2100 the sea and air temperatures were 21° and 6° respectively, and sea smoke was present continuously, reducing the visibility to 50 m at times; towering black cumulonimbus clouds with bases at about 1000 feet were also observed all around accompanied by rolling banks of sea smoke/fog and frequent showers of driving snow and rain. Ahead of the ship on either bow, waterspout development from the cloud base was seen.

The waterspout on the port bow did not extend to the sea surface and dissipated after five minutes, but the one on the starboard bow developed to reach the surface and then travelled southwards. Disturbance of the sea surface measuring 50–100 m in diameter could be seen extending to about 0.5 n.mile from the ship. Once the waterspout had reached the port bow its upper reaches broke up although the banks of cumulonimbus continued and dense sea smoke persisted.

The sea smoke continued into the next day and had cleared by 1800 when the ship left the influence of the Gulf Stream.

Position of ship at 1200 UTC on the 19th: 37° 24′N, 67° 12′W.

Note. Mr M. Rowe, of the Tornado and Storm Research Organisation, comments:

'This is an unusual report, associating waterspout activity with sea smoke at the boundary of the Gulf Stream. The waterspout that did not reach the surface was, strictly speaking, a funnel cloud. It is useful to know the width of the true waterspout, and the weather conditions in detail.'

GUST

North Atlantic Ocean

f.p.v. *Vigilant.* Captain H.A. MacKenzie. Greenock to Stornoway. Observers: the Master, Mr J.P. Laycock, 1st Officer, Mr J. Buchan, Seaman and ship's company.

17 January 1993. At 0600 UTC as the vessel was proceeding south-westwards through the Sound of Shiant (east of the Isle of Harris) the First Officer, who was sending the observation via SATCOM, noticed the vessel heel over as a tremendous gust of wind hit it. The Master was called to the bridge, and the second engine was clutched in. From the anemometer it was noted that the wind was W×N'ly, force 12, with gusts of 85 knots.

The associated pressure change was quite spectacular: at 0600 the barometer read 963.8mb, and at 0705 the barograph showed a rise of 12 mb in one hour. Moderate rain ceased at 0725 and then the cloud began to break up, the wind being W×N'ly, force 10, pressure 981.9 mb (a rise of 20 mb since 0605). By 1200 the pressure had risen to 996.0 mb.

Following the engaging of the second engine the vessel continued on passage, allowing 40° leeway. Temperatures at 0600 were: air temperature 8.1°, wet bulb 7.8°, sea 7.8°.

Position of ship: 57° 54′N, 06° 30′W.

Editor's note 1. The depression responsible for this observation developed from a complex area of low pressure having two centres, which developed at roughly 45°N, 35°W during 15 January. As it tracked north-eastwards towards Iceland, the westernmost centre deepened more rapidly than its partner and, at the time of the observation, was to the south-east of Iceland with a central pressure of 956 mb, the other centre having formed a lesser feature. A very strong westerly airflow followed the passage of the cold front associated with the depression, allowing gusts such as that noted by the observers. Before it finally began to fill, the depression generated a central pressure of 949 mb.

Editor's note 2. This depression was also probably responsible for a 15-m wave encountered in the Irish Sea by the ferry *Stena Hibernia* (currently reporting in the MARID code) while crossing from Holyhead to Dun Laoghaire on the 17th, and which caused some injury and damage to persons and vehicles on board.

PASSAGE OF FRONT

South Pacific Ocean

m.v. *Southland Star*. Captain W. Jones. Auckland to Suva. Observers: Mr P.T. Clegg, Chief Officer, Mr O. Tati, 2nd Officer and Mr K. Tuipulotu, AB.

21 March 1993. At 1230 UTC a period of continuous moderate rain commenced, the rain apparently being within 6–8 n.mile of the vessel. The wind backed at 1815 and freshened to E'ly, force 4/5 while the rain continued and pressure fell rapidly.

An hour later the wind veered to S×E'ly and increased to force 6 as the rain intensified. About 0.5 n.mile on the starboard bow a small whirlwind was apparently trying to develop into a waterspout, but activity ceased after two or three minutes. The pressure fluctuated for 20–30 minutes after this before the rain eased and a horizon could be seen ahead. The general appearance of the sea in the immediate visible area was very disturbed, like that of tide-rips, although no abnormal steering effect was noticed.

Photo. supplied by O. Tati

Cloud striations

At 2015 the wind was veering rapidly and settled between NNW'ly and N'ly, force 5/6, and 30 minutes later as the vessel moved ahead into clearer weather with isolated showers, the clouds astern became striated across an arc of 60°, showing great contrast between the striations, see photograph.

Position of ship at 1800 UTC: 26° 48′S, 176° 36′E.

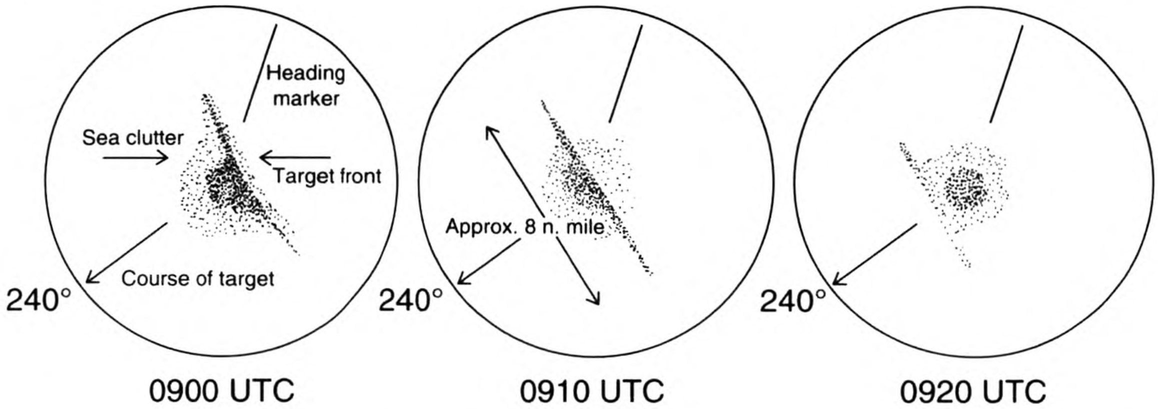
RADAR ECHO

Western North Atlantic

m.v. *Providence Bay*. Captain D. Tracey. New Orleans to Norfolk, Va. Observers: Mr G. Bissett, 2nd Officer and Mr D. Stevens, Cadet.

24 March 1993. At 0900 UTC an elongated target, as shown in the sketches, was observed on both X- and S-band. At first, it was assumed to be a large, dense

rain cloud approaching on the starboard bow, but after going to the bridge wing to sight it visually, the area in the vicinity of the radar target was found to be cloudless.



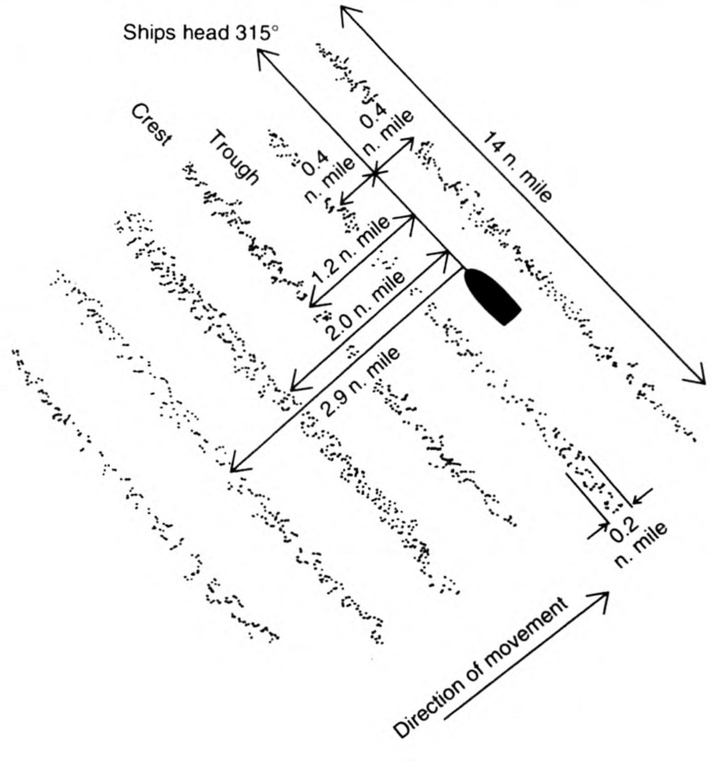
A radar plot of the target was executed to obtain course and speed; on completion, a course of 240° and a speed of 12 knots was calculated. As the wind was force 2–3 at the time and observed wave height was 0.3–0.5 m, it was thought the echo was of a lone phenomenal non-breaking wave. The 'wave' remained on the radar screen for a period of about 30 minutes after which time it slowly became unobservable. No additional movement of the vessel was incurred as it encountered the phenomenon.

Position of ship: 28° 58′N, 78° 32′W.

Equatorial Atlantic

m.v. *Wiltshire*. Captain A.G. Smith. Aratu, Brazil to Nuevitas, Cuba. Observer: Mr J.R. Parsons, Chief Officer.

11 February 1993. At approximately 0600 UTC the wave-like phenomenon shown in the sketch was observed on both the 3- and 10-cm radar screens. The



display showed that the period from one 'crest' to the next was about 20 minutes and although no wave could be seen visually the ship did throw a few moderate rolls and the sea was 'choppy' at the crests. When observed visually, the crests actually approached the vessel against the on-coming wind and swell, with their width being about 0.2 n.mile wide and having an average distance between them of 0.8 n.mile.

As the second and third crests passed, the choppy state of sea was more pronounced; the sea temperature was taken in successive crests and troughs and was found to lie between 26.5° and 27.0°, the wind being NE'ly, force 4 throughout; no marked rise or fall in pressure was noted. It was thought possible that the phenomenon was of seismic origin.

Position of ship: 00° 12'N, 42° 00'W.

Editor's note. As the observers on the *Providence Bay* (pp. 10–11) realised, their phenomenon was probably an internal wave generated by differing currents, salinities and densities of the waters in the region of the Gulf Stream. Similar conditions could also have been responsible for the *Wiltshire* report, which occurred within the region of influence of the freshwater outflow from the rivers Amazon and Orinoco.

Fedorov and Ginzburg [Phenomena on the sea surface, as studied from visual observations, *The Marine Observer*, 1987, pp.116–121, 190–196.] state that both areas are among those from which anomalous conditions at the surface are most frequently reported. With regard to the *Wiltshire* report the authors have also stated that "multiple alternating parallel bands of ripples, surges, or intense turbulence and more tranquil water accompanied by yawing of the ship" ... "is univocally interpreted as visible phenomena which are manifestations of internal wave trains on the sea surface, sometimes occurring because of [internal] fronts".

It should be noted that the text of this article was translated from Russian, and that English equivalents of the word 'surges' include 'disturbed water', 'rough water' and 'choppy water'.

CETACEA

North Atlantic Ocean

m.v. *Canterbury Star.* Captain J.F. Rowe. Puerto Limon to Zeebrugge. Observers: the Master and Mr A. Giron, 2nd Officer.

12 February 1993. Between 1530 and 1615 UTC whilst the vessel was stopped for minor engine repairs a large school of whales numbering 25–30 was seen to approach from the south-west and circle around off the starboard bow at a distance of about 90 m. The school then moved to the port bow and down the port side (lee side) coming very close to the vessel and circling just below the port bridge wing for about 30 minutes.

Dark slate or grey-black in colour, the whales had flat 'noses' with blowholes well to the front while their tails were fairly large. The biggest whales were about 7.5 m long while the smaller ones were roughly 3–4 m long. Moving aft, the whales then circled off the stern before returning to the port side, then to the port bow and finally back to the starboard bow where they continued circling.

By this time the vessel was ready to resume passage, so to avoid any chance of striking them the engines were put briefly to Dead Slow but the noise obviously disturbed them and they moved away southwards. A possible identification for the whales was that they were female Sperm Whales with their young.

At the time of the observation the wind was SW'ly, force 7, the sea was moderate to rough with a moderate northerly swell and the weather was partly cloudy with occasional heavy rain squalls.

Position of ship: 43° 16'N, 31° 55'W.

MARINE LIFE

Southern Ocean

m.v. *Greenpeace*. Captain A. Sorensen. Scientific cruise off Australian Antarctic Territory. Observers: the Master and ship's company.

26 January 1993. At 1800 UTC whilst drifting, long string-like objects were observed in the sea alongside the vessel, and were initially thought to be lengths of string or rope. There were two types: one was fronds about 45–60 cm in length, each having a transparent body with bright-orange (nearly 'dayglo') pods or seeds which were nodule-like and occurred every 5 cm. The fronds moved with the water, usually below the surface but sometimes breaking the surface to give a mucous-like appearance.

The second type was shorter, about 22 cm long and was white, almost phosphorescent in the clear, smooth water. It appeared to have or contain nodules like the first type but this could not be confirmed. These latter were also moved by the water although in a more jerky fashion than the former, giving the impression that they were stiffer in construction. They also tended to be curled into a half-circle shape whereas the orange fronds lay at full length.

The wind was variable, force 2 and the sea conditions were smooth to slight with very clear water.

Position of ship: 65° 02′S, 147° 09′E.

BIRDS

North Sea

m.v. *Harting*. Captain J.M. McCuaig. Norway to the Thames. Observers: Mr J.B. Nichols, Chief Officer, Mr L. Doyle, Bosun and members of ship's company.

27 March 1993. During the day a Water Rail was found resting on deck when the vessel was about 40 n.mile north-east of the Norfolk coast, in the Smiths Knoll area. When disturbed the bird flew through an open door and settled in the Bosun's cabin. It showed no signs of being distressed and when released on deck it immediately flew off in the direction of the coast. The rail's bill was about 10 cm long and was a vivid scarlet colour. (See photograph on page 38.)

It was not known whether these birds normally migrate or if it had strayed. Winds had been light, mainly N'ly during the previous 48 hours.

Position of ship: 53° 08′N, 02° 41′E.

Note. The *Harting* trades mainly in British waters and makes observations in the MARID code.

BAT

Equatorial Atlantic

m.v. *Eredine*. Captain J.A. Hofton. Juaymah to Le Havre. Observer: Mr A.R. Parker, 2nd Officer.

3 January 1993. At about 1800 UTC a bat was discovered on board. It was 12 cm long from head to tail and had an unknown wing-span which may have been roughly 30 cm; it was grey with a creamy-white underbelly and had beady brown eyes with an evil glint. The bat carried at least one passenger, assumed to

be fleas and these were the largest the observer had ever seen, being brown and about 5 mm long. They moved very quickly in a staccato manner.

There was some oil or tar on the bat's chest which seemed to cause some discomfort for the area was scratched with a hind leg.

Position of ship: 05° 18′N, 14° 12′W.

Note. Mr J.E. Hill, late of the Department of Zoology, Natural History Museum, comments:

'This record supplements previous reports of bats at sea in this region and it seems likely that some factor such as a strong NE'ly offshore wind blows them off course at times.'

GECKO

Red Sea

m.v. *Peninsular Bay*. Captain K.J. Owen. Singapore to Suez Canal. Observers: Mr J.H. Lafferty, 3rd Officer and Mr R. Miles, Senior Seaman.

4 January 1993. A small gecko about 6 cm long was discovered on the poop deck while washing down. The gecko was still alive and was a light-brown colour with dark stripes on its tail, as indicated in the sketch.

Flies were caught for it in an attempt to keep it alive, but as the vessel progressed further north the temperature dropped and the gecko died.

Position of ship: 22° 39′N, 37° 26′E.

Note. Dr C. McCarthy, of the Department of Zoology, Natural History Museum, comments:

'The gecko was probably a species of *Hemidactylus*. These geckos have a circumtropical distribution and are frequently associated with dwellings; indeed, their common name is House Gecko. They also frequently stow away among goods and luggage and their wide distribution is, at least in part, due to human agency.'

BIOLUMINESCENCE

Strait of Hormuz

m.v. *Liverpool Bay*. Captain J.W. Welch. Jeddah to Jebel Ali. Observers: the Master, Mr R.T. Whelan, Chief Officer and ship's company.

26 March 1993. At 1540 UTC while the vessel was transiting the Strait of Hormuz westbound, within the traffic separation scheme it was strangely illuminated for several minutes by what turned out to be bioluminescent organisms. Bearing in mind the size of the vessel and the height of the containers above the water (about 25 m) the intensity of the light produced was remarkable.

The first appearance could only be described as something out of a science fiction novel, as the vessel moved through a wave-like form of light which initially appeared to be above the water in the pitch-black night. Shortly afterwards an area to port at a distance of several hundred metres exhibited an even more amazing display of concentric circles emanating from a single point; the starboard side maintained the more broken wave form but retained the same intensity of light. The vessel and deck containers were illuminated by an eerie and variable glow.

Traffic density combined with mild to pleasant shock did not allow the observers to retrieve a water sample or to direct an Aldis lamp on the sea surface. Both the Master and Chief Officer were 'seasoned campaigners' and had witnessed bioluminescence on many occasions but neither had seen such a phenomenon before.

The ship was travelling at 22 knots, the sea temperature was 22.0° and the wind was S'ly, force 3.

Position of ship: approximately 26° 30′N, 56° 00′E.

Note. Dr P.J. Herring, of the Institute of Oceanographic Sciences Deacon Laboratory, comments:

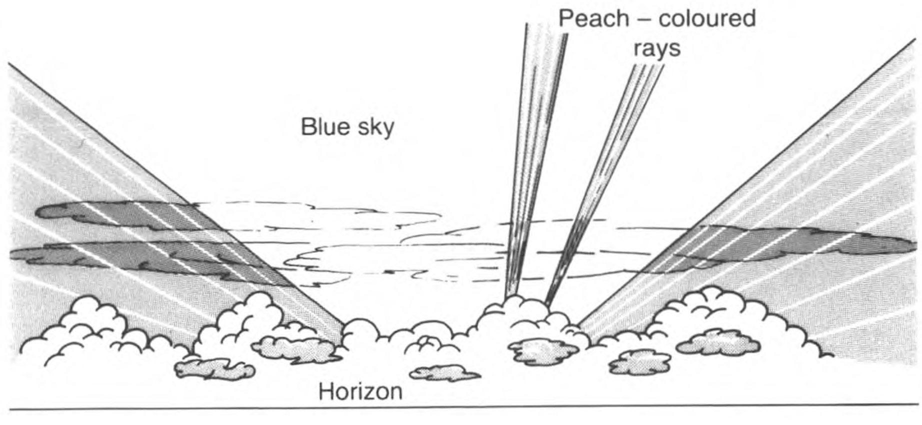
'The vessel was lucky enough to encounter one of the manifestations of the phosphorescent wheel phenomenon, the Strait of Hormuz being one of the best-known locations. Wheels, concentric circles and/or moving bands typify this luminescence, but there is still no certainty about its cause. The vessel's engine vibrations may be involved, as may submarine seismic phenomena. Clearly, some mechanical stimulus sets off the luminescent plankton (probably dinoflagellates) in the area.'

CREPUSCULAR RAYS

Equatorial Atlantic

m.v. *Western Bridge*. Captain C. Bamford. Port Talbot to Saldanha Bay. Observers: Mr J.L. Wilson, Chief Officer and Mr M. McShane, Deck Cadet.

26 March 1993. At 0625 UTC two bright peach-coloured 'walls' of sun rays were seen, separated by a 'wedge' of blue sky; additionally, two smaller rays were observed within the blue wedge and were also peach-coloured. The entire phenomenon, shown in the sketch, took up a quarter of the horizon, with the edges of the two large walls gradually fading into the blue of the surrounding horizon. The vertical extent of the phenomenon was approximately 35–40°.



This beautiful view lasted for about 20 minutes as the peach-coloured areas gradually faded. Although it was dawn, sunrise was not until 0654, so the sun was still below the horizon when the phenomenon was first observed. Clouds visible at the time of the observation were large and small cumulus together with altocumulus at different heights.

This display was thought to be a variation of crepuscular rays.

Position of ship: 01° 22′N, 10° 24′W.

Editor's note. Crepuscular rays include three similar classes of phenomenon:

(a) Sunbeams penetrating through gaps in a layer of low cloud and rendered luminous by water or dust particles in the air ('sun drawing water' or 'Jacob's ladder').

(b) Pale-blue or whitish beams diverging upwards from the sun hidden behind cumulus or cumulonimbus clouds. The well defined beams are separated by darker streaks which are the shadow parts of the irregular cloud.

(c) Red or rose-coloured beams diverging upwards at twilight from the sun below the horizon. The light is scattered to the observer by atmospheric dust; the beams are separated by greenish-coloured regions which are the shadows of clouds or hills below the horizon.

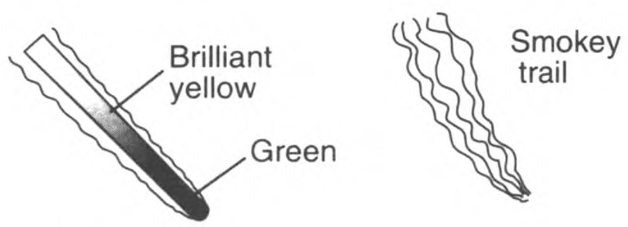
Occasionally, the rays and shadows may persist across the sky and, owing to the illusion created by perspective, appear to converge at the opposite horizon. These are then termed "anti-crepuscular rays".

METEOR

South Atlantic Ocean

m.v. *Ormond*. Captain D.F. Heaselden. Richards Bay to Rotterdam. Observers: Mr G. Krishnaswammy, 2nd Officer and Mr N. Patagnan, GP1.

14 March 1993. At 0117 UTC a brilliant meteor was observed as shown in the sketches. It was a greenish colour in the centre, bright-yellow at the sides and left a



smokey trail which lasted for about 5–10 seconds. The meteor was visible for 4–5 seconds and was first seen at azimuth 333°, altitude 18°; it vanished at azimuth 342°, altitude about 10°.

The sky was almost clear and the wind was SE'ly, force 4.

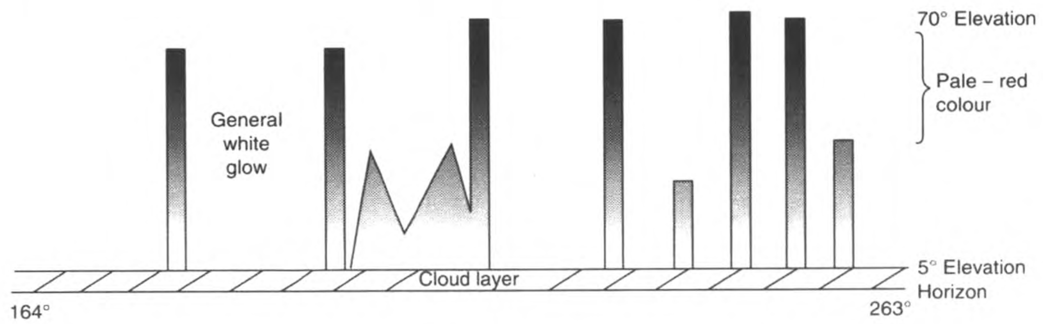
Position of ship: 26° 59′S, 11° 48′E.

AURORA AUSTRALIS

Bass Strait

m.v. *Encounter Bay*. Captain A.W. Ellis. Port Chalmers to Melbourne. Observers: Mr A.B. Millar, 2nd Officer and Mr A. Howes, SM1.

15/16 March 1993. At 1220 UTC a semicircular area of pale-white light bearing between 164° and 263° was seen above a layer of stratocumulus cloud on the horizon, see sketch. The cloud extended to about 5° vertically, and after a few moments the general patch of light began to develop well-defined streaks.



These streaks intensified until 1230 when they reached their peak intensity and extended from about 5° above the clouds to about 70° elevation. During the peak of the display a pale-red colour could be seen from about 30° upwards.

By 1235 the streaks had disappeared and all that remained were patches of white light at about 10° elevation. These lasted until 1250 when the phenomenon faded away.

Position of ship: 39° 32′S, 145° 10′E.

Southern Ocean

R.R.S. *Discovery*. Captain K.O. Avery. Scientific cruise from Cape Town and return. Observer: Mr A.R. Louch, Chief Officer.

21/22 February 1993. At about 1723 UTC a brief display of the aurora australis was observed. Bearing 170°, a milky glow extended from about 15° to 45° in altitude and covered an arc of the horizon of about 40°. The display was initially noted as a glow but developed several rays which extended vertically and also showed some pulsing activity. After five minutes the sky clouded over and viewing was ended.

Position of ship: 63° 28′S, 70° 55′E.

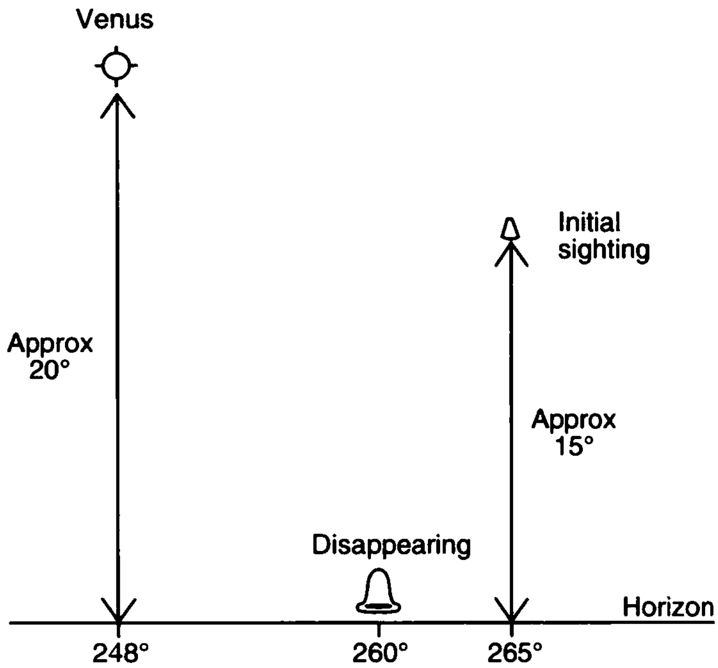
UNIDENTIFIED LIGHT

Eastern North Pacific

m.v. *BP Adventure*. Captain K.E. Peacock. Panama to Chiba. Observers: Mr S. Keitch, Chief Officer and Mr R.O. Ball, Radio Officer.

14 January 1993. At 0235 UTC the phenomenon shown in the sketch was first seen about 15° above the horizon, bearing 265°. It was initially thought to be a downward pointing spotlight from an aircraft; it was bright (nearly white), conical in shape and about 1° high. During further observation the shape slowly enlarged, becoming more bell-shaped with a darker elliptical patch at the bottom. As it increased in size, the shape faded away and moved slowly towards the horizon in a slightly southerly direction before disappearing just above the horizon at 0254, bearing 260°.

The maximum height reached by the shape was about 5° and throughout the observation stars could be seen through it while at one point it was nearly obscured by cloud of which there was 1 okta. The only other bright object nearby



was Venus, being slightly higher and to the south, bearing 248°, elevation about 20°. Visibility was excellent as about 10 minutes after the observation a ship was spotted bearing 280° at a distance of 16 n.mile. The observers felt that the shape was too regular to be a cloud but had no real idea of its origins.

Position of ship: 21° 07′N, 112° 49′W.

ASSISTANCE TO VESSEL

North Atlantic Ocean

m.v. *Regina Oldendorff*. Captain R.G. Head. Houston to Lagos. Observers: the Master and ship's company.

30 March–3 April 1993. At 0630 a red flare was sighted by the Chief Officer. Forty-five minutes later the *Regina Oldendorff* was standing by the *Gulf Express*, a 61-m former West German trawler converted into a small coaster. The vessel had broken down on a voyage from Cabo Verde to Dakar and had been adrift for 24 days with a total of 57 persons on board. Using her lifeboats, the *Regina Oldendorff* ferried provisions, water and medical supplies, while attempts were made to arrange a tow to safety. At 1430 the following day it was decided to tow the vessel to Freetown, a rocket-line was sent at 1528 and by 1606 the tow was under way.

The two vessels entered Freetown at 1248 on 3 April after towing over a distance of 482 n.mile. The *Gulf Express* was cast off some 200 m from the jetty and, after recovering her tow line, the *Regina Oldendorff* proceeded towards Lagos.

The Master remarked that while in no way being meteorological or oceanographical, this account described a phenomenon which occasionally happens at sea; it also provided a novel excuse for the missing observations at noon on 30 March and 3 April being entered in the logbook as 'Navigational duties'.

Position of ship at 0715 UTC on the 30th: 07° 44′N, 21° 09′W.

551.322:551.467

The Cryosphere — a view from the Ice Bench*

By A.P. Maytham

(Met. Office Sea Ice Officer with METROUTE)

Introduction

In the first part of Captain Maytham's article on the main sea ice systems of the world, he described the formation of ice and listed the five ice systems, detailing the important features of the main northern salt-water system, called System 1. In this second part he gives a description of the other four systems and for the sake of clarity we begin with a repeat of the full list of the systems involved.

The five parts of the cryosphere

For the purposes of the Ice Bench, the cryosphere can be divided into five separate numbered areas. Each of the five parts is a distinct system, differing not only in seasonal fluctuations but also in the forces, controls and ice dynamics which drive them. Even the wind stresses are at variance, the south having mainly continuous westerlies and the north experiencing winds from all directions.

System 1. This is the main body of the North Atlantic between the Kara Sea and Cape Farewell (Kap Farvel) at the southern point of Greenland. This has access to the polar region and is influenced by the Polar Gyre. The ice is not always new ice as there will be multi- and first-year ice from outflow at Fram Strait at various stages included in this area. There are very few bergs in this area, which do not present a hazard until Cape Farewell.

System 2. This covers Baffin Bay, Hudson Bay and the associated bays surrounding the area, down to the St. Lawrence Seaway and the Grand Banks. This has no access to the Arctic ice and all in this area is new ice. The main feature of the area is the presence of icebergs. The influence of the Polar Gyre is insignificant.

System 3. The Pacific Arena and the Bering Sea to Japanese waters. Although there is access to the polar region, the drift and gyre move ice in the opposite direction, away from the Bering Straits, and little or no old ice is found in the seasonal ice growth southwards.

System 4. The fresh-water area of the Baltic Sea, Gulf of Bothnia and Gulf of Finland; also the salt water Black Sea area, the northern part of which freezes due to the shallow waters rapidly releasing heat. All the ice decays rapidly once the land starts to warm, due to having a low albedo.

System 5. The Antarctic.

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* Continuing excerpts from an in-house colloquium presented to staff by Captain Maytham in September 1992.

System 2

Baffin Bay, Hudson Bay and area to the St Lawrence Seaway and the Grand Banks.

To all intents and purposes, after passing along the east coast of Greenland, System 1 ends at Cape Farewell, where System 2 begins. Icebergs are the predominant feature of this system. The region is almost entirely surrounded by continental mainland and islands, there is no access to the Polar Gyre and it is not influenced by the Trans-Polar Drift. It can therefore be considered an independent system. However, under extreme wintry conditions, some of the ice brought south from the Arctic Ocean on the East Greenland Current will reach and round Cape Farewell into System 2. (Figure 1).

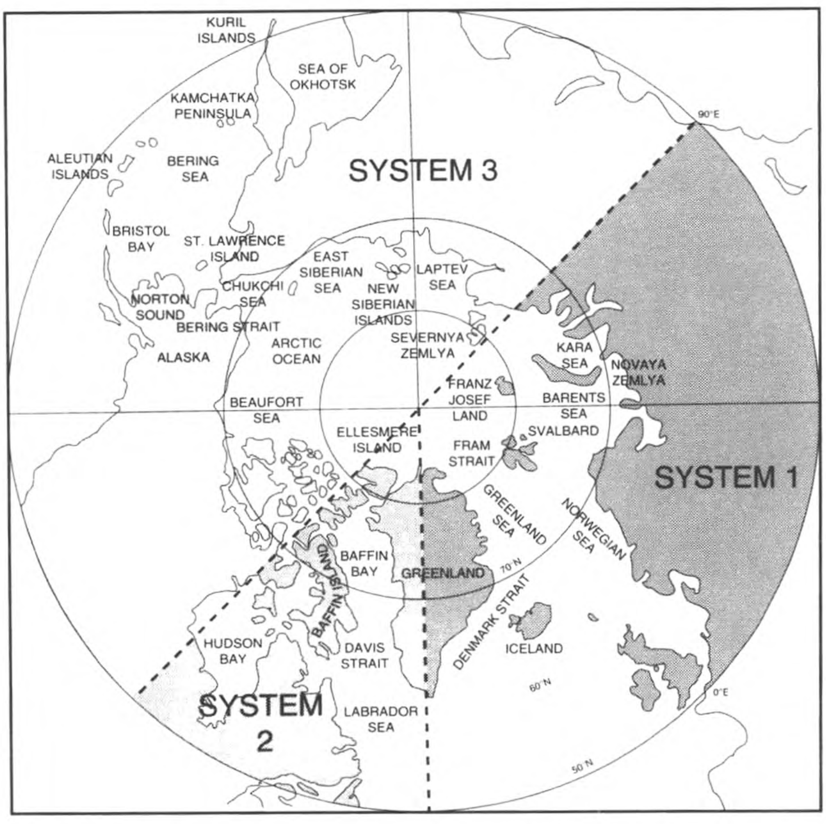

Figure 1. The Arctic, showing Systems 1 to 3.

The main element governing the iceberg flow is a warm current passing north-westwards along the west coast of Greenland. This current plays an important role in the ecology of the area; it also controls the ice melt and growth in the seasonal 'ice pulse'. The importance of this current can be seen from the movement it imposes on the bergs as they drift out from the main glacier streams, northwards from Cape Farewell to Baffin Bay, where they may remain under the influence of the circulation for up to three years, before drifting southwards under the influence of the Canadian and Labrador Currents, to the area well-known for their presence, the Grand Banks of Newfoundland. As it flows northwards, the relatively warm West Coast Greenland Current collects the bergs. The current brings water of up to 8°C and when encountering such relatively high temperatures, a normal iceberg may rapidly fall apart, sometimes in five or six days, as land ice structure contains many flaws. Bergs therefore do not survive for long south of Disko Island. (Figure 2).

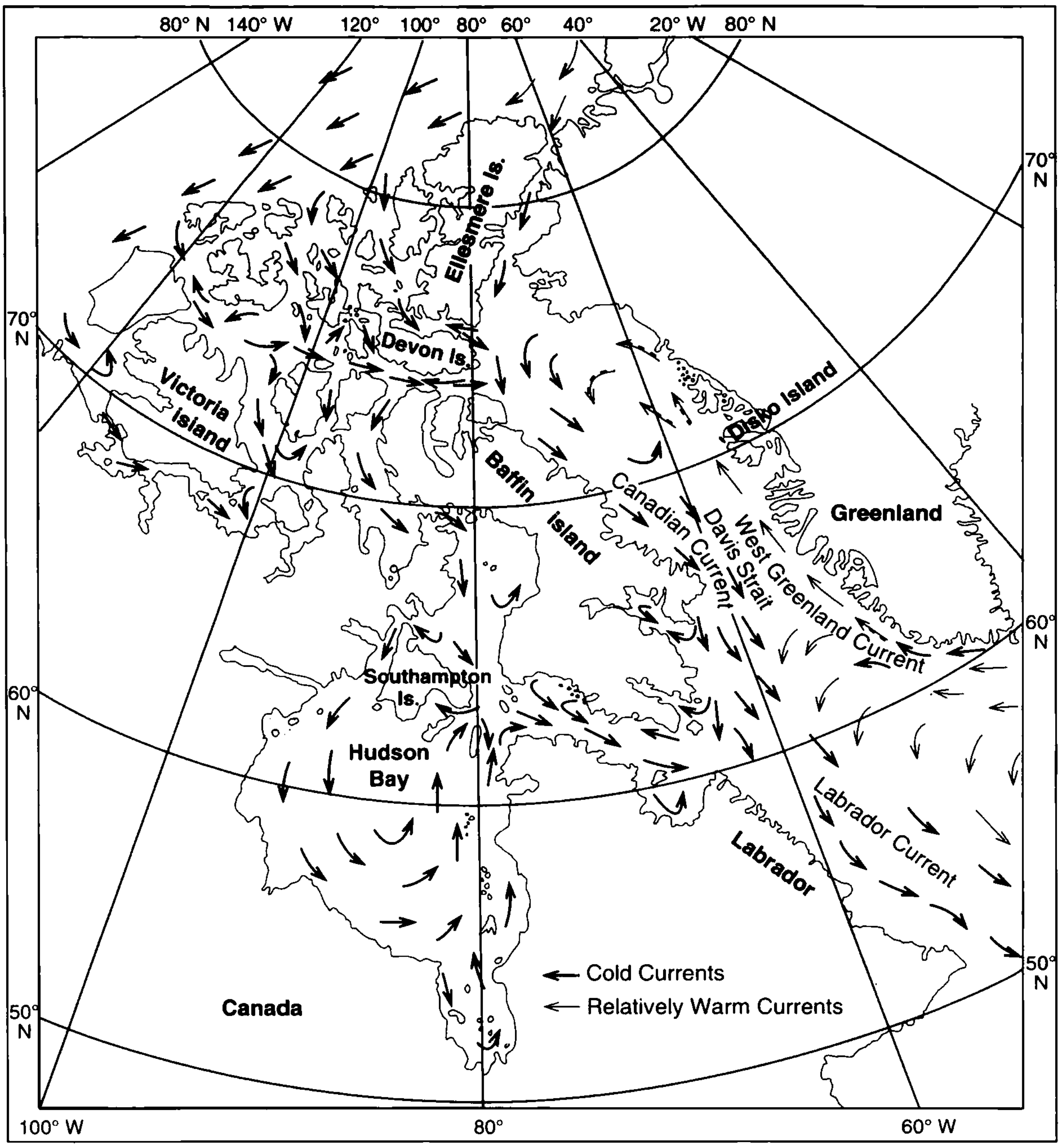

Figure 2. Generalised sea surface currents for System 2.

Small bergs are also calved south of Disko Island but the main calving grounds for larger bergs are further north, where there are as many as 100 main tidal fjords which maintain a strong flow of bergs. Bergs drift southwards with vast amounts of soil, rocks and other debris that glaciers gouge out of the land under normal circumstances and the enormous pressures generated by weights of up to 3,500 tonnes. In sea water sea ice normally shows one-seventh above the water and six-sevenths below. Freshwater ice in fresh water shows one-eighth above and seven-eighths below. Due to the conglomeration of rocks and other debris within ice of land origin, however, the mass balance is entirely changed and there is no method of determining keel depths. Gravity will withdraw much of the debris from bergs as they drift southwards along the west coast of Baffin Island and into the Labrador Current, then on to the Grand Banks, where their state of flotation will influence the commercial interests. The Sea Ice Bench is always particularly interested in the icebergs in this region.

The Labrador Current divides over the Grand Banks, carrying smaller bergs along the coast or grounding them on the banks, which display large grooves extending over considerable areas of their muddy topography. Not all these grooves appear on the northern edge, some are also in the centre: the whole area of the banks shows entering and leaving grooves over its entire surface. As bergs melt and change shape they may put down deeper keels, but they may also clear and pass over the banks only to ground on the falling tide later, especially if the initial passage occurs at spring tides. Drift will continue on the next rise of tide or after some melt of ice has taken place. Debris retained on arrival at the banks will be released and will assist bergs to split up into smaller pieces. The silt settles between boulders, giving the appearance of a smooth sea bed scarred by bergs: it also reduces the depth of water. The main flow of the bergs is with the small vortices and eddies which bring the bergs south of Newfoundland, and with the currents and tidal streams around the Grand Banks. Although the main current flow ceases at about 43°N, bergs have been reported as far south as Bermuda and as far east as the Azores. Although these are anomalies and should be treated with caution, the fact that there were icebergs in the River Plate in 1992 means that anomalies cannot be ignored.

Following the sinking of the *Titanic* after striking an iceberg off the Grand Banks on 15 April 1912, with great loss of life, the international community set up the International Ice Patrol in 1914. Soon after the disaster, the Safety of Life at Sea Convention was being held in London when it was decided that an ice patrol was needed. The IIP was founded with all parties to the Convention contributing, and the United States was requested to man and maintain the service, which is based in Groton, Connecticut.

The IIP reports on the extent of the icebergs to the marine commercial fraternity, during the stage when the main bergs are drifting southwards. This occurs as the sea ice recedes and releases the bergs into the current streams, usually between about 30 May and 28 July each year. Of all bergs, 94 per cent appear between March and June, but 64 per cent of them flow out between April and May after being trapped in the ice.

Sea ice in the current stream is mixed with bergs, and, being a cold current, the bergs within usually survive, whereas most of those on the fringes soon decay, as warm water eddies destroy them. In the Hudson Bay area there are no glaciers and therefore no icebergs. The seasonal pulse is greatly influenced by the heat budgets of a particular season and the lesser bays, basins, gulfs and inlets are usually sea ice free, following the seasonally adjusted patterns.

Sea ice is rarely more than about four metres in thickness, being formed from rafting and ridging, and is normally present for most of the year; it is formed by the cooling of the land and is therefore generally confined to coastal areas. Even in mid-summer there is light sea ice which has drifted down the fjords or pieces of land ice broken from glaciers to be seen, but it is rarely of any appreciable depth or in heavy concentrations. Whilst the current plays a large part in keeping this system moving, it also usually keeps Davis Straits and Baffin Bay ice-free in summer.

System 3

The Pacific Arena and the Bering Sea to Japanese waters.

See Figure 3. There are three main features to this system.

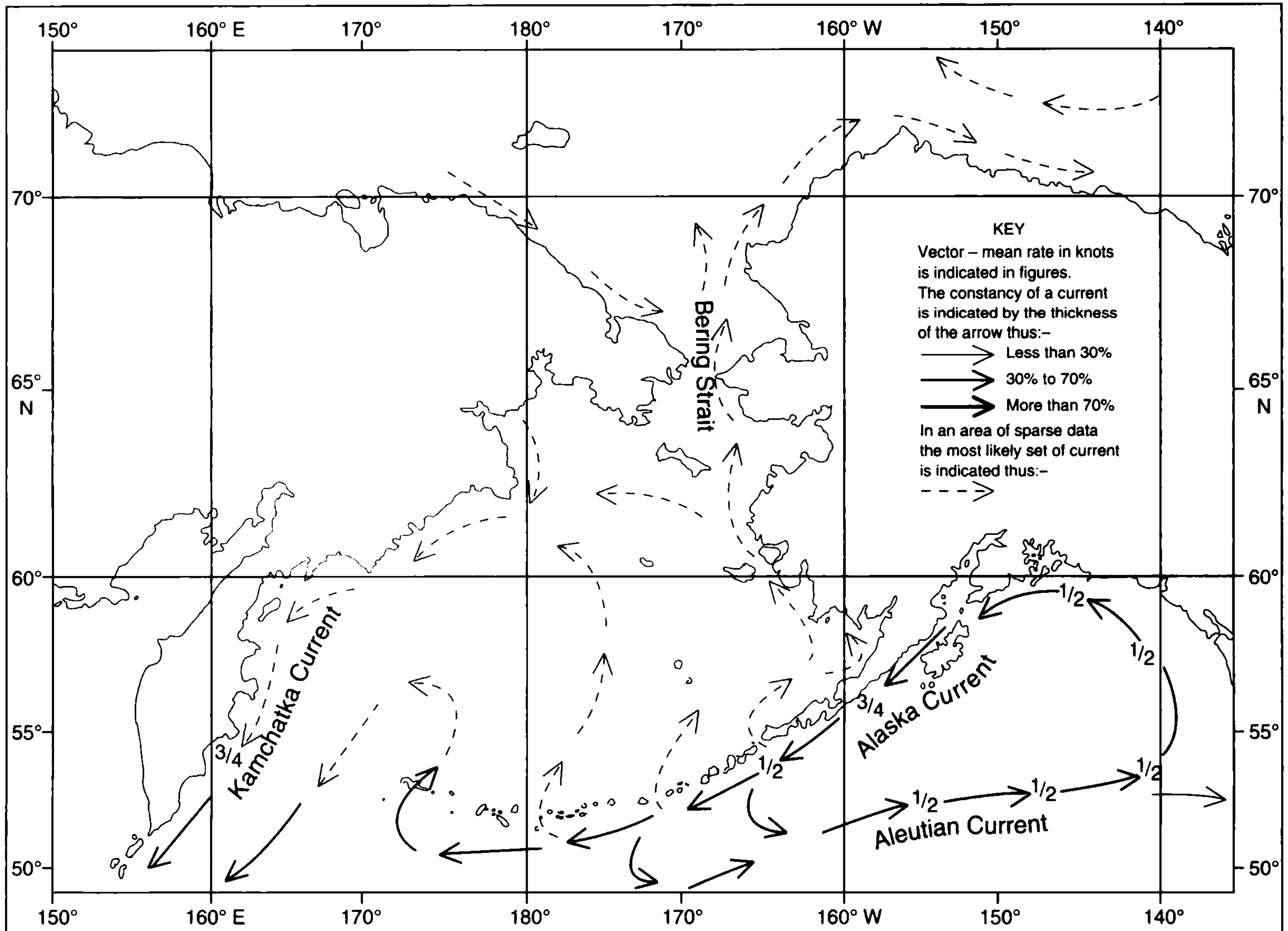

Figure 3. Average sea surface currents during winter for System 3.

First, although exposed to the polar region, it is not influenced by either the Polar Gyre or the Trans-Polar Drift: second, sea ice follows a constant seasonal pattern of growth and decay: and third, the current in the Bering Strait, because it flows in a northerly direction, has no effect on the outflow of ice.

As discussed in the first part (see *The Marine Observer*, October 1993 page 183) the Beaufort Gyre, influenced by warmer water exposed to the atmosphere (and the sea, having a low albedo, absorbs much sensible heat), generates an area of low pressure. Although the pressure gradient is not steep, it is still sufficient to initiate a clockwise gyre of the free floating ice cap, starting a polar drift. However, this gyre and the Trans-Polar Drift carry ice away from the Bering Strait, resulting in no flow from either gyre or drift.

The ice grows south to Hokkaido Island in northern Japan but never further south because the northerly currents inhibit growth. Air temperatures in Japan give severe winters with much snow but sea ice only in the north. The currents keep both the east and west coasts of Japan ice free. Likewise, the current on the west coast of Canada and Alaska keeps that coast ice free also. Where ice does occur it becomes fairly dense due to the effect of the northerly currents.

Comparison with System 1 shows that region to be under pressure from the Polar Gyre and the Trans-Polar Drift. Arctic sea ice grows only to about two metres in thickness, but from the effects of rafting, ridging, hummocking and various ice impacts, the ice can attain depths of four to five metres. System 3, however, experiences no such pressures and has no main outflow or current driven pattern. The sea ice will grow seasonally and recede through the Bering Strait, having maximum keel depths of one to two metres, dependant upon the influences it has experienced.

All the ice is new, first year ice as there is no second year or multi-year ice in the Pacific region, except for a small proportion which may be wind-driven out of the Bering Strait. Another feature peculiar to the region is that there are no icebergs, since no glaciers feed the Pacific area, nor do any flow out from the Arctic basin.

System 4

The Baltic Sea, including the Gulfs of Bothnia and Finland, and the Black Sea.

The Baltic ice is a major influence on shipping concerns and interests the Sea Ice Bench. On average the ice will grow to cover the Gulf of Bothnia. Normally the Gulf of Leningrad always freezes whereas the Baltic Sea does not invariably freeze, either the north, known as 'The Bay', or the south, known as 'The Sea'. Because it is fresh water of between 1.002 and 1.006 specific gravity, it will start freezing as soon as the air temperature reaches 0°C. Whilst the land mass cools the sea rapidly in coastal areas, it will leave a warm pool in the central area. The sea ice rarely reaches the North Sea, and when it does it is usually Baltic ice drifted out on the tide.

Arctic ice has been measured to a maximum depth of five to six metres due to heavy ridging and rafting, but the Baltic can generate keel depths of as much as 28 metres which, from a sea ice point of view, is phenomenal.

In the Black Sea, the ice of the Crimea grows because the water is very shallow, and it cools and freezes rapidly. The ice never grows to any great depth because of the lack of a long enough period of cold conditions, and it decays at a correspondingly rapid rate as the air temperature rises again. The ice season, when the ice forms, is usually between February and March.

System 5

The Antarctic

As described in part 1, the Antarctic is an ice sheet seven times as large the Arctic sheet, on top of a land mass: the Antarctic also contains eight times the volume of ice. The ice sheet achieves a maximum height of 5,500 metres and glacier ice extends about 500 metres below sea level.

The main season for the growth of ice in the Antarctic is from March to October: between November and February, due to the low thickness of the ice and as there is little or no melt over the land, warm upwelling of sea water leads to rapid decay. Summer minimum of ice cover is therefore in February.

Polynyas occur in the Antarctic as well as in the north, the main feature being a polynya on the eastern side of the Weddell Sea. An eddy is formed in the main circulation due to the presence of the Continental Shelf and this brings warm water back to the Weddell Sea. This polynya does not always occur, but on appearance it is always in the same area, unlike the Arctic experience where polynyas can occur anywhere.

The Southern Ocean Current sets in a generally easterly direction around the globe in the Southern Hemisphere, with its southerly limits lying between 63°S and 72°S. Between the current and Antarctica lies a belt of mainly clockwise eddies. Some of these eddies are large and semi-permanent features located in Bellingshausen, Weddell and Ross Seas while others, less permanent in nature, affect other parts of this region. (Figure 4).

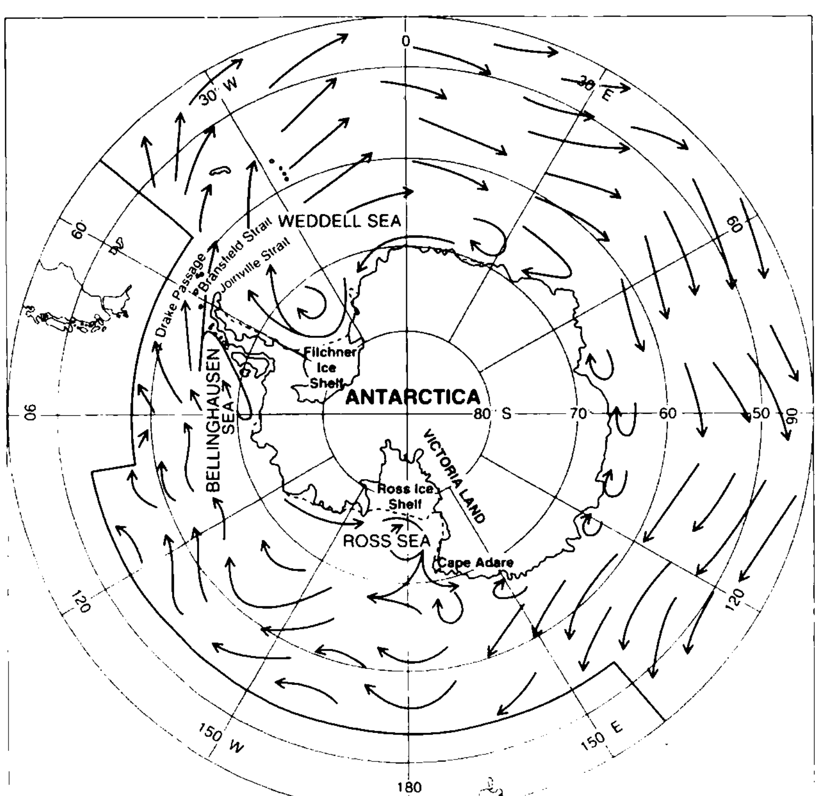

Figure 4. Generalised sea surface currents around System 5.

The introduction of meteorological satellites in polar orbits caused a dramatic improvement in the availability of sea ice data, so that a much clearer understanding of ice conditions around the polar regions continues to unfold. The winter sea ice belt in Antarctica extends a considerable distance northwards into the Southern Ocean but the long-term variations in mean sea ice conditions are difficult to assess with accuracy. Figure 5 shows the mean limits of 5/10 sea ice concentration at the times of greatest extent (September/October) and least extent (February/March). As an example it also shows the limit of 5/10 ice on 12 December 1969, this being representative of the 'mid-season' condition and helps to explain the complex nature of the break-up of sea ice as the seasons change. Average iceberg limits are also shown.

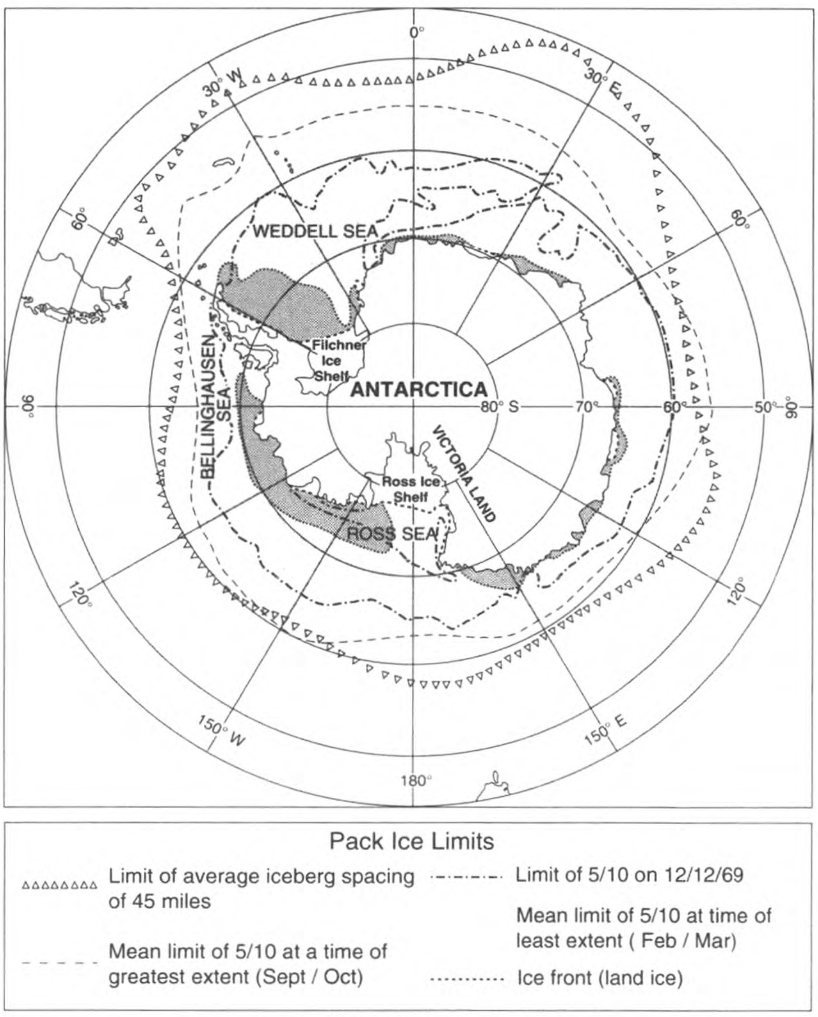

Figure 5. Drift ice limits in Antarctica.

Appendix

There are many miscellaneous facts about ice which the Sea Ice Bench finds of interest. One such fact is that when the bow of a ship strikes salt water ice, the ice will crack or split and may open a lead. Fresh water ice, however, will not crack in the same way, as it is more flexible and 'sticky' than salt water ice.

Superstructure icing is a major hazard to be encountered in sea ice areas. The main problem with icing is that it can be observed but the extent of the danger it is causing cannot easily be determined. The ice can seal doors and windows and other exits, so that it may be impossible to get out on deck. Radio aerials can become iced over, brittle enough to snap, leaving no means of communicating the problem in the area.

The colour and transparency of water can be determined by use of a *Sachii disc.* This intense white disc is floated in the water and the water colour determined. The disc is also sunk until it just disappears from sight, giving the transparency of the water. Codes were devised by Forel for the Arctic region which has thus been colour coded. However, these tests can also be used in the open oceans. Bacteria and other particles found in the water and mixed by the currents cause the changing colours. The clearest of blues is found in the Barents Sea in the Arctic.

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Squatters in the muslin*

By Betty Moss

Algal cells are present generally in the atmosphere. When the reservoir, wick and muslin are in position around the wet-bulb thermometer they each provide a moist substratum to which algae become attached. These grow and multiply, and together with dust particles they may fill the minute spaces between the individual cellulose fibres of which the threads of the muslin and wick are composed. The rounded form of the algal cells contrasts with the angular form of the dust particles which can be seen when fragments of muslin or wick are examined under a scanning electron microscope (SEM). (Figures 1 and 2).

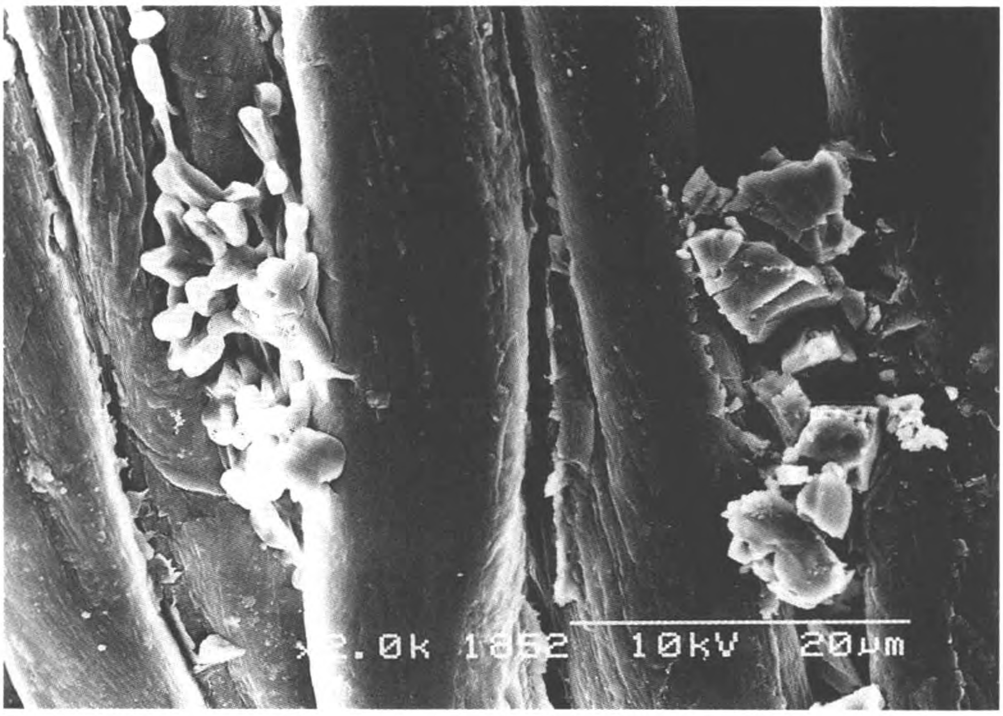

Figure 1. Algal cells contrasted with the angular dust particles caught between the cellulose fibres of the muslin as seen under an SEM (x2000).

* Reprinted from *Weather*, Vol. 47, No. 11, November 1992, pp. 444–446 with permission from the Editor.

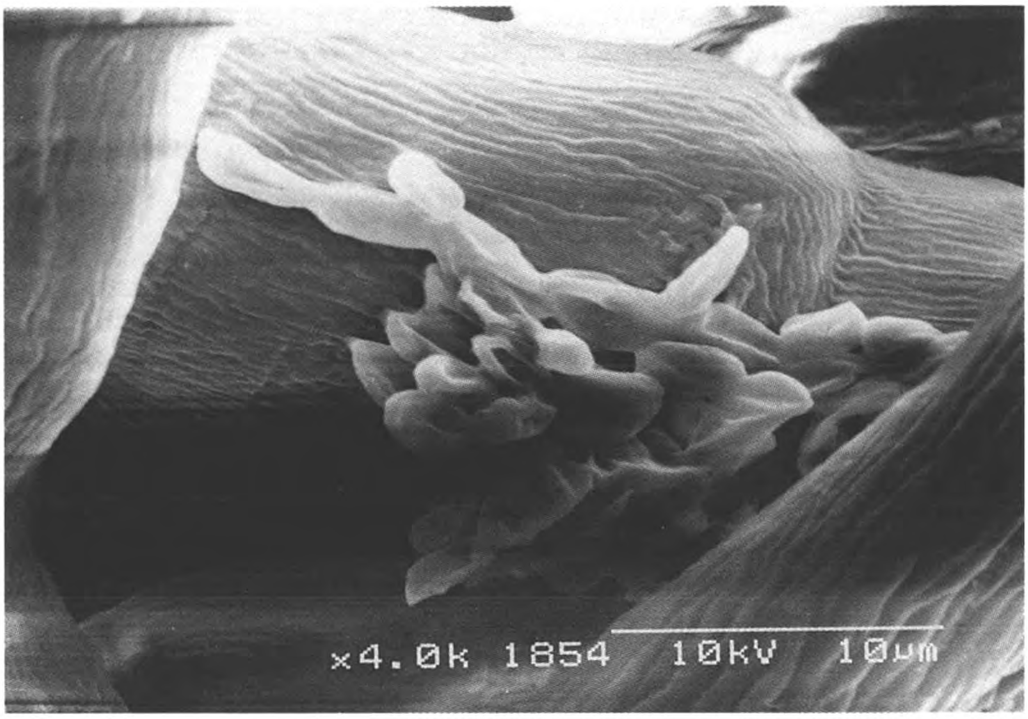

Figure 2 Filamentous algal cells with cluster of unicells between cellulose fibres of the muslin as seen under an SEM (x4000).

With time, a rich growth of algae develops in the reservoir. At Longframlington [Northumberland], they are mostly unicellular swimming forms such as species of *Chlamydomonas* and small filamentous green and blue-green algae (*Cyanobacteria*).

Eventually the growth may become so dense that the water inside the reservoir appears green. When a clean wick and muslin are connected to such a reservoir, motile forms may swim up the wick, while filamentous forms get carried in the surface films of water towards the muslin. Here they accumulate, especially at the base of the bulb, where they may stain the muslin pale green. When evaporation is

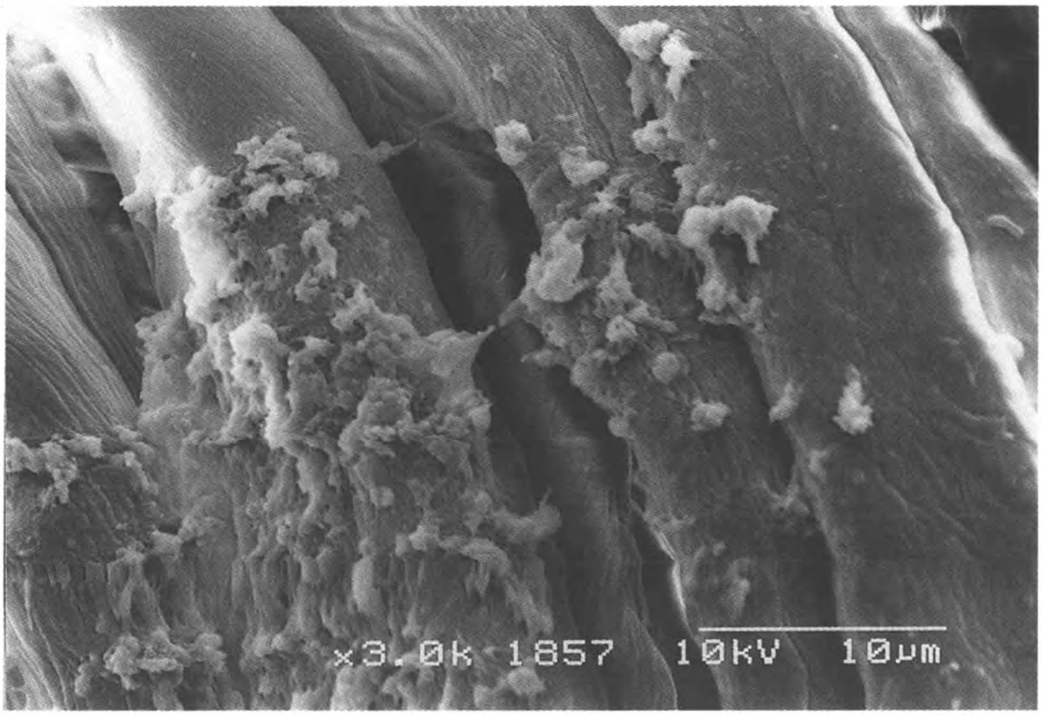

Figure 3. The build-up of a layer of material over the cellulose fibres as seen under an SEM (x3000).

rapid, the algae on the outside may dry out, settle down and produce the orange pigment often seen colouring a 'dirty' muslin. At the same time they may produce copious mucilages which help to form a gelatinous layer of debris over the cellulose fibres (Figure 3).

It is well known that algae give out extracellular substances into the medium in which they are growing (Fogg 1966, 1971). This means that before any green colour is visible in the reservoir the liquid inside is no longer distilled water but is enriched with organic and inorganic compounds. Continually topping-up with distilled water just adds to the 'soup' inside. It seems pointless to renew the wick and muslin if the dirty reservoir remains as a source of infection. At Longframlington the water in the reservoir shows a slight green colour after about three months. A clean reservoir is then substituted. A plastic reservoir is not easily sterilised, but if a dirty one is soaked for 24 hours in a solution of domestic disinfectant most of the algae are destroyed. The reservoir can then be washed thoroughly and stored in the dark until required. If it is left in the light, algae are likely to grow again in the damp corners.

As a phycologist, I am used to studying the settlement and growth of small algae on various materials. Now that I have turned to observing the weather in my retirement, I cannot understand why I am instructed to change the wick and muslin every week but never to change the water and clean out the reservoir.

Acknowledgements

I wish to thank Mr H. Sergeant of the Electron Microscope Unit, University of Newcastle-upon-Tyne, for technical assistance.

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The storm of the century?

A preliminary assessment of the deep depression labelled in the United States as 'The storm of the century', the full force of which was encountered by *Providence Bay* on 13/14 March 1993 (see page 6), was first published in the U.S. *Mariners Weather Log*, Spring 1993, Vol. 37, No. 2, pages 38–45. We are indebted to the Editor for permission to reprint excerpts from this article, which was a precursor to a more detailed item to be published when official statistics are available.

From 10 to 15 March 1993 a severe winter storm struck the Gulf Coast and eastern United States with strong winds, an unprecedented late-season snowfall and bitter cold. A combination of an intense upper level situation, an intensifying storm over warmer than normal Gulf of Mexico waters, and a surge of arctic air were the ingredients that fuelled this atmospheric powerhouse.

Adjectives abound in meteorological jargon. There are Great Hurricanes, Super typhoons, freak waves, torrential rains and frigid temperatures to mention but a few. Some have been quantified, like England's *Storm of the Century* of October

1987, followed a few years later by another. However, after all the records are tallied and analysed this March storm of 1993 will go down as one of the most severe East Coast storms on record.

The sheer strength of the storm was attested to by the number of all-time minimum barometric pressure records that were shattered, including a 975 mb reading at Tallahassee, Florida, and a 966.5 mb pressure at Washington National Airport in Virginia. In the Carolinas the storm broke pressure records set by hurricanes, and a lowest all-time pressure was recorded at White Plains, New York (958.4 mb), among others.

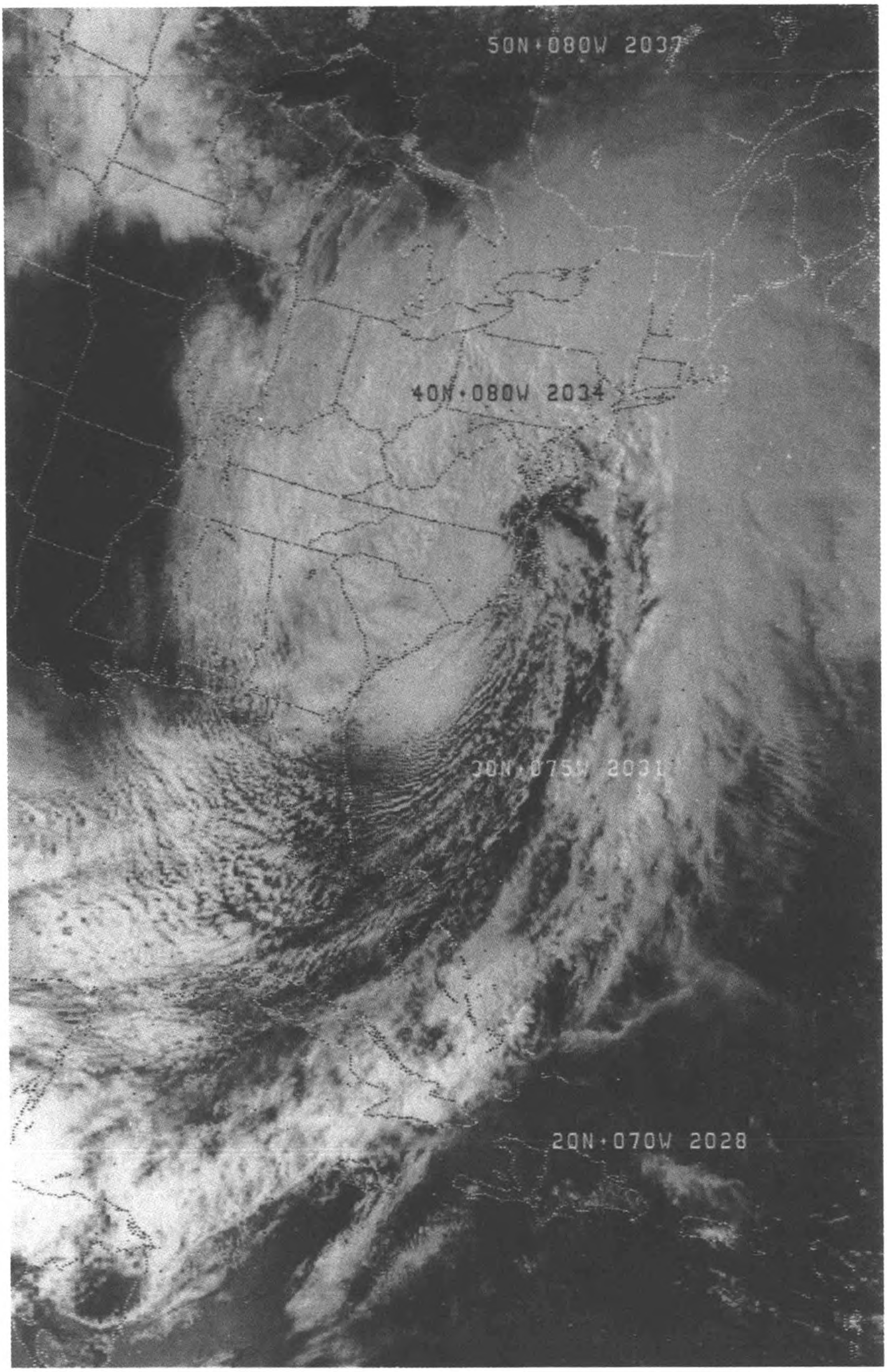
Blizzard conditions were reported from Alabama to Maine while more than 25 tornadoes ravaged parts of Florida. Snowfalls in south-eastern states reached extreme levels. The highest recorded wind gusts were 110 mph in Florida and New Hampshire, whilst gusts of 98 mph were reported from two stations in Louisiana.

At sea the Coast Guard reported rescuing 235 people from 103 vessels in the Gulf of Mexico alone over the weekend of 13/14 March, with many Coast Guard helicopters flying on rescue missions around the clock.

The s.s. *Tropic Sun*, from Marcus Hook, Pennsylvania to Nederland, Texas, experienced the full wrath of the storm in the same area as *Providence Bay*, off Cape Hatteras, experiencing gusts of 90 knots or higher and very heavy wind-driven rain. The seas were described by the Mates in the logbook as 'exceptionally high', 'relentless', 'violent' and even 'mountainous'. The vessel's speed was reduced to bare steerageway in seas at least 60 ft high. The helmsmen, steering by hand, were experiencing great difficulty in keeping the ship on course. The wind and seas did not diminish until late on the 14th and the *Tropic Sun* reached Texas in safety on the 18th with minimal damage.

Various other ships' barograms show the sharp pressure fall on the approach of the storm and the following sudden rise accompanied by force 10–12 winds and phenomenal seas. Several ships noted the difference between the low pressure of the storm and the very high pressure that succeeded it (1042 mb).

A satellite image of the storm appears on the opposite page.



A NOAA-11 satellite composite showing a visible image over the eastern United States taken between 2028 and 2037 UTC on 13 March 1993. The centre of the storm is located near Cape Hatteras at about the same time that *Providence Bay* was in the area.

SCENE AT SEA

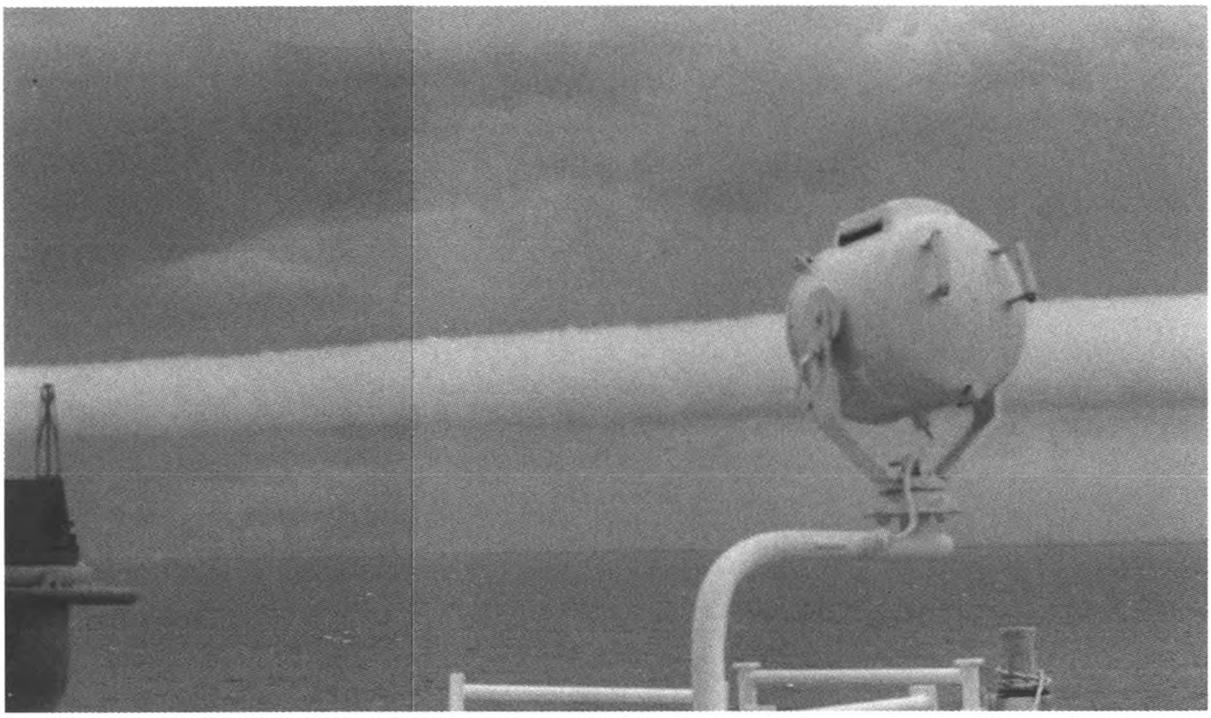
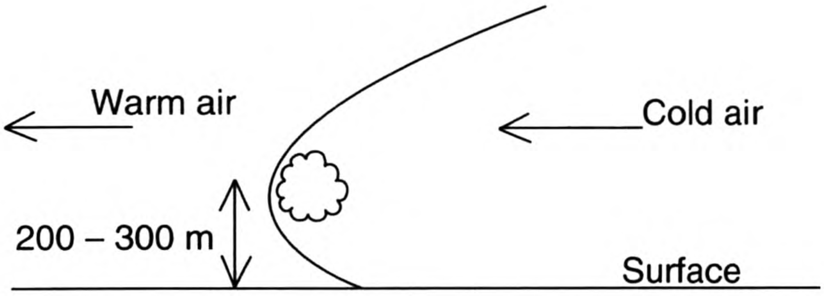


Photo. by W.T. Lawrie

Composite picture of part of a roll cloud lying across the coastline between Sydney and Newcastle, N.S.W. on approximately 4 February, 1993. The squall associated with the cloud formation was at the leading edge of a front and had caused extensive damage in Sydney, with unexpectedly high winds which were thought to have been close to the highest speeds recorded there.

Editor's note. This cloud formation is normally associated with more vigorous cold fronts and line squalls, when the passage of the roll cloud is almost immediately followed by a squall and heavy rain. The atmospheric conditions leading to the formation of this type of cloud are shown in the diagram.



The cold air, moving more quickly and being more dense, attempts to undercut the warm air ahead of the front. However, friction slows the cold air near the surface so that the vertical profile of the leading edge of the cold air takes on the shape of a 'nose', as indicated in the diagram. The nose itself is a turbulent region where there is sufficient vertical motion to form cloud; this cloud is commonly observed to roll over on itself.

Meet the Port Met. Officers

For the third item concerning the work of our PMOs around the United Kingdom, we feature the Port Met. Officer based in Cardiff Weather Centre.

Bristol Channel

Captain A.F. Ashton is in his ninth year as Port Met. Officer for the Bristol Channel region, having spent almost all his marine career, afloat and ashore, working from near his home base, now with a territory extending from the north Devon coast to south of Holyhead, embracing Avonmouth and Portbury, the great South Wales ports and several smaller havens. In his operations he is assisted by one Assistant Scientific Officer, visiting Voluntary Observing Fleet ships and their owners or operators, port offices, training establishments as well as visiting ships from overseas, and other duties.

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Captain Ashton on board R.R.S. *Challenger* at Barry, South Wales.

Archie Ashton was born in March 1934 and educated at Cardiff's Canton High School. He was trained for seagoing at H.M.S. *Conway* in 1950–51 and started his Apprenticeship with Canadian Pacific's *Beaverglen* in January 1952. The first of his many meteorological logbooks of high quality came from that company's s.s. *Empress of Australia* in October 1954.

After passing for Second Mate in March 1955 he joined Bristol City Line, serving on general cargo ships running from the Bristol Channel to the east coast of Canada and the U.S.A., gaining his Master's Certificate in 1960. His first command came in 1967, s.s. *New York City,* and he submitted 27 logs, all with an Excellent assessment, during 15 observing years with Bristol City alone. During part of 1970 he was based at Montreal as the company's representative before standing by and sailing in the new *Dart* class of large container ships until 1975, Bibby Line having taken over Bristol City in March 1972.

Having served the first 23 years on the North Atlantic, Captain Ashton became well experienced in bad weather and ice navigation. It was therefore a shock to his system when, in 1975, he was transferred to Bibby Line ships trading on the spot market, tramping around the world and finding himself in strange new places. Leaving Bibby Line in 1977, for most of the following year he was Master with Island Navigation Corporation of Hong Kong. He then swallowed the anchor and was appointed as Nautical Surveyor in the Department of Trade (now Transport) Marine Division at the end of 1978, also acting as Examiner of Masters and Mates up to December 1984.

During his 22 observing years which covered all his seagoing time except the last year, he sent in a total of 57 logs, 36 of them being marked Excellent, and he received six Excellent Awards. For his long-term efforts, he was presented with a special barograph by the Director General in 1976.

Captain Ashton then joined the Met. Office and was temporarily appointed Sea Ice Officer at Headquarters in January 1985, a position he was uniquely experienced to fill. However, his destiny lay at the Port Met. Office in his home town of Cardiff, where he has remained since November 1985. He maintains strong links with the sea, sailing regularly as volunteer Navigator in the Sail Training Association schooners *Sir Winston Churchill* and *Malcolm Miller*, having taken part in the 1991 Tall Ships Race. He is intensely interested in ships and the sea as well as canals, and is beginning an interest in industrial archaeology. He still lives in Cardiff, with his wife Dorothy, who is a piano teacher, and they have one son of 26 who is a graduate engineer, living and working in Gloucester.

PRESENTATION OF BAROGRAPHS

We were fortunate enough to be able to welcome all four shipmasters, accompanied by their ladies, to receive their long-service barograph awards at a ceremony held in the National Meteorological Archive in Bracknell on 24 June 1993. (See photographs on pages 35, 36 and 37.)

The nominees for this annual event were Captain A.D.G. Bell, V.Ships Ltd, Captain C.R. Elliott, British Antarctic Survey, Captain D. Patrickson, Stephenson Clarke Shipping Ltd and Captain E.D. Somes, Acomarit (U.K.) Ltd. In addition to these four Captains, senior officials from all the companies represented were able to be present, as well as Met. Office Directors of the relevant Divisions and the Marine Superintendent and his staff.

In the temporary absence of the Chief Executive, Dr Julian Hunt, who was officiating at the important Conference of Commonwealth Meteorologists in Reading, the presentations were made by Deputy Chief Executive, Dr Peter Ryder. Dr Ryder commenced proceedings by offering general thanks to all voluntary observers for their continuing efforts and particular commendation to the four shipmasters present, whose long and excellent observing service was being honoured this day. The weather data collection carried out on merchant ships was just as vital as before, he said, and was complementary to the information supplied by satellites and computers.

(Continued on page 39.)

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Dr Ryder (Deputy Chief Executive, Met. Office) presents a long-service award to Captain Bell.

Crown Copyright

Dr Ryder presents a barograph to Captain Elliott.

Crown Copyright

Dr Ryder presents a barograph to Captain Patrickson.

Crown Copyright

Dr Ryder presents a barograph to Captain Somes.

Crown Copyright

Presentation of barographs at Bracknell on 24 June 1993, outside the Met. Office Scott Building, home of the Marine Division and the Meteorological Archive. Standing, left to right: Captain G.V. Mackie, (Marine Superintendent, Met. Office); Captain D. Patrickson (Stephenson Clarke); Captain C.R. Elliott (British Antarctic Survey); Captain A.D.G. Bell (V.Ships Ltd); Captain E.D. Somes (Acomarit (UK)); Dr P. Ryder (Deputy Chief Executive, Met. Office). Seated: Mrs Patrickson; Mlle F. Bondet de la Bernardie (fiancée to Captain Elliott); Mrs Bell; Mrs Somes.

Photo. by J.B. Nichols

Water Rail on board the *Harting* in U.K. waters during March, 1993. (See page 13.)

Photo. by J.B. Nichols

Black Redstart on board the *Harting* in U.K. waters during March, 1993. As the photographer remarked, 'Not so many people realise that the Black Redstart occupies "bogs".'

Note. Commander M.B. Casement, of the Royal Naval Bird Watching Society, comments:

'Water Rails (*Rallus aquaticus*) are mainly resident in the United Kingdom, but with immigrants from the continent from September to April, with notable influxes during hard winters. Black Redstarts (*Phoenicurus ochruros*) are rare summer visitors to Britain, with passage migrants from the continent from March to May and September to November.'

The period under consideration was the twelve months to the end of 1991, and qualifications considered for the long-service award are a minimum of 18 voluntary observing years and completion of at least one meteorological logbook in the year in question. This scheme was inaugurated by the Director of the Met. Office in 1948, and has been carried out annually since.

After the presentations of individually inscribed barographs, the assembled company were able to view the many historical treasures placed on display by the Head of the Archive, Mr M. Wood, in addition to the Masters' own initial logs and copies of their full observing records, during which interval the Chief Executive was able to call in during a lull in his conference proceedings and mingle with the guests. Professor Hunt and senior staff then conducted the guests to lunch at a local hotel and the visiting party was later given a conducted tour of the Headquarters Main Entrance screen display and of the Central Forecasting Office by Senior Chief Forecaster Mr Ralph Hardy.

AURORA NOTES JANUARY TO MARCH 1993

By R.J. Livesey
(Director of the Aurora Section of the British Astronomical Association)

As usual, observations of the aurora made by mariners are listed in Table 1. Our thanks go to the Masters and observing officers of the ships concerned for taking the trouble to observe and record what they saw. With the changes in shipping fleets, methods of ship management and many other factors there has been a decline in the overall number of auroral observations received and we are, therefore, very grateful to receive any reports that are made.

Table 1 — Marine aurora observations January to March 1993

Date	Ship	Geographic Position	Time (UTC)	Forms in Sequence
21/22 Feb.	*Discovery*	63° 28'S, 70° 55'E	1723	G.RR.p_2RR. Max. alt. 45°.
26/27	*Discovery*	61° 38'S, 81° 48'E	1715–1735	G.HA+m_1RR.aG. Max. alt. 90°.
15/16	*Encounter Bay*	39° 32'S, 145° 10'E	1220–1250	G.R_3R.P.G. Max. alt. 70°.
22/23	*Falklands Desire*	50° 57'S, 62° 57'W	0840–0930	N
29/30	*Cumulus*	60° 18'N, 15° 30'W	2200–0400	p_2RA.p_2RA.p_4SB. a_4p_2HB.qR_2R.
31 Mar./ 1 Apr.	*Cumulus*	62° 42'N, 22° 18'W	0355–0410	a_1HA.

KEY: a_1 = active, a_4 = forms changing, m_1 = one form, p_2 = flaming, p_4 = pulsating, q = quiet, G = glow, HA = homogeneous patch, N = unspecified form, P = patch, RA = rayed arc, RR = ray bundle, R_2R = medium rays, R_3R = long rays, SB = striated band.

During the period under review the total number of auroral reports from both land and marine observers was very low. Cloud, wind, rain and all forms of bad weather took their toll of observing time; even our observer in North Dakota, who has the best clear sky rating of all our correspondents, noted 11 sunless cloudy days in a row. This was so unusual that it warranted a page of reporting in the regional newspaper. In Scotland, where the tanker disaster occurred on Shetland, a period of 28 days of continuous night cloud goes without saying. It is under such circumstances that perusal of the magnetic record of solar disturbances to the Earth's magnetic field indicates the state of the magnetosphere and hence the probability of active aurora. Significant magnetic storms were recorded on 28 December 1992; 10, 25 and 31 January 1993, 7, 17, 22 February and 3, 8, 11, 15, 24 March. The magnetic field was generally disturbed in the periods 28 December to 20 January, 9–13 February and 8–31 March with other periods of disturbance centred about the mentioned storms.

Generally, there seemed to be a build-up of activity from a period of quiet towards the end of December 1992 to a period of magnetic disturbance centred on March and April coincident with the spring equinox. This is shown in Table 2.

Table 2 — Comparison of magnetic and auroral observations January to March 1993

Planetary Magnetic Index	**Jan.**	**Feb.**	**Mar.**
No. of days equal to or exceeding 5	6	7	15
No. of days equal to or exceeding 6+	0	1	3
No. of days with shock events	1	1	4
Aurora observed by 2 or more people			
No. of nights, Fair Isle or southwards	1	0	7
No. of nights, Port of Leith or southwards	0	0	1
North Dakota aurorae			
No. of nights	5	8	8

By far the majority of events appear to have been related to coronal holes on the sun and not to flare activity associated with sunspots, the number of which have declined since sunspot maximum. One could call the periods of disturbed magnetic activity 'gusty', synonymous with wind as mariners know it. Although some coronal hole driven storms can be quite strong and lead to active aurora it is more usual in British waters to find the aurora relatively quiet and consisting of glows, arcs and possibly some rays seen mainly at the higher latitudes. This seems to be the pattern at the present time.

The North Dakotan aurorae observed at Glen Ullin by one observer, Jay Brausch, are included for they give a good representation of auroral frequency and strength. At geographic latitude 46° 48'N and longitude 101° 46'W the nights are sufficiently dark all the year round to detect summer aurorae lost in the twilight in northern British waters. The corrected geomagnetic latitude of this station is equivalent to about that of Fair Isle, because of the position of the magnetic pole on the North American continent, so that aurorae are relatively frequent as mid-latitude events. Further, the United States Air Force atlas of cloud-free sight line probabilities shows this area of the world to be one of the best for cloud-free nights. As the result of having observed over 1,000 aurora event nights and photographed the displays over the past 10 years the British Astronomical Association has awarded Jay the Merlin Medal for his efforts. The extent of observed aurorae in North Dakota and activity during the recent decade may be judged from the frequencies given in Figure 1.

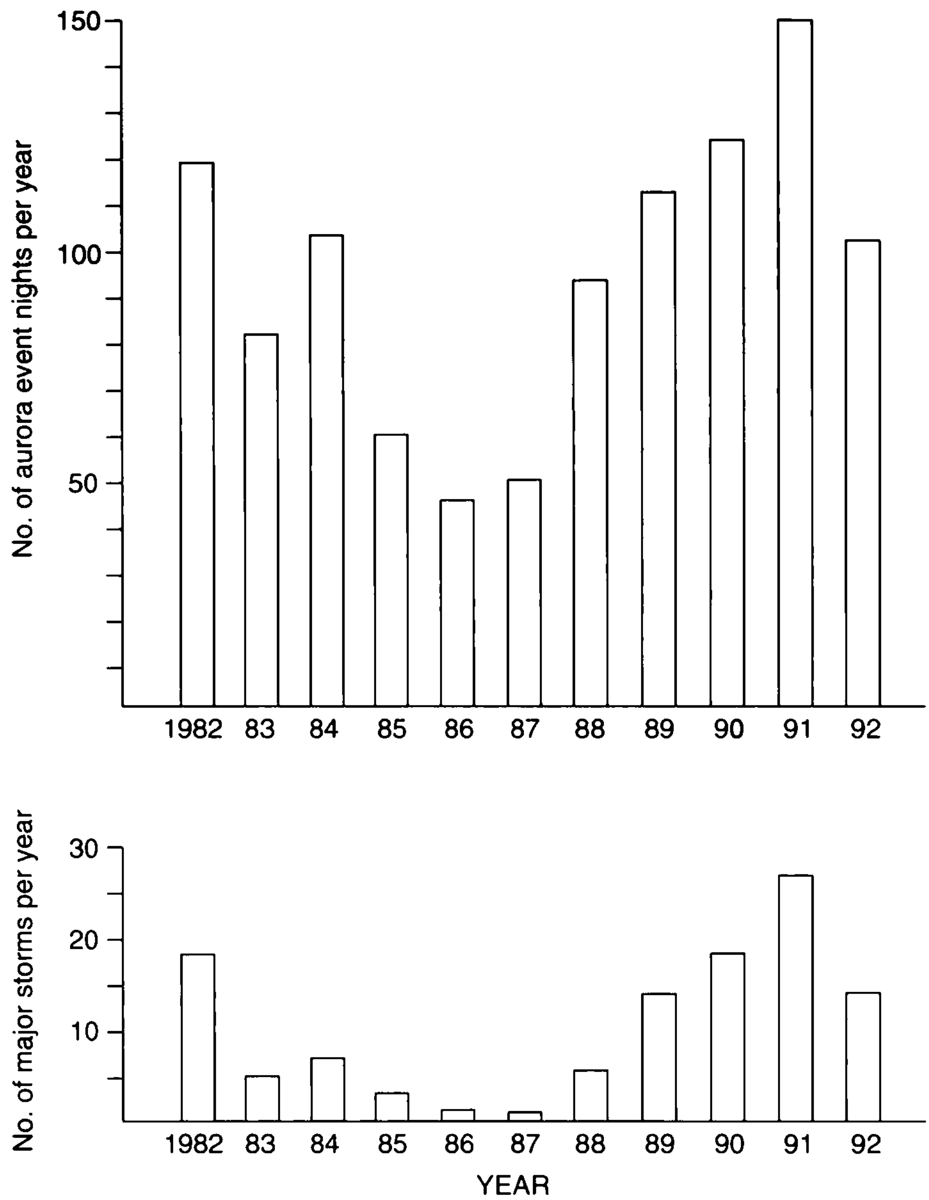

Figure 1. Frequency of auroral activity as measured at Glen Ullin, North Dakota.

In contrast, the state of the weather at Fair Isle, for example, may be judged by the fact that the observatory records only about 30 per cent of the auroral frequency of its co-magnetic partner in the United States.

Book Review

Greenhouse Earth by Annika Nilsson. 197 mm × 130 mm, ix + 219 pp. John Wiley & Sons Ltd, Baffins Lane, Chichester, West Sussex PO19 1UD. Price: £9.95, paperback.

The author was asked by officials of the United Nations Environment Programme and the Scientific Committee on Problems of the Environment to write a book about the different factors that scientists consider in their scenarios of the future, resulting from the greenhouse effect and global warming, aimed at a non-scientific audience.

Annika Nilsson is a freelance writer from Sweden with a Bachelor of Science degree in Journalism as well as a Bachelor of Arts in Biology from the University of Kansas. Her qualifications have enabled her to draw the attention of the average non-scientific reader to what is perhaps one of the most important aspects of the climate change process in an admirably simple text, enhanced with a proliferation of clear graphics: that economic ideas based on better use of energy will help reduce the effects of global warming as well overcoming the problems of air pollution and depletion of the ozone layer.

The twelve chapters are the author's synthesis of several scientific reports, particularly the work done by the Intergovernmental Panel on Climate Change as presented in three reports from 1990. The book opens and closes with 'a message from the year 2030', the author looking back to the end of the previous century and analysing scientists' attempts to weigh environmental priorities and energy-efficient technologies. This approach underlines the fact that severe global warming could occur inside a few decades.

Three chapters describe climate's basic mechanisms, the influence of trace gases which contribute to global warming and the ways in which Man's activities might upset the overall system of climate. Two later chapters describe climate models and how they serve to predict global warming, at the same time questioning the apparent lack of limits imposed on modelling approaches. Five further chapters comment in detail on sea-level natural ecosystems and how a warmer global atmosphere would affect the cryosphere and the hydrosphere. The last two chapters cover aspects of policy, such as the importance of signing the Nations Convention on Climate Change; they also emphasise the differing perceptions of the urgency of global climate change, comparing the opposing views of the industrialized and the developing nations.

Although the general reader might find the chapters on the impact of climate change somewhat more detailed than is appropriate to a book for the non-scientist, the speculations contained in these sections bear investigation. Some of these predictions may also have been overtaken by the findings of the subsequent United Conference on Environment and Development in Rio de Janeiro, which took place in June 1992, shortly after the publication of this book. In particular, the conflicts between environment and development that the Convention on Climate Change might impose.

These minor shortcomings do not detract from the main impact of this work, which is to elucidate clearly enough the real issues concerning global warming and the problem of turning scientific results into political awareness, or the need to establish procedures and institutions to ensure the implementation of important decisions to limit emissions of greenhouse gases for the sake of future generations.

J.F.T.H.

Personalities

RETIREMENT — COMMODORE L.E. HOWELL retired from P&O Containers last August after joining his first ship forty-three years earlier.

Laurence Edmunds Howell was born in Glasgow on 8 August 1933 and educated at Rothesay Academy on the Isle of Bute. After pre-sea training at Glasgow Technical College he joined the former Scottish company of Hugh

Hogarth & Sons as Apprentice from 12 July 1950, on coal-burning tramp steamers *Baron Belhaven* and *Baron Elphinstone*. He recalls this period in his life as tramping around the world and never going home'.

On gaining his Second Mate's Certificate he joined the New Zealand Shipping Company in 1954 for 'the fourteen most formative years of my career, NZS Co being a first class company with high professional standards. Ended my time there as Chief Officer of the two elegant training vessels, *Rakaia* and *Otaio*, carrying up to seventy cadets'.

He obtained his Master's Certificate in April 1960 and then, in 1968, Commodore Howell was the first sea-going officer to volunteer for service in the newly formed Overseas Containers Ltd, being sent to stand by the building of the new ships in Germany. His first command came in 1972 when he was appointed to the *Discovery Bay*, and since then he has commanded twelve of these large modern container ships. He took command of the lead ship of the latest generation of sophisticated, computerised ships, *Oriental Bay*, on handover from the builders in 1989, and remained as Captain of that ship until he came ashore in March 1993. He was appointed Commodore of the P&O Containers fleet in 1990, 'having gone from coal to computers in a career thoroughly enjoyed'.

In a highly successful sea career it is perhaps not surprising that Commodore Howell achieved an excellent observing record, from his first log received from NZS Co's *Papanui* in July 1955, to 33 years and 65 logs later, his final offering from *Oriental Bay* in March 1993. An assessment of 'excellent' was given to 48 of the meteorological logbooks bearing his name. In his 33 observing years he received Excellent Awards no fewer than 16 times, and at the early age of 47 he was invited to Bracknell to receive from the Director General the ultimate in weather observing accolades, a long-service barograph.

For five months after his last sea voyage, Commodore Howell assisted P&O Containers Fleet Management with various tasks, including speaking at symposiums and making safety inspections, finally retiring on 31 August 1993. He is a Younger Brother of Trinity House, a Fellow of the Nautical Institute and a Member of the Honourable Company of Master Mariners, actively supporting all three bodies.

To give him the final word: 'I have always gained satisfaction over the years from my association with the Met. Office and viewed the many met. observations I must have made with much pleasure. A keen and alert awareness of changing weather patterns is as valuable and important today to large high-powered modern ships as it was in the old coal burners where I started. Contrary to general belief, the young officer of today is both extremely smart and highly trained and is just as aware of the importance of meteorological studies as we were years ago. The strong attachment to met. observations is alive and well in P&O Container vessels.

'My thanks to your Port Met. Officers whose help has been much appreciated, and I know that the *Bay* boats have been well taken care of by your colleague at Southampton as well as by your Marine Division at Headquarters.

'I have enjoyed my career immensely and now intend to do the same in retirement. Our children are grown up and well scattered, with a son and daughter working in the City, whilst another lives in Malaysia. My wife and I will now have time to enjoy leisurely visits to them and to our daughter and grandson in Kuala Lumpur. My old father, a retired sea captain, is alive and well at 87, and I firmly believe that retirement is kind to mariners. I have high hopes, but not a great deal of expectation, of becoming better at my two sports — fishing and curling — but feel that the salmon in the Annan need not worry too much.'

The Office reciprocates those generous compliments and thanks to Commodore Howell and offers good wishes for that active and full retirement.

Notices to Marine Observers

APPOINTMENT OF SHIP ROUTEING OFFICERS

Captains J.A. Doody and T.D. Corbett recently joined the METROUTE team of former shipmasters operating the Met. Office ship routeing service provided for shipowners, operators and charterers world-wide, located in the Central Forecasting Office at Bracknell Headquarters. They replace the team's senior member, Captain Jim Williamson, following his transfer to the Port Met. Office at Liverpool on the retirement of the incumbent, Captain Albert Britain; and Captain Donald Hewitt who moves to a new post in Commercial Services Division as Market Sector Manager for Sea Transport, whilst still working closely with his METROUTE colleagues.

John Doody was trained at Sir William Reardon Smith's College in Cardiff before joining the shipping company of that name in October 1972. He passed his Second Mate's Certificate in February 1976 and was promoted to Third Officer in the following month. In August of the same year he provided the first of several meteorological logbooks sent to the Met. Office, from m.v. *Fresno City*, as he continued to serve mainly in general cargo ships and bulk carriers.

On obtaining his Mate's Certificate in 1979 he joined Buries Markes Ship Management as Second Officer and served in bulk carriers and chemical tankers. On passing his Master's examination in 1983 he was promoted to Chief Officer and three years later was given his first command. He and his wife Stephanie live in the heart of Gloucestershire.

Tim Corbett entered H.M.S. *Conway* in 1960 for three years pre-sea training, before serving as a Deck Apprentice with Port Line, running to Australasia and the U.S.A. His first observing ship was *Jamaica Producer* from whence we received his first log in April 1967, following which he spent some time with Everard's and Stephenson Clarke's general cargo and coastal tankers around European coasts. After obtaining his Second Mate's Certificate in 1968, he joined United Baltic Corporation, gaining useful experience serving in ice conditions.

In 1969 he joined Ben Line as Third Officer, serving on general cargo ships to and from the Far East, soon renewing his interest in voluntary weather observing, so to provide many good examples of meteorological logs and earn himself two Excellent Awards. He obtained his Master's Certificate in 1981 and was promoted Chief Officer in 1983, sailing on bulk carriers world-wide and then for his last nine years at sea on large container ships to the Far East.

Since the demise of Ben Line he has been relieving on P&O ferries. His hobbies include dinghy sailing and offshore racing, and for home relaxation, woodwork and computers. He has his home in Torquay with his wife, Ruth, who accompanied him on many of his voyages in the last eight years, assisting with the weather observations whenever practicable.

NEW HYDROGRAPHIC OFFICE PUBLICATION — *ADMIRALTY LIST OF RADIO SIGNALS*, VOLUME 5

The Hydrographer of the Navy launched his new publication covering the Global Maritime Distress and Safety System, *Admiralty List of Radio Signals*, Volume 5, at the end of June. This volume contains the rules, regulations and services available to assist vessels participating in the GMDSS and can be obtained from Admiralty Chart Agents, retail price £8.00. This volume can be kept up to date using the weekly *Admiralty Notices to Mariners*.

The 105-page volume contains an introduction explaining the need for improvement to the old system of maritime distress and safety communications, information and associated diagrams, including extracts from relevant International Radio Regulations and services available to assist vessels using or participating in the GMDSS.

Particulars of the nearest Admiralty Chart Agents can be obtained by contacting the Hydrographic Office, Taunton, Somerset TA1 2DN. (Telephone: 0823 337900. Fax: 0823 284077. Telex: 46274.)

FACSIMILE CHARTS FROM BRACKNELL

Further to the notice in the July 1993 edition of this journal, the transmission of facsimile charts from GFA and GFE were combined into one broadcast from 1 September 1993 and advance warning of this change was transmitted on the two channels in July and August.

These changes differ from the advice given in last July's journal in that the two services have been merged, to incorporate both surface and upper air charts in one series of transmissions using current GFA frequencies.

When responsibility for the transmission of radio broadcasts is sub-contracted, broadcast frequencies may be changed. The Marine Superintendent will monitor progress towards these changes to try and ensure that the requirements of marine users are met.

CARE OF ACCESSORIES TO THE WET-BULB THERMOMETER

It is common knowledge that the wick, muslin and water for the wet-bulb thermometer should be changed weekly to ensure efficiency of the instrument. What is sometimes forgotten is that the plastic reservoir containing the distilled water must also be periodically cleaned. Over a period of time, algae will become attached to the moist surfaces of the reservoir, multiplying into a rich growth if not checked.

To prevent a build-up of infecting compounds in the reservoir, it should be soaked for 24 hours in a solution of domestic disinfectant, followed by a thorough washing in fresh water, thus destroying most of the algae. If a spare reservoir is available, this can be used to replace the infected one, which should be stored in a dark place when not in use.

MARINE LIFE REFERENCE BOOK UPDATE — MATERIAL REQUESTED

Environmental Consultant Kevin Morgan is updating the book *The Seafarer's Guide to Marine Life,* published in 1985 by Croom Helm in association with The Marine Society for author and marine biologist Paul Horsman. The book has since become a well-used guide by seafarers, including its adoption aboard the ten craft in the British Steel Challenge Round-the-World yacht race held in 1992/93.

Mr Morgan is currently doing research to update the book to become a reference work on the marine ecosystem for the environmentally aware seafarer. The latter term is intended to embrace all who sail, cruise or potter on the sea for any purpose. The importance of collecting environmental data will be stressed and information gleaned from Voluntary Observing Fleet ships will be available for inclusion. The new book will also focus on naturalist skills, recording schemes, natural history topics, and marine pollution and how the seafarer can lessen its impact on the environment.

Seafarers, and anyone with an interest in marine life, are invited to send in suggestions on how recording schemes for seafarers can be improved, on particular groups of marine life or environmental topic they would like to see discussed in the book, to: Mr Kevin Morgan, BSc, MSc, CBiol, MIBiol, FRGS, 64 Fairford Gardens, Worcester Park, Surrey KT4 7BJ.

Fleet Lists

GREAT BRITAIN

Updated information regarding the list published in the July 1993 edition of *The Marine Observer*. Amendments for this list are required by 15 September. Information for the main listing in July is required by 15 March.

Name of Vessel	Date of Recruitment	Master	Observing Officers	Senior Radio Officer	Owner/Manager
Al Awdah	7.7.93	—		—	Kuwait Oil Tanker Co.
Al Funtas	26.4.93	—		—	Kuwait Oil Tanker Co.
Al Shuhadaa	16.4.93	—		—	Kuwait Oil Tanker Co.
Al Tahreer	8.7.93	—		—	Kuwait Oil Tanker Co.
Ambra Dolphin	5.4.93	—		—	Wallem Ship Management (H.K.) Ltd
Brisbane Star	30.7.93	G. Clark	K. Sykes, C. Balatero, D. Manzo	J. Morena	Blue Star Ship Management Ltd
Bubiyan	26.3.93	—		—	Kuwait Oil Tanker Co.
Chiquita Italia	20.4.93	—		—	Logbridge Ltd
Chiquita Rostock	3.3.93	—		—	Logbridge Ltd
City of Barcelona	12.8.93	G. Railson	R. Noble, N. Hood	—	Denholm Ship Management (U.K.) Ltd
Geest Dominica	22.4.93	G. Foster	A. Ward, J. Williams, A. Scales	—	The Geest Line
Geest St Lucia	10.3.93	A. Cole	T. Hogg, H. Mackenzie, J. Lawes	—	The Geest Line
Gem	23.3.93	A. Hennell	B. Tucker, M. Lenckowski	—	Stephenson Clarke Shipping Ltd
Glen Roy	1.8.93	K. Curry	R.P. Williams, D.A. Hartley, A. Montejo	—	MOL Tankship Management Ltd
Hoo Kestrel	28.4.93	T. Pollitt	N. Cartwright	—	R. Lapthorn & Co. Ltd
London Enterprise	7.4.93	J.W.W. Peters	R. Smith, S. Proctor	R. Gerstner	London & Overseas Freighters Ltd
Singapore Bay	7.7.93	P.A. Furneaux	M. Longford	—	P&O Containers Ltd
Tonbridge	26.7.93	C.A. Sheffield	V.J. Indirin, N.F. Anyikwa, E. Edwards	R. Nukhopadhyay	Kuwait Oil Tanker Co.

The following Selected Ships have been deleted:

Aberdeen Bay, Adviser, Arctic Ranger, BP Advocate, BP Architect, British Trent, European Clearway, Griparion, Lumiere, Matco Avon, Meltem, Merchant Pioneer, Nike, Oil Hustler, Pole Star, Risnes, Shell Explorer, Southland Star, Telnes, Tribulus, Tricula, Wellington Star.

BRITISH COMMONWEALTH

The following Selected and Supplementary Ships have been recruited or deleted since the list published in the July 1993 edition of this journal:

HONG KONG (Information dated 11.8.93)

Recruited (Sel.): *Al Muharraq, Grand Fortune, Kurama, Rainbow, Ratana Valai.*
Recruited (Sup.): *Silver Clipper.*

INDIA (Information dated 1.8.93)

Recruited (Sel.): *Lok Pratap.*
Deleted (Sel.): *Har Rai, Indian Reliance, Indian Renown, Indian Resource.*

NEW ZEALAND (Information dated 17.8.93)

Recruited (Sel.): *Direct Kea, Fishguard Bay, Rangikura, Rangitane, Socofl Stream, T.A. Navigator, United Peace.*
Deleted (Sel.): *Forum New Zealand, Northern Transporter.*

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