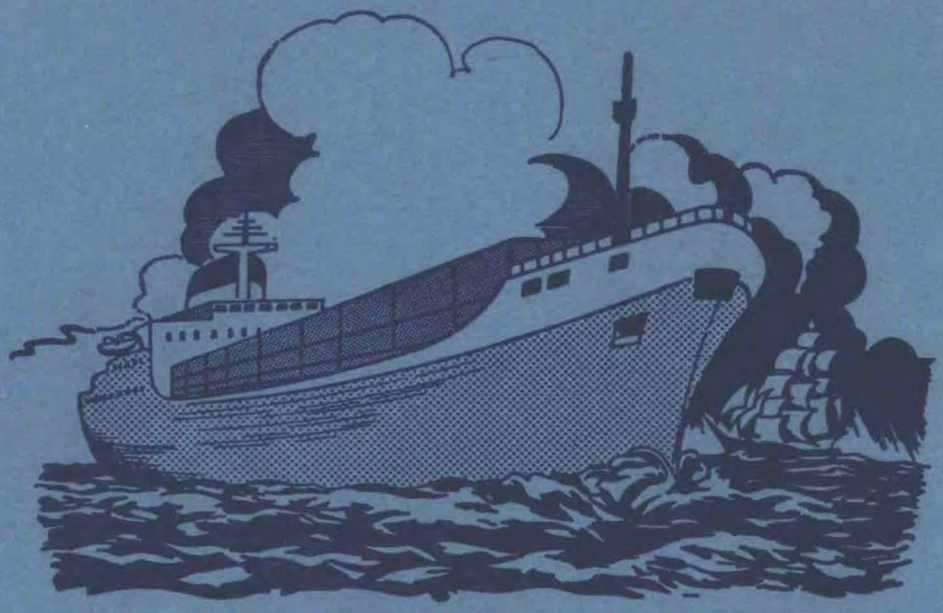
Met. O. 953

The Marine Observer

A quarterly journal of Maritime Meteorology



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THE MARINE OBSERVER

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

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CONTENTS

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Report of Work for 1981

(MARINE DIVISION OF THE METEOROLOGICAL OFFICE: VOLUNTARY OBSERVING FLEET AND OCEAN WEATHER SHIPS)

1. Voluntary Observing Ships

At the end of the year the British Voluntary Observing Fleet was composed as follows:

(*a*) 446 Selected Ships, including trawlers, which are supplied with a full set of meteorological instruments on loan and which make observations in code every 6 hours and transmit them to the appropriate coastal radio station wherever their voyages take them.

(*b*) 16 Supplementary Ships, including trawlers, which make less-detailed observations than Selected Ships and are supplied on loan with only a barometer, air thermometer and screen. They use an abbreviated code for their messages.

(*c*) 45 Coasting ('Marid') vessels which make sea-surface temperature observations in UK coastal waters and transmit them in a special code by W/T or R/T. When in the North Sea, the coasting ships include in their messages wind, weather and visibility observations.

(*d*) 13 Light-vessels and 1 light-tower which make observations of wind, waves, visibility, air and sea-temperatures; all of these send coded reports by R/T. Reports from the *Royal Sovereign* and *Goeree* light-towers together with the *Channel, Dowsing* and *Varne* light-vessels are included in the BBC weather bulletins for shipping and all report barometric pressure, using the precision aneroid. They also report barometric tendency.

(*e*) 5 Auxiliary Ships which make and transmit visual observations similar to those made by trawlers, with the addition of pressure and air temperature readings from the ships' own instruments (using the 'Shred' code). These ships do this work only when in areas where shipping is known to be sparse.

The value of regular weather observations from ships at sea becomes apparent when it is realized that the oceans cover 71 per cent of the earth's surface. With the exception of H.M. ships, research vessels, ocean weather ships and data buoys, these observations are provided by the masters and officers of merchant ships and the Marine Division has been responsible for obtaining them since 1855. These co-operating merchant ships are collectively known as the Voluntary Observing Fleet (VOF) and vary from very large crude oil carriers and passenger liners to trawlers and small coastal trading vessels.

The British Voluntary Observing Fleet includes ships of many shipping companies and Table 1 shows the variety of trade routes on which they are engaged.

Table 1. Average number of British Selected and Supplementary Ships on main trade routes to and from the UK

Europe	98	West Indies	13
Australasia	23	South America	10
Far East	28	Pacific coast of North America	4
Persian Gulf	23	Falkland Islands and Antarctic	2
South Africa	6	World-wide trading	190
West Africa	14	Near and distant-water fishing grounds	4
North Atlantic	47		

The current recession in world trade has had a considerable impact on the British Shipping and Fishing industries. As a result, much older tonnage of the British Merchant Navy has been scrapped or sold-off leaving a reduced fleet of larger and faster ships which spend less time in port and hence a greater proportion of the year at sea. The seven Port Meteorological Officers established in the major ports of London, Liverpool, Southampton, Hull, Newcastle, Cardiff and Glasgow have been hard put to maintain the strength of the VOF and it is largely as a result of their unflagging efforts that the reduction in voluntary observing ships has been kept to a minimum. Despite the reduction in strength, the number of observations has marginally increased as a result of the time spent at sea by modern merchant ships.

During a typical 5-day period in June, the average daily numbers of reports from ships and sea stations received in the Central Forecasting Office at Bracknell from various sources were as shown in Table 2.

Table 2. Average daily number of reports received at Bracknell by various sources from ships and sea stations

	1980	1981
Direct reception from:		
British ships	182	190
Foreign ships	97	112
Rigs, Platforms, Buoys	57	83
Total	336	385

Total number of reports received by direct reception and from other sources from ships and sea stations:

	1980	1981
Eastern North Atlantic	874	880
Western North Atlantic	347	330
Mediterranean	87	80
North Sea	193	247
Arctic Ocean	54	65
North Pacific	845	777
All other waters	410	495
Total	2810	2874

The making, recording and transmission of meteorological observations in British merchant ships have always been carried out on a voluntary basis and, as the Port Meteorological Officers are all Master Mariners with considerable experience of meteorological observing at sea, they are able to significantly affect the standard of the observations received from the VOF. Once again, it is gratifying to note that a high standard continues to be maintained.

The installation of distant-reading meteorological equipment in a number of ships under construction in order to reduce the workload of observing officers and also in view of the on-going trend to reduce the complements of merchant ships has continued with the whole-hearted support and co-operation of shipowners. Trials have also continued with the automatic transmission of ship's weather messages.

Once again, acknowledgement must be made of the valuable assistance given by many foreign and Commonwealth Port Meteorological Officers in the replacement of defective instruments and replenishment of publications and

stationery in ships of the British VOF which seldom return to the UK. These foreign and Commonwealth Port Meteorological Officers have also rendered valuable services in connection with the withdrawal of equipment from British observing ships which have been sold or ended their sea-going careers in ports abroad.

2. Ocean Weather Ship Activities

Under the North Atlantic Ocean Station (NAOS) scheme the United Kingdom continued to operate two Ocean Weather Ships on station 'Lima' situated at 57° 00'N, 20° 00'W. The ships, *Admiral FitzRoy* and *Admiral Beaufort*, alternately manned the station throughout the year with the exception of a 4-day period in January when *Admiral Beaufort* vacated the station to land an injured crew member, a one-day period in August when *Admiral FitzRoy* vacated the station to evacuate an injured crew member by helicopter and a further one-day period later in August when *Admiral FitzRoy* had to vacate the station prematurely owing to shortage of fuel. These ships are now approaching the end of their useful life and arrangements were made during the year for them to be taken out of service early in 1982.

The weather ships make hourly surface and 6-hourly upper-air observations. Sea and swell records using the Tucker ship-borne wave recorder were continued throughout the year. Sea water temperature and salinity readings to within 100 metres of the sea bed, observations of magnetic variation, collection of rain-water samples for analysis by the International Atomic Energy Agency and collection of sea-water samples on passage to and from station for monitoring radioactive content were undertaken at regular intervals. On behalf of the Institute for Marine Environmental Research, a plankton recorder was towed on about half the voyages to and from station during the year. Also, aurora observations were made for the British Astronomical Association.

3. Ship Routeing

A ship routeing service is provided to advise on North Atlantic and North Pacific passages and to offer advice in regard to the movement of tows and salvage operations. Advice is also given to vessels on passage in other parts of the world on request. For conventional vessels the object of the service is to select the best route for the ship to follow in order to reach her destination in the shortest possible time with the most economical fuel consumption commensurate with least damage to ship and cargo. To achieve this, data are extracted from the ship's deck logbook to determine the vessel's response to various sea wave fields and a ship/wave performance curve is constructed. However, the service has now amassed a large amount of performance data for almost all types of vessels and it is frequently possible to assess wave/performance characteristics from basic ship size and type without recourse to the deck logbook. The forecasters in CFO provide the ship routeing officers, who are all Master Mariners with long sea-going experience, with wind and sea predictions up to 72 hours ahead at 12-hourly intervals and this information is used in conjunction with the performance curve to determine the most favourable course for the vessel to follow. At the same time, consideration is given to the loading state of the vessel, navigational hazards such as shoals, sea ice and areas of fog and also to sea-surface currents. The latter stages of the voyage are also taken into consideration. Communication with the vessel to be routed is usually by telex prior to sailing and via pre-determined coastal radio stations whilst on passage. Routeing advice to tows which do not have restrictive weather parameters is similar to that provided for conventional vessels but allowance is made for the slower speed of the tow and for restricted manœuvrability. For tows with limiting weather factors—which may be wave height or period, amount of heel

or wind force—the routeing service advises when and where to seek shelter or when to resume passage.

Despite the current recession in the Shipping Industry, the number of routeings has been maintained at a high level during the year and now averages more than 30 per month. A major contract was secured with an Israeli shipping company to route their entire fleet of container ships and bulk carriers across the North Atlantic; this contract entails approximately 160 routeings per year. The voyage assessment service in which an investigation is made into the performance of a ship in relation to the weather encountered during the voyage and the weather reported by the ship which was introduced last year has proved to be of value to shipowners and charterers. During the latter part of the year, the service provided a weather watch for some of the eight remaining large Thames Barrier gates on passage from Middlesbrough to the Thames Estuary.

4. Services for Marine Activities

Services to shipping via BBC Radio, British Telecom International Coastal Radio Stations and our international radio teleprinter and radio-facsimile broadcasts continued with some additions throughout the year.

As a result of the automation of the *Noord Hinder* light-vessel, actual weather reports in the Coastal Waters forecast from this station were discontinued and replaced by reports from the *Goeree* light-tower and, for the same reasons, the Lizard Point Lighthouse weather reports in the Inshore Waters forecast from this station were discontinued and were replaced by those from Land's End Coastguard. The temporary replacement of weather reports from Machrihanish by those from Prestwick broadcast in the Inshore Waters station reports has become permanent.

In October, the British Telecom International Coastal Radio Station at Oban together with its 'slaves' at Lewis and Skye ceased to operate between the hours of 2200 and 0800 GMT daily and arrangements were made for gale warnings issued for sea areas Rockall and Bailey between these hours to be broadcast by Portpatrick Radio. The British Telecom International Coastal Radio Station at Cullercoats continued to broadcast weather forecasts and gale warnings for all North Sea and adjacent forecast areas from Fair Isle to Plymouth in Radio Teletype as a temporary service.

The Small Craft Warning Service came into operation for the first time. This service is provided in the holiday season between Good Friday and 31 October and warnings are issued whenever the wind is expected to reach Beaufort force 6 or more within five miles of the coast. The warnings are issued by Weather Centres to local radio stations which broadcast the information as soon as possible.

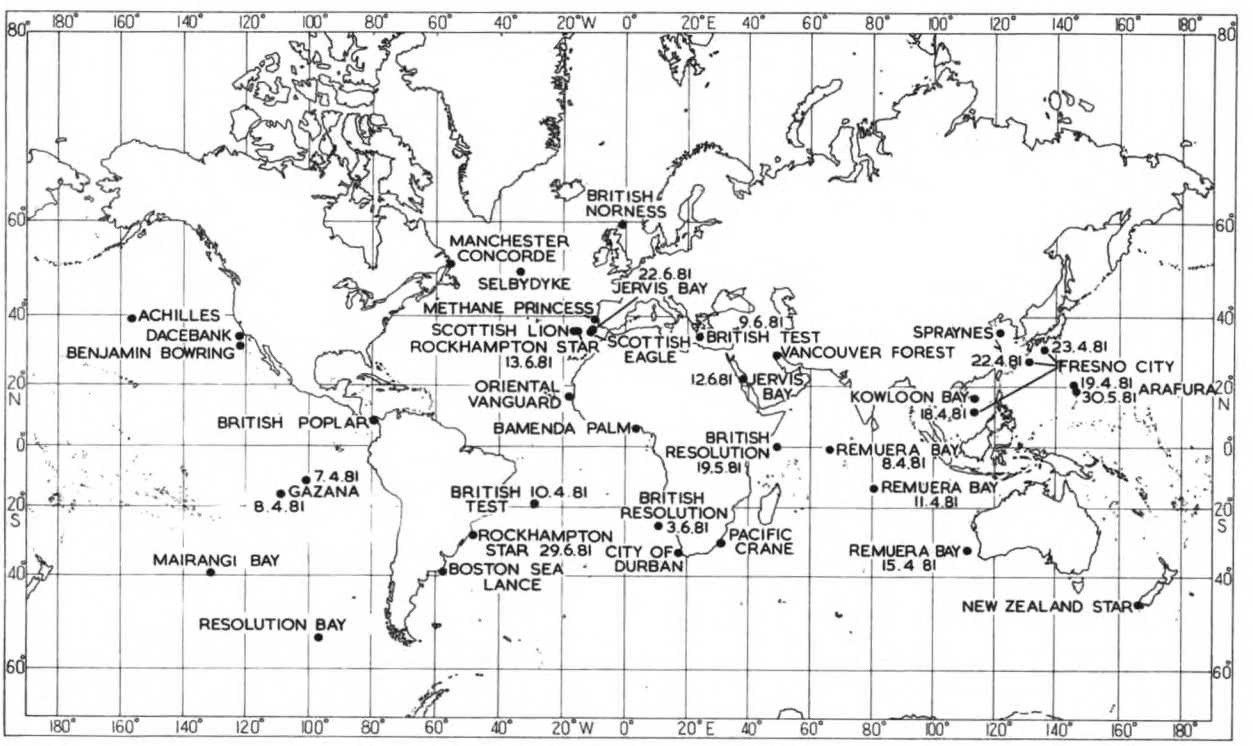
5. Inquiries

Marine inquiries, principally from shipping interests, solicitors, universities and industrial firms, have continued at a high level. These have covered a wide variety of subjects ranging from the general meteorological conditions prevailing off the south-east Scottish coast during the sea trials of H.M.S. *Speedy*, the Royal Navy's new waterjet-propelled hydrofoil, to a request for actual weather conditions experienced by H.M.S. *Ark Royal* in the Bay of Biscay during a period in the early 1950s.

6. Awards to Voluntary Observers

The shipmasters, principal observing officers and radio officers who submitted the best meteorological logbooks during the year were presented with Excellent Awards in the form of books as in previous years. Similar awards were made

to masters and officers serving on short sea traders for their work in making sea temperature observations and to a trawler skipper and radio officer who made and transmitted valuable non-instrumental weather observations. The books selected for this year's awards were Philip's New World Atlas, Cassell's English Dictionary and 'The Spy who came in from the Cold and other stories' by John le Carré. In recognition of their valuable voluntary meteorological observational work over many years during their careers at sea, four shipmasters were presented with long-service awards in the form of barographs.



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

April, May, June

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

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

TROPICAL CYCLONE 'OLGA'

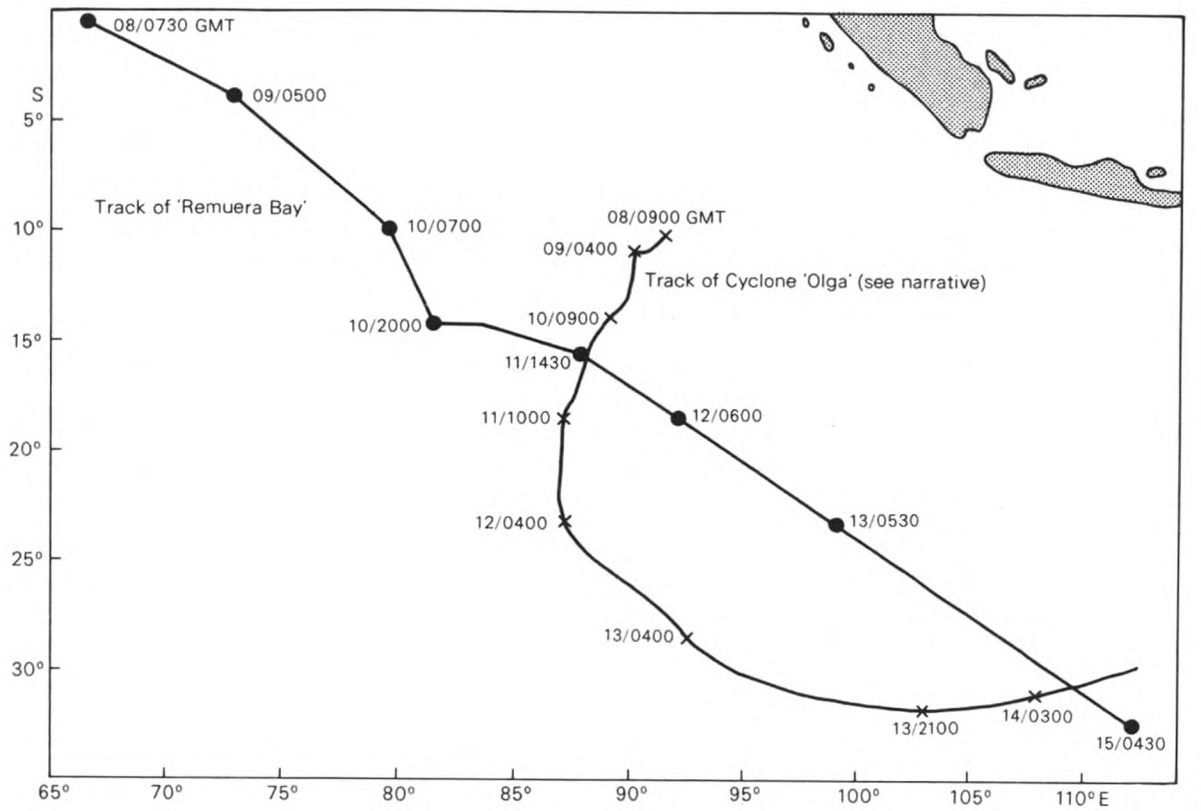
Indian Ocean

s.s. *Remuera Bay*. Captain K. E. Howard. Suez to Melbourne. Observers, the Master and ship's company.

8–15 April 1981. Early on 8 April the ship received a weather report from Mauritius Radio indicating the presence of a tropical cyclone named 'Olga' near 11·5°S, 95·5°E. Shortly afterwards Perth Radio issued a warning, giving approximately the same position, and the movement of the cyclone as south at 10 knots. It had been planned to follow a Great Circle track from Diego Garcia to Cape Leeuwin, but this was abandoned as it would have taken the vessel nearer to the cyclone.

Positions of the tropical cyclone were obtained at 3-hourly intervals from Perth Radio and a plot was started on the chart. Successive reports from 0400 GMT on the 9th to 0300 on the 10th showed the track to be WSW at first, then curving southwards to SSW at 6 knots. At 0900 GMT on the 10th the cyclone was reported to be heading south at 9 knots. It was assumed that the cyclone was recurving during this time and consequently at 0700 GMT on the 10th the vessel's course was altered to 158°(T) in order to pass to the west of 'Olga'.

However, a report from Perth Radio, timed at 1600 GMT on the 10th, gave the cyclone's track as SW again at 12 knots, and so at 2000 GMT on the 10th the course was altered to 090°(T) to pass to the north of 'Olga'. Hourly readings of the barometer were started at 1830 GMT on the 10th, corrected for diurnal variation using Table 12 (p. 135) of the *Marine Observer's Handbook*, and the results were compared with the Mean Pressure diagram found on the Admiralty Routeing Chart—Indian Ocean (April). When the vessel came within 300 n. mile of the centre of the cyclone 3-hourly reports were transmitted to Perth Radio.



After passing north of 'Olga' course was altered progressively to the south to make a rhumb line track to Cape Leeuwin. Tropical cyclone 'Olga' did recurve later, overtaking the ship well to the south and passing approximately 350 n. mile ahead of the ship before crossing the Australian coast.

The tracks of the cyclone and the ship are indicated in the sketch.

Position of ship: 8 April, 0730 GMT: 00° 37′S, 66° 37′E
11 April, 0300 GMT: 14° 19′S, 81° 29′E
15 April, 0430 GMT: 32° 36′S, 112° 06′E.

SEVERE DEPRESSION

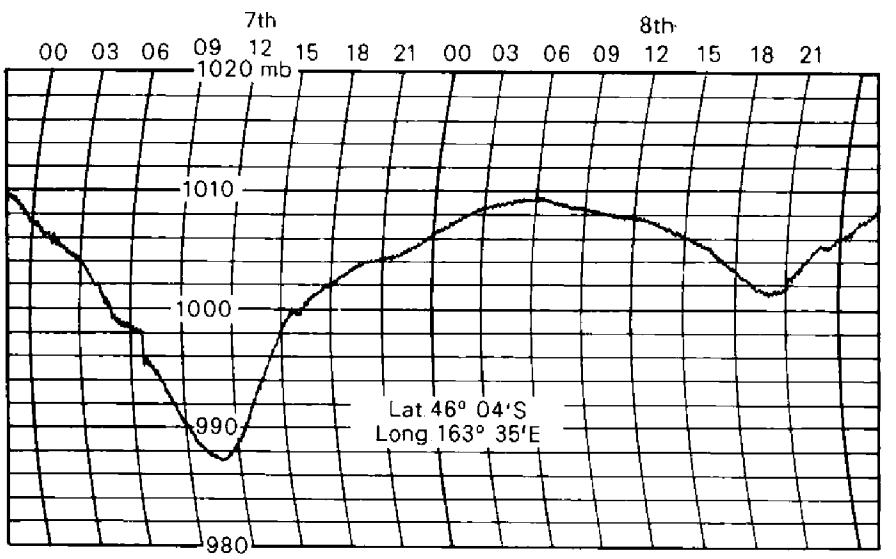
Tasman Sea

m.v. *New Zealand Star*. Captain A. W. Kinghorn. Port Chalmers to Melbourne. Observers, the Master, Mr T. Jones, Chief Officer, Mr G. Neill, 2nd Officer, Mr A. Parker, 3rd Officer, and Mr R. Shuttleworth, Extra 3rd Officer.

7–8 May 1981. The vessel left Port Chalmers at 0400 GMT on 7 May, bound for Melbourne via Foveaux Strait. Upon departure the weather was fine, wind N'E, force 3, and barometric pressure 1013·3 mb. We were off Bluff at 1100 and the Foveaux Strait was calm. At 0800 the pressure was 1009·9 mb, falling, and the wind NE, force 3–4. By 1200 the pressure had fallen to 1003·2 mb, and a radio warning, from Awarua Radio (South Island, New Zealand, near Bluff) reported a depression in the Tasman Sea, apparently to the north of the course we would be taking, but moving SE at 20 knots. Checks were made that all cargo, stores, furniture, and other movable objects were secure, and extra lashings were put on where necessary. Air temperatures at 1200 were dry bulb 12·0 °C and wet bulb 10·7.

By 1400 on 7 May the vessel had cleared the Foveaux Strait and was heading for Banks Strait (between Flinders Island and Tasmania) with the pressure now falling rapidly, and a very heavy northerly swell building up over a lower easterly swell. The wind remained steady from N'E, increasing in strength.

At 1600 on the 7th the wind was N'E, force 7–8 and the barometer read 994·4 mb. Temperatures were dry bulb 16·0 °C and wet bulb 15·0. The sea was by now very rough and the swell very heavy. Course was altered to make the vessel ride as comfortably as possible and revolutions reduced from 1400 onwards until by 1800 the vessel was barely making headway. By now the vessel was rolling very heavily at times. At 1800 the pressure had fallen to 987·5 mb and then steadied; the wind was from the north, force 10, with gusts up to force 11. The sea was very rough, and the N'ly swell was, at a conservative estimate, 20 metres from trough to crest, about 300 metres from crest to crest, though this was confused by the persistent E'ly swell running underneath. The barometric pressure then began to rise. At 2000 the wind was still N'ly, force 10, but easing slightly. The pressure had risen to 990·1 mb and the temperatures were dry bulb 14·2 °C and wet bulb 13·0. The wind began backing towards the west. A very heavy confused swell was accompanied by very rough seas. The vessel was virtually hove to with the swell on the starboard bow, riding well, but rolling up to 40° to starboard, and more to port by the force of the wind. No heavy water was being shipped, but the air was full of spray. As there was a danger of the deck cargo shifting, the vessel was hove to, and the Chief Officer, Boatswain and seamen went to secure it. When new lashings had been secured, and all cargo inspected, course was resumed and speed increased slightly as the weather was now definitely easing.



By 0001 on 8 May the wind was W'N, force 8–9, barometric pressure 1000·4 mb, temperatures dry bulb 14·3 °C and wet bulb 12·3. By 0400 the wind had dropped to W'N, force 4. The pressure had risen to 1004·3 mb and the temperatures were dry bulb 14·4 °C and wet bulb 13·0. The swell was still running high, but the sea had abated, and course was resumed for Banks Strait.

Position of ship at 1400 GMT on 7 May: 46° 15'S, 166° 10°E.

Note. The *New Zealand Star* is a New Zealand Selected Ship.

SQUALLY WEATHER

South Atlantic Ocean

s.s. *British Resolution*. Captain M. Dunning. Kharg Island to Rotterdam. Observers, Mr S. Oliver and Mr T. Pymont, 3rd Officers.

3 June 1981, 0500 GMT. The vessel was steering a course of 322°(T) at a speed of 8·5 knots. The cloud cover at this time consisted of patches of constantly changing cumulus cloud rolling across from the NW. The wind was NW'ly, force 2 and the visibility was more than 10 n. mile. Around sunrise at 0520 the cumulus and stratocumulus clouds were thickening and developing and by 0630 the bases of the clouds were turning black. Rain showers were now visible beyond 10 n. mile.

At 0700 the vessel's position was 25° 46'S, 10° 42'E and still steering 322°(T) at 8·5 knots. The sky was now completely overcast and a few rain showers were within 3 n. mile. The wind at this time was NW'W, force 3. The seas were slight, the dry bulb 18·0 °C and the barometric pressure 1016·8 mb.

At 0710 the wind backed sharply and increased to W'ly, force 6, and the vessel began to roll noticeably to a steepening W'ly swell. Shortly afterwards the vessel entered an area of rain in which the visibility was reduced to about 2 n. mile. At this time the radar indicated fairly extensive showers to be surrounding the vessel. The barometric pressure had risen to 1017·0 mb but the air temperature had dropped to 15·5 °C.

At 0730 the wind backed quickly to SW'S, force 8 and the pressure continued to rise and reached 1017·6 mb. The visibility improved to about 3 n. mile.

At 0820 the rain cleared from the vessel but showers remained within 3 n. mile. The wind was still SW'S, force 8 and the temperature had dropped further to 14·0 °C, while the pressure, still rising, had reached 1018·5 mb. Rough seas prevailed, the waves being about 3·5 m high.

Between 0900 and 0948 slight rain fell during which visibility was reduced to about 4 n. mile. The temperature was steady at 14·0 °C but the pressure had risen to 1019·6 mb. By 1000 the wind had backed to S'ly, force 6 and the visibility had improved to 10 n. mile. These conditions lasted until 1300 when the sky started to clear and the showers ceased. The temperature was now 15·0 °C and the pressure 1019·8 mb. The weather stayed fine until around sunset when it once again turned showery.

Position of ship at 0700 GMT: 25° 46'S, 10° 42'E.

WEST AFRICAN 'TORNADO'

Nigerian Waters

m.v. *Bamenda Palm*. Captain G. A. Holeyman. Alongside Apapa Quays (Nigeria). Observers, the Master, Mr J. Goble, Chief Officer, and Mr I. Hillier, 3rd Officer.

19 April 1981. On this Easter Sunday the vessel experienced a very typical example of what is locally known as a tornado, widespread at the beginning of the rainy season. It appears to be the passage of a cold front; the barograph trace reproduced indicates this very strikingly with a rise in pressure of 5 mb in $2\frac{1}{2}$ hours accompanying the tornado. The salient features observed were as follows:

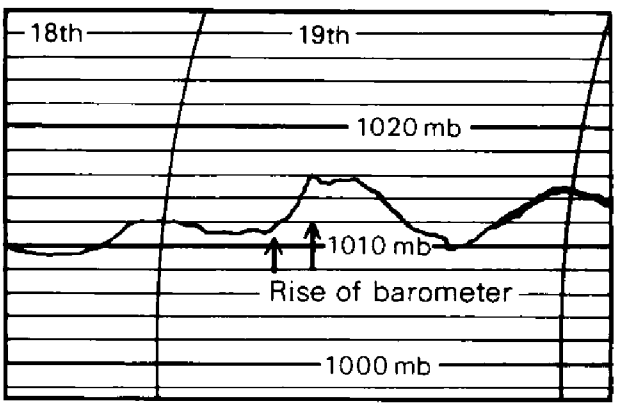
0600 GMT. Dry bulb 28·5 °C, wet bulb 27·5, barometric pressure 1011·0 mb, wind SW'W, force 2, five oktas towering cumulonimbus, especially to the east.

0700 GMT. Pressure 1012·0 mb, wind NNE, force 3, sky now covered with cumulonimbus exhibiting very turbulent undersides.

0720 GMT. Wind NNE, gusting to force 10. Dry-bulb temperature fell sharply to 23·0 °C. Torrential rain, visibility under 1 n. mile, lightning seen and thunder heard.

0820 GMT. Wind NNE, force 4. Pressure 1013·0 mb. Dry- and wet-bulb temperatures 25·0 °C. Low overcast, steady heavy rain.

1000 GMT. Wind veered from NNE to E'S, remaining force 4. Pressure 1016·0 mb, temperatures 27·0 °C.



1030 GMT. Rain ceased. Over the next 4 hours the wind veered further and steadied at S'E, force 3. Vessel sailed at 1600 GMT and found at sea a s'ly swell in place of the usual wsw'ly swell.

Position of ship: 6° 26′N, 3° 24′E.

FREAK WAVE

South African Waters

m.v. *Pacific Crane*. Captain J. Lundberg. Durban to Port Elizabeth. Observers, the Master and ship's company.

27 June 1981, 1928 GMT. Whilst proceeding along the South African coast, the vessel encountered an abnormally large wave. At the time the vessel was steering a course of 202°(T). Port Shepstone Light was bearing 311°(T) at a distance of 8·2 n. mile, which put the vessel about 1 n. mile outside the 100-fathom line. The following paragraphs describe the sequence of events before and after the wave was encountered.

1800 GMT. Vessel pitching moderately to head sea (SSW, force 3) and short sw'ly swell.

1915 GMT. Vessel pitching very heavily at times to rough head sea (SSW, force 5) and short, steep swell. At this time the vessel's speed was reduced to 18–19 knots.

1917 GMT. Speed further reduced to 16 knots.

2125 GMT. Speed reduced to 15 knots. Vessel continued to pitch heavily, shipping spray or water frequently forward.

2128 GMT. Vessel encountered an abnormally large wave, and pounded violently; the whole forward part of the vessel plunged deeply, completely covering the forecastle with a wall of white water. The vessel shuddered, before continuing to hit succeeding troughs. Owing to the darkness a detailed description of the wave could not be recorded. The height of the wave, however, was estimated at approximately 15–18 metres. The swell was between 8 and 10 metres, sw'ly, with a period of 8 seconds. The vessel's Doppler Log read 6–7 knots at the time of impact with the wave, the estimated speed then being 15 knots.

Weather conditions following the encounter remained much the same, viz.: wind ssw, force 4, sw'ly swell, barometric pressure 1011·0 mb, sea temperature 20·7 °C.

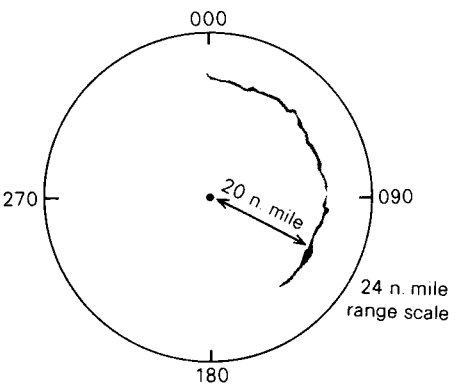
Position of ship: 30° 50′S, 30° 35′E.

RADAR PHENOMENA

Eastern North Atlantic

m.v. *Scottish Eagle*. Captain M. Whiteley. Lisbon to Gibraltar. Observers, the Master, Mr T. Martel, Radio Officer, and Cadet A. McMaster.

16 June 1981, 0745–0940 GMT. As the vessel approached the Strait of Gibraltar on a course of 085°(T) at a speed of 11 knots, distinct and well-defined coastline echoes were observed on the 3-cm radar at an apparent distance of 20 n. mile, despite the fact that readings on the satellite navigator placed the vessel 250 n. mile from the coastlines of southern Spain and Morocco. These echoes were observed through an arc of 145° from 000°(T) to 145°(T) and they persisted for nearly two hours.



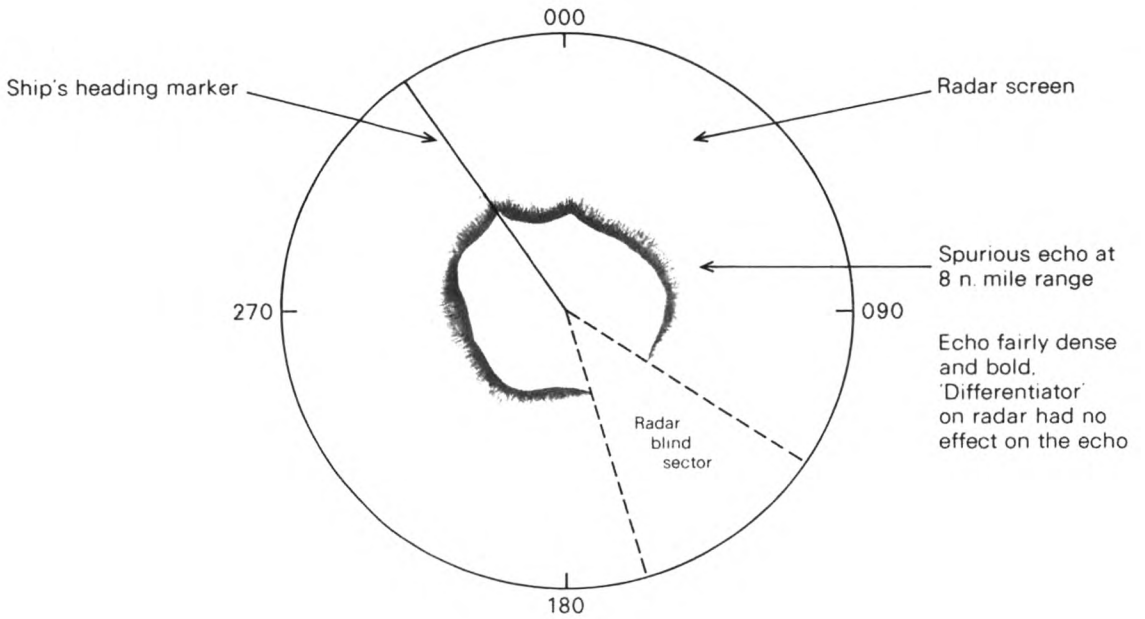
Weather conditions: dry bulb 19·8 °C, wet bulb 19·4, relative humidity 98 per cent, sea temperature 20·0, barometric pressure 1014·0 mb, visibility 5 n. mile, sky cloudless with horizontal haze.

Position of ship: 35° 32′N, 12° 10′W.

Red Sea

s.s. *Jervis Bay*. Captain R. Brinkworth. Jeddah to Port Said. Observers, Mr J. Peterson, Chief Officer, Mr J. Dodsworth, 2nd Officer, Mr D. Slack, 3rd Officer, Mr V. A. Gorny, Radio Officer, and Cadet P. Trafford.

12 June 1981, 1300–1700 GMT. Spurious echoes were observed on the radar screen in ring formation at a range of 8 n. mile. The phenomenon was not observed on radar 'B'—a Kelvin-Hughes Situation Display which was running throughout the period on the same range scale. The echoes were apparently caused by atmospheric conditions in the Red Sea.



Weather conditions: dry bulb 29·0 °C, barometric pressure 1006·0 mb, decreasing slowly.

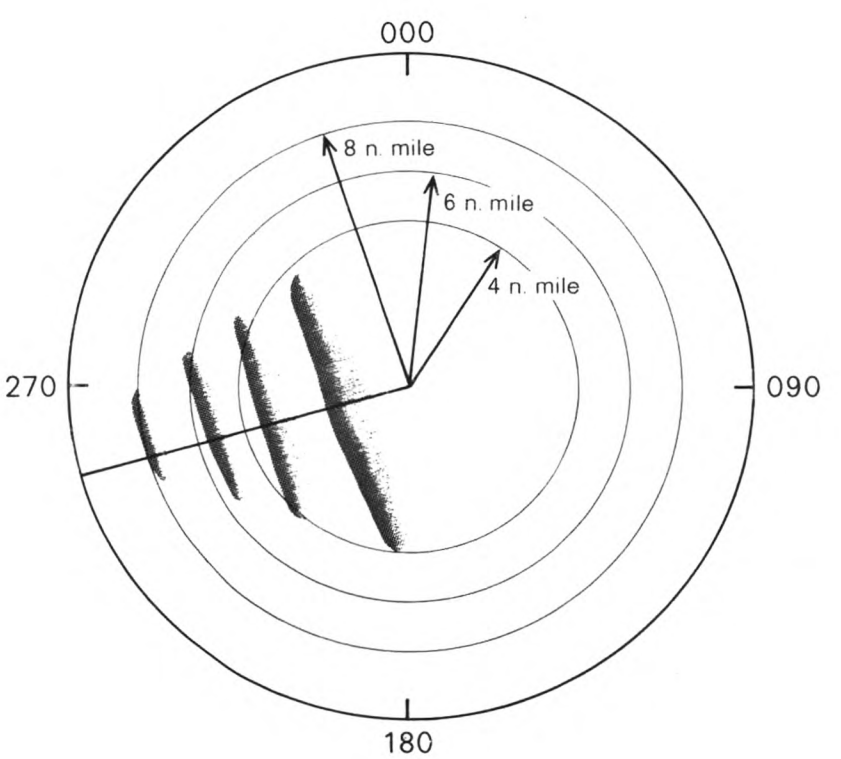
Course 325°(T), speed 19·5 knots.

Position of ship: 22° 25′N, 38° 02′E.

Strait of Gibraltar

s.s. *Jervis Bay*. Captain R. Brinkworth. Fos to Bremerhaven. Observers, Mr J. Hoy, 2nd Officer and Cadet J. Crisp.

22 June 1981, 0050–0110 GMT. Spurious echoes were observed on both radars, approaching in waves. Radar 'B' did not pick up these strong echoes until they were 2–4 n. mile away. The echoes had very well-defined rear edges.



Weather conditions: dry bulb 20·0 °C, barometric pressure 1014·6 mb, decreasing slowly, fine with misty patches, becoming overcast.

Course 258°(T), speed 20 knots.

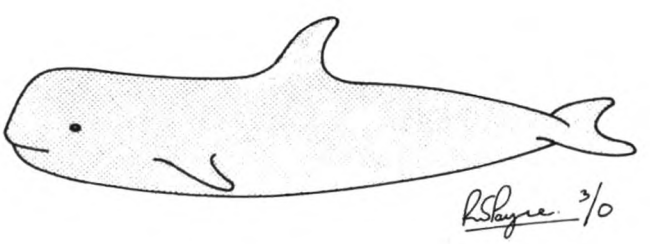
Position of ship: 36° 04′N, 5° 10′W.

CETACEA

North Atlantic Ocean

s.s. *Methane Princess*. Captain M. Goddard. Gibraltar to Canvey Island. Observers, Mr R. S. Payne, 3rd Officer, and Cadet R. J. Taylor.

15 April 1981, 1625 GMT. A school of small whales was seen, five or six of which were a 'dirty' white colour, the dorsal fin being 'dirtier' than the rest of the body. The whales were about 4 to 5 metres in length, with blunt, rounded heads and a single beak (see sketch). The dorsal fin was about $\frac{1}{3}$–$\frac{1}{2}$ metre high, recurved and round-tipped, the base being about half as wide as the height. There may have been a slight ridge on the back.



They appeared to ignore our vessel, although we passed within 50–70 metres of them. They breathed every 20–30 seconds and were clearly visible below the surface, never diving very deep. Only one was seen to leap clear of the water, and then in a very untidy fashion, landing on its side with an impressive splash.

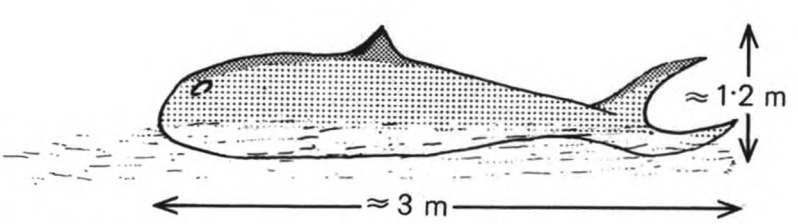
Darker individuals, coloured dark grey, were present, but all our attention was focused on the lighter specimens.

Position of ship: 39° 15′N, 10° 00′W.

South China Sea

m.v. *Fresno City*. Captain A. Gosset. Port Elizabeth to Kashima (Japan). Observers, Mr M. J. Clarke, 2nd Officer and Cadet M. A. Ryan.

18 April 1981, 0700 GMT. While steaming on a course of 042°(T) at a speed of 14 knots the vessel passed a 'Japanese' type fishing vessel, with buoyed nets, which extended for about 1·5 n. mile to leeward. The vessel's course was altered towards the North in order to avoid these nets and about five whales were observed swimming on or near the surface in the vicinity of the buoys. The whales were black in colour and about 3 metres in length. As they stayed in the



area of the nets, it was presumed that they were feeding on the fish caught within them.

Position of ship: 12° 18′N, 113° 22′E.

Note. Mr D. A. McBrearty, of the Department of Anatomy, University of Cambridge, comments:

'In this area, and at approximately 3 metres, an apparently all-black small whale without a beak could be one of perhaps four species; Pilot whale (*Globicephala*), false killer whale (*Pseudorca*), pygmy killer whale (*Feresa*) and the melon-headed whale or Hawaiian blackfish (*Peponocephala*) would all fit the description.

None of these whales has a dorsal fin anything like that in the sketch. The nearest approach to that shape would be the fin of the Indo-Pacific humpbacked dolphin (*Sousa*). This dolphin is common throughout Indonesia and although the adult is light coloured, juveniles are quite dark. They are usually no more than 2 metres in length and they do have a distinct beak.'

SEA-LIONS

Argentinian Waters

m.v. *Boston Sea Lance*. Captain F. Surtees. At Mar del Plata (Argentina). Observer, Mr M. T. Phillips, 3rd Officer.

11 May 1981. Whilst the vessel was loading fish in the fish dock, several large adult sea-lions were observed. These animals were feeding on fish from trawlers and at times on frozen fish from our vessel. They displayed no alarm at close quarters and would come to the side of the ship without apparently taking any notice of the fact that men were working within a few metres of them. Both bulls and cows were observed. They seemed to be unaffected by floating oil, which was thick on the surface in some places. They are protected by the harbour administration, but it is understood that they are killed elsewhere in the vicinity. They will apparently tear trawlers' nets in order to obtain fish.

Position of ship: 38° 01′S, 57° 32′W.

Note. Mr McBrearty comments:

'These would be the Southern Sea Lion (*Otaria byronia*), a species found all round South America from Brazil round Cape Horn to Peru. Their diet is said to be principally squid and crustaceans but free fish is obviously a possible substitute.'

TURTLES

North Atlantic Ocean

m.v. *Rockhampton Star*. Captain A. H. White. New Haven (Conn.) to Recife. Observers, the Master, Mr L. C. Colam, 2nd Officer, and Mr R. E. Lough, 3rd Officer.

13 June 1981. Between 1200 and 1600 GMT 36 turtles were sighted floating past the vessel, each of which passed within 5 metres of the ship's side. All were individual sightings with the exception of two. The turtles varied in length from head to tail within the range 0·5 metre to 1·5 metres. The colour of the shells varied also, some of them being a sandy gold giving the appearance of leather, some of them being dark brown, and some being black. All had shells with ridges except for a couple of very small ones which appeared to have smooth shells, these being sandy gold in colour. The flippers and undersides of all the turtles were yellow. As the vessel approached the turtles about half of them sounded, giving an excellent view of the undersides and flippers, whilst the remainder just floated past. The ones that floated had their flippers extended but not the head.

Weather conditions during period of sightings: dry bulb 19·6 °C, wet bulb 17·8, sea temperature 19·7, barometric pressure 1019·4 mb, wind NE'ly, force 2, eight oktas stratocumulus formed from the spreading out of cumulus, clear visibility, rippled sea and low swell.

Position of ship: 35° 58′N, 15° 24′W.

Note. Mr E. N. Arnold, of the Department of Zoology, British Museum (Natural History), comments:

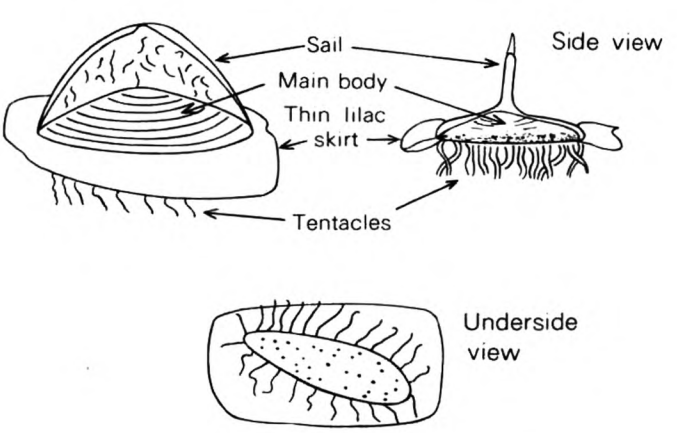
'It is difficult to know from the description what species was involved. Ridging suggests that some of them might have been Leathery turtles (*Dermochelys coriacea*) but it is not clear whether several ridges were present, as in this species, or if there was a single ridge, as in some other turtles. The light-coloured animals are unlikely to be Leathery turtles but it is not possible to say which of the other species they were.'

VELELLA

North Pacific Ocean

m.v. *Benjamin Bowring*. Captain L. Y. Davis. Sydney to Los Angeles. Observers, the Master and ship's company.

18 May 1981, 1400 GMT. The sea was thickly covered with Velella, which were being blown down by the wind. The average size was 5 cm long, 4 cm wide and 5 cm high. There was a thin sail on top (4 cm), transparent in colour, and a thin lilac-coloured skirt around the main body. The tentacles were about $2\frac{1}{2}$ cm long around the rim of the mouth. Inside the mouth the tentacles were short and yellowish.



These animals were found all the way down the Californian coast and off Oregon and were later found all the way to the Canadian coast.

Position of ship: 32° 02′N, 122° 38′W.

Note. Dr F. Evans, of the Dove Marine Laboratory, University of Newcastle upon Tyne, comments:

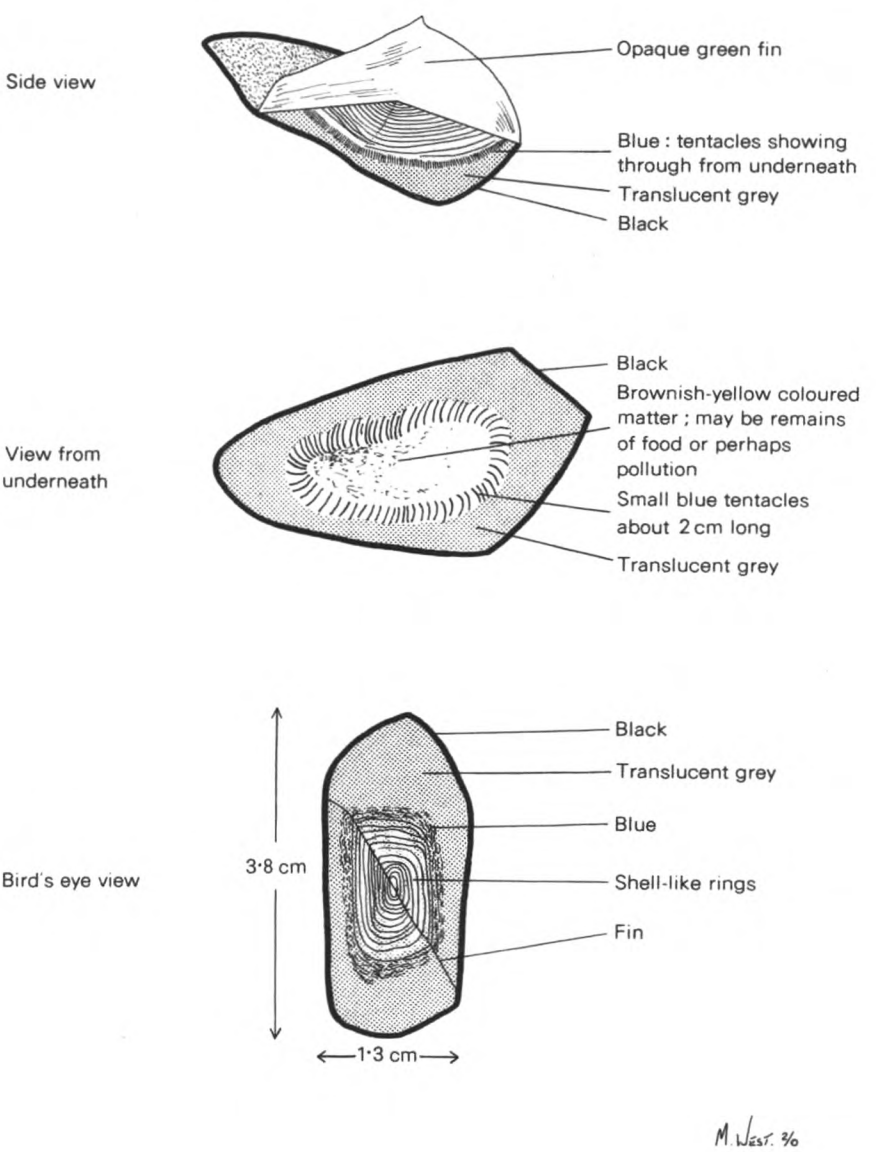
'A nice account of Velella, to which I can only add that the animals are found throughout the world in lower latitudes.'

JELLYFISH

North Pacific Ocean

m.v. *Dacebank*. Captain T. D. Scott. Hong Kong to Los Angeles. Observers, Mr M. J. West, 2nd Officer, and Cadet A. N. Coombes.

3 May 1981, 0200 GMT. For the previous three days the vessel had been passing through thousands upon thousands of small disc-like objects floating on the surface. A specimen was obtained and studied. It was a small type of jellyfish with an opaque green fin on its back, with dimensions approximately 3·8 cm × 1·3 cm. Around its periphery it was black in colour, changing to translucent grey through which the blue colour of the short tentacles showed from underneath.

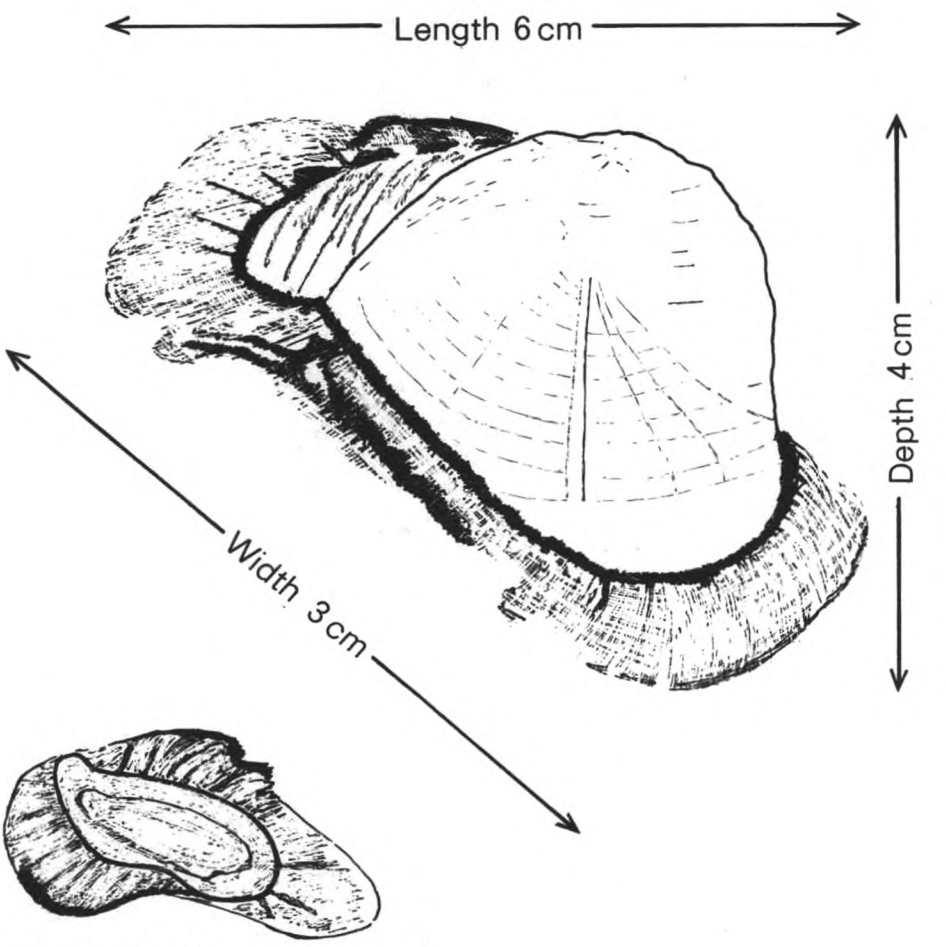


At the centre, on top, and on either side of the fin, were fine rings set in the slightly raised back, which closely resembled a shell except that they were formed of fine jelly—see sketch.

Position of ship: 34° 40′N, 122° 35′W.

m.v. *Achilles*. Captain M. Furlong. Los Angeles to Hsinkang (China). Observers, the Master and ship's company.

25 May 1981. At 1600 GMT the vessel passed through large concentrations of small jellyfish, which seemed to be of the 'Portuguese man-of-war' type. They were easily seen floating on the surface in the foam produced by the bow wave, but were not observable on the surface of the clear water. They were semi-transparent and of dark blue/purple colouring. The size varied from 1 cm in diameter to an oval shape 6 cm long and 4 cm wide with a single sail running along the back and raised to a height of approximately 3 cm. Underneath the tentacles were light blue in colour, forming an oval about 7 mm in from the edge of the jellyfish. Their length was about 1·5 cm at the outer edges, reducing to about 0·5 cm near the hollow centre.



The concentrations varied from 1 to about 10 jellyfish to the square metre of sea surface. The jellyfish were observed in these numbers continuously during daylight hours until the vessel reached position 38° 30′N, 174° 18′W at 0600 GMT on 28 May.

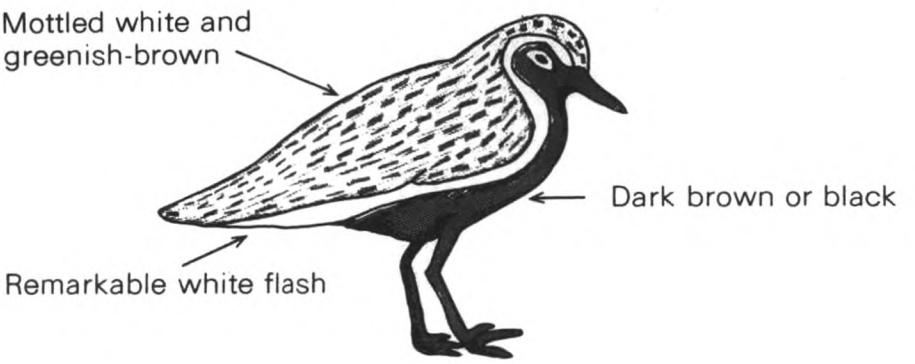
Position of ship at 1600 GMT on 25 May: 39° 30′N, 156° 54′W.

BIRDS

North Atlantic Ocean

m.v. *Selbydyke*. Captain J. Gray. Hartlepool to Three Rivers (Canada). Observers, the Master, Mr I. Marshall, Chief Engineer, Mr D. Wright, Chief Officer, and Mrs V. E. Gray.

20 May 1981. At 0805 GMT three unusual-looking birds were seen circling the ship and endeavouring to land on a hatch. At length, and with much difficulty, they managed to alight, although they were obviously not comfortable in their stance.



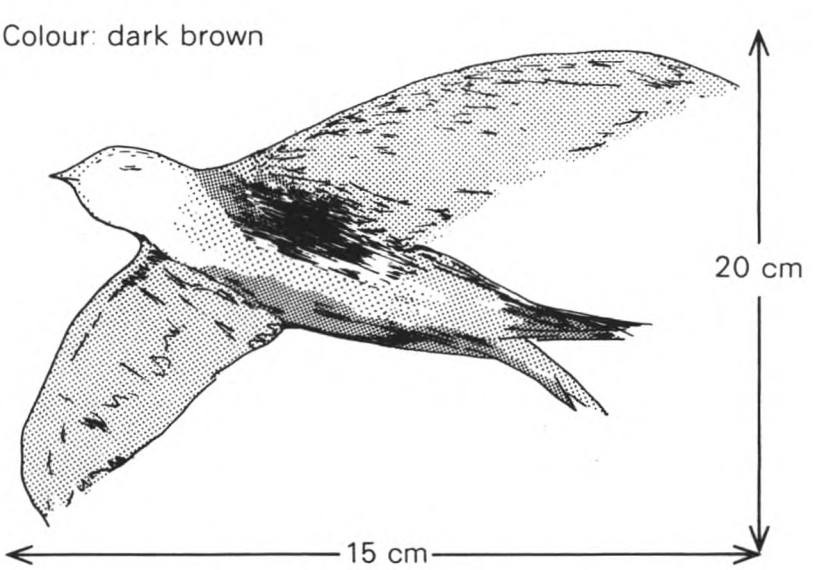
They were eventually tentatively identified as Golden Plovers, to everyone's amazement, as it was not known that these birds were found at sea. On consulting the only available bird book, however, it was found that this species breeds in Iceland but is an occasional visitor to the British Isles. The wind at the time was s'ly, force 3 or 4, but during the previous two days a heavy northerly swell had given evidence of a storm somewhere to the north, and it is thought that this may account for their having been blown so far off course. To the description of colouring on the sketch should be added the fact that, in flight, a distinctive whitish flash, or stripe, could be seen along the upper wings.

Position of ship: 50° 20′N, 33° 18′W.

Mediterranean Sea

m.v. *British Test*. Captain I. A. Oliphant. Sarroch (Sardinia) to Port Said. Observers, Mr. L. J. Loftus, 2nd Officer, and Mr P. Moulton.

9 June 1981, 1600–1800 GMT. While the vessel was south of Gavdo Island on a course of 114°(T) two swifts were observed playing around the accommodation. They made repeated attempts to land on the funnel, often in vain,



with a hard bang when they struck it. The bridge-wings seemed to intrigue them too, and their low flights across them caused the watch-keepers to duck out of the way. The prevailing wind was WNW, force 3, but unfortunately no-one noticed from which direction the birds had arrived, and although they were closely observed they seemed just to disappear without advance warning.

Position of ship: 34° 45′N, 24° 06′E.

Balboa Harbour

m.v. *British Poplar*. Captain T. V. Watkins. At anchor in Balboa Harbour awaiting Panama Canal transit. Observers, Mr S. Bryant, 3rd Officer and Cadet A. Plows.

3 May 1981. Two flocks of pelicans were observed flying in single file 30–60 cm above the water. What was interesting was the length of the lines and the number of birds. One line totalled 180 birds, while the other was slightly shorter at 160. Several other smaller flocks of about 30–70 birds were also seen behaving in the same fashion, that is to say they were heading in a SW'ly direction, towards Taboga Island and Taboguilla Island, and were weaving between the many vessels anchored in the harbour.

Position of ship: 8° 58′N, 79° 34′W.

South Pacific Ocean

m.v. *Gazana*. Captain J. A. Smeeton. New Orleans to Geelong via Panama Canal. Observers, the Master, Mr J. N. Balkwill, 2nd Officer, and ship's company.

7 April 1981, 0430 GMT. At about 2230 local time, when 840 n. mile from the nearest land, a bird, later identified as a white-throated storm petrel, was found stuck to the boat deck, which had been painted that afternoon.

It was still alive, though very dejected, and was gently prised off the tacky deck and brought into the bar. A box was found for it in which it spent the night.

In the morning, most of the paint covering its feet, wing-tips and underbody was carefully cleaned off with grease remover.

After looking through past editions of *The Marine Observer*, unsuccessful attempts were made to feed the bird with sardines and sardine oil from a syringe (minus needle); it did, however, drink a little water from a beaker. It slept deeply for most of the afternoon, then in the evening it became much more perky, preened itself, made a few clumsy steps, and exercised its wings. It was then put in the dark to rest.

By dawn it seemed fully recovered, and in fact lost some feathers while flapping around! We considered the possibility of keeping the bird until we came closer to land, but as it seemed so energetic, it was carried out to the windward bridge wing. After gripping on to Mr Balkwill's hand, and fanning its wings for a moment, it took off by itself, flew strongly up into the air and was last seen heading in a northerly direction at 1300 GMT. At no time during the bird's convalescence did it show any sign of being afraid of humans.

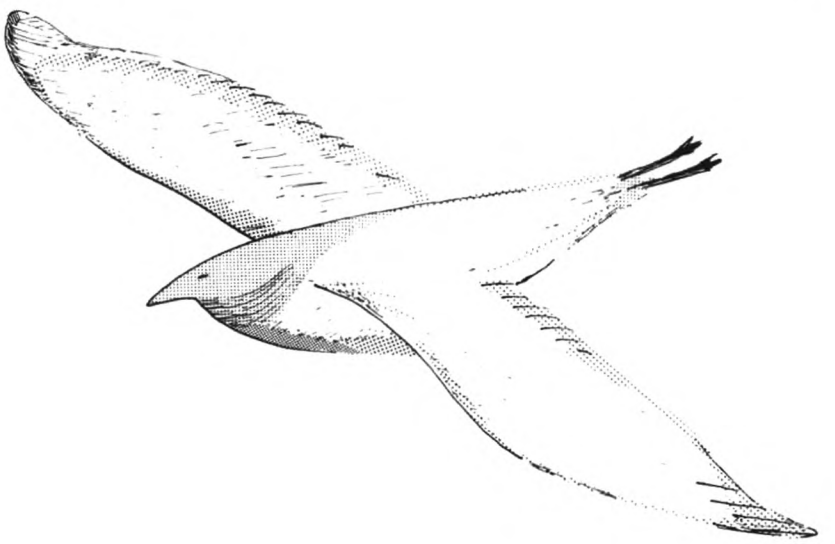
Weather conditions at time of bird's release: wind E's, force 4.

Position of ship: 7 April, 0430 GMT: 11° 20′S, 100° 40′W
8 April, 1300 GMT: 15° 40′S, 108° 10′W.

East China Sea

m.v. *Fresno City*. Captain A. Gosset. Port Elizabeth to Kashima (Japan). Observers, the Master and all ship's officers.

22 April 1981, 1000 GMT. Eleven birds were seen flying alongside the vessel in the evening. They flew very close to the water for quite long periods and landed on deck at sunset. In flight they were very graceful, but on deck they seemed rather ungainly as they stood with a hunched appearance.



Their plumage was generally white, with orange bill, head, and stripe down back. Legs and feet were slate blue, height about 60 cm and wingspan 75–90 cm. The birds left at some time during the night when the wind freshened and the vessel started to ship spray.

Position of ship: 27° 30′N, 131° 00′E.

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

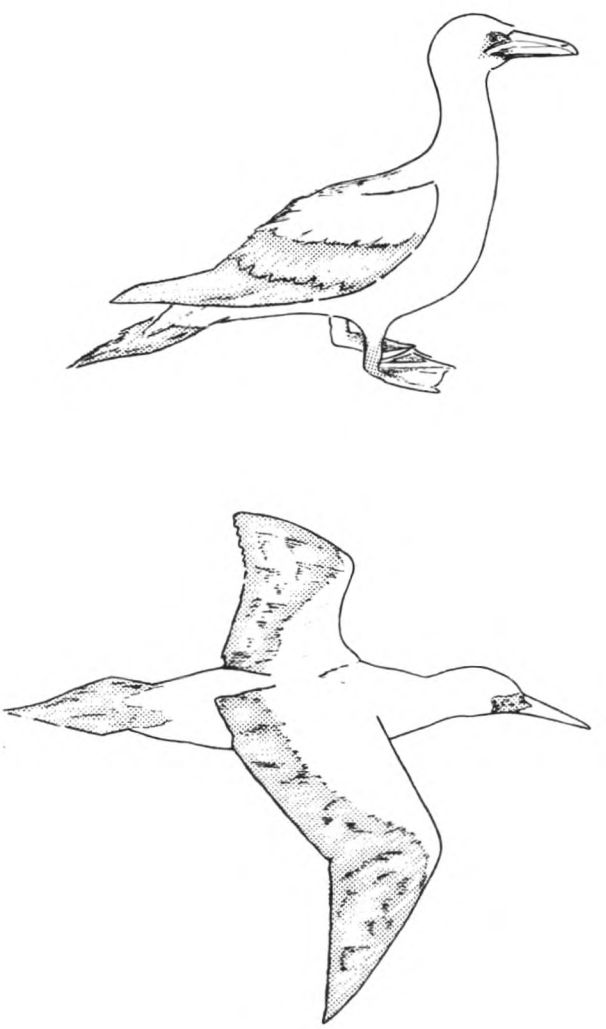
'The birds described and illustrated were little Egrets (*Bulbalcus ibis*). The species has in recent years spread very widely around the world, and by now can be seen in south-east Asia, the Philippines, India and south China, as well as in western areas. It usually avoids salt water and inhabits low-lying land, pastures and marshes.'

South China Sea

s.s. *Kowloon Bay*. Captain D. G. Brown. Hong Kong to Singapore Roads. Observers, the Master and ship's company.

1 April 1981. At approximately 2230 GMT one blue-faced or masked Booby (*Sula Dactylatra*) was observed following the vessel. The bird was also seen fishing. (See sketch.)

Position of ship: 16° 00′N, 113° 21′E.



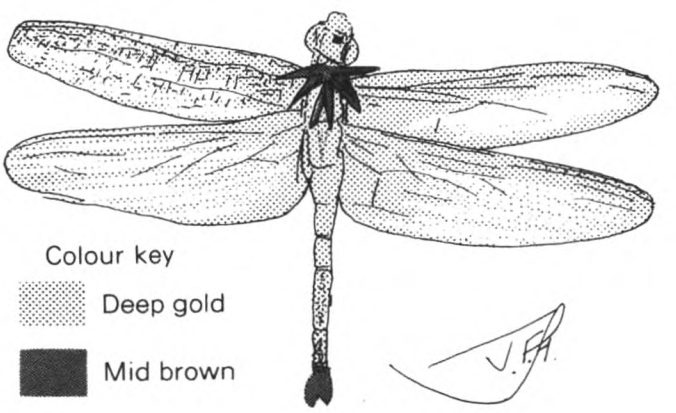
INSECTS

Kuwaiti Waters

m.v. *Vancouver Forest*. Captain J. F. Houghton. At anchor off Shuwaikh Port, Kuwait. Observers, the Master, Mr T. M. Scott-Thomas, Chief Officer, Mr C. J. Alston, 2nd Officer, Mr I. F. MacKay, 3rd Officer, and Cadet M. MacDonald.

12–13 May 1981. Whilst at anchor off Shuwaikh Port the vessel was invaded by large swarms of dragonflies (and many other insects) many of which died during the heat of the noon-day sun (see sketch).

The average dragonfly was about 6 cm long, wingspan about 10 cm, and diameter of head 9–12 mm. The sizes of those observed varied from about one-quarter of this to approximately twice this size. The body colour of the majority was off-white, though some were dark coloured. The two incredibly thin pairs of wings of the specimen depicted were delicately veined, with deep gold stripes about 5 mm long on the leading outer edges of all four wings.



From the wind directions, the dragonflies were assumed to be on breeze-blown migration from the North, i.e. from the direction of Iraq. The Kuwaiti pilot recognized them as a species of insect which caused large numbers of an un-named bird to flock to the area in order to feed on the insects during their brief appearance.

Weather conditions: dry bulb 26–32 °C, winds calm to N or NW, force 1–2.

Position of ship: 29° 21′N, 47° 55′E.

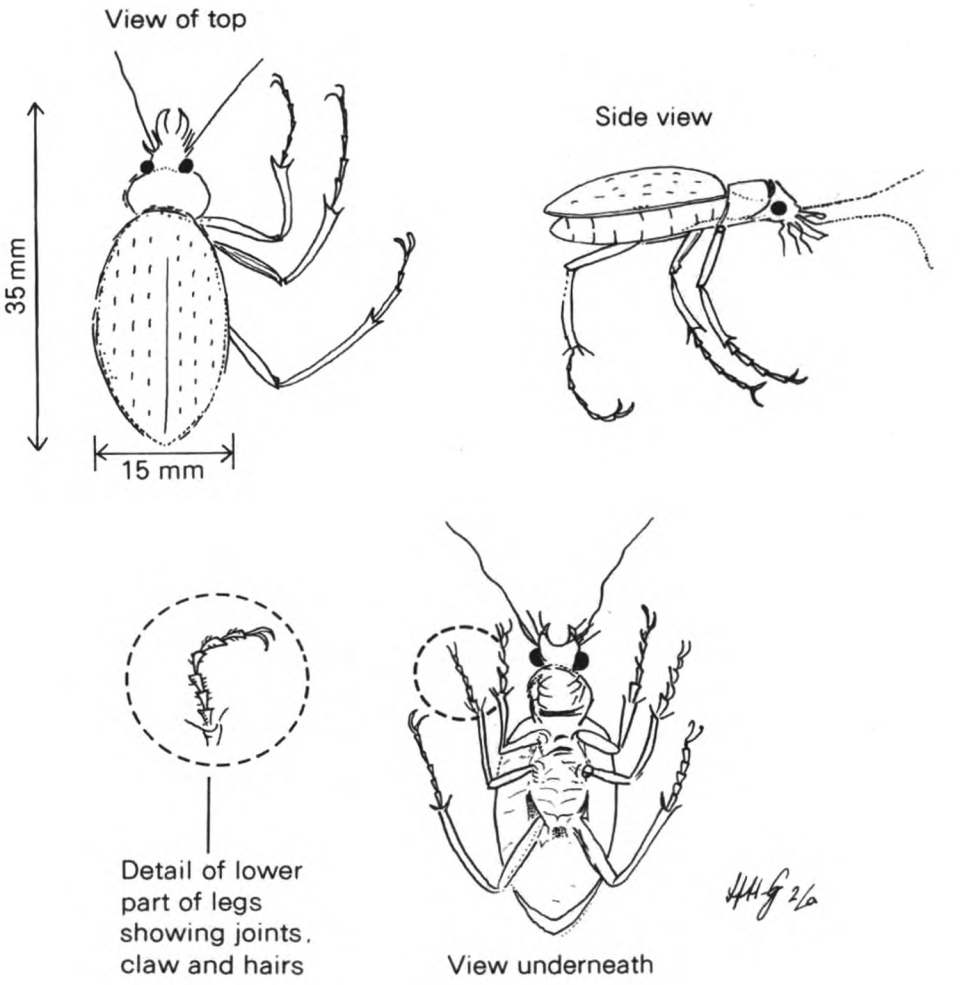
Chinese Waters

m.v. *Spraynes*. Captain A. J. Drury. At anchor at Tsingtao (China). Observers, Mr I. J. H. Grainger, 2nd Officer, and Mr R. J. Bennett, 3rd Officer.

22–28 June 1981. On every night during this period swarms of flying beetles, attracted by the ship's accommodation lights, flew on board and ended up on the decks after hitting various parts of the accommodation. The beetles seemed stunned for a while but stayed on the vessel during darkness and flew off before sunrise. The insect depicted in the sketch was an average-size beetle, though many were smaller or much larger. It was completely black in colour, except for faint gold spots in parallel lines down its shell. The shell completely covered the wings. The two sets of front legs were noticeably thinner than the back legs but all legs below the first joint were covered by a fine coating of hair. At the end of each leg was a hooked claw. The insect was 35 mm long at its extreme body length, and its extreme width was 15 mm.

The insects were quite capable of fast movement along the deck, and not very susceptible to insect repellent.

Position of ship: 36° 05′N, 120° 16′E.



Note 1. A beetle of the same species as that described was found alive and well on the poop deck at 2300 GMT on 18 July in position 47° 15′N, 128° 55′W. This specimen was 25 mm in length and 12 mm in width. It was presumed to have come aboard in China and to have been stowed in the steering flat with the mooring ropes, which were brought up on deck earlier on the 18th.

Note 2. Mr P. M. Hammond, of the Department of Entomology, British Museum (Natural History), comments:

'This is an interesting observation backed up by an excellent drawing of one of the insects involved. The insect is sufficiently well figured that it may be identified as to species with some confidence. It is a ground-beetle of the family Carabidae, the species almost certainly being *Calosoma chinensis* Kirby. It is not unusual for very large numbers of insects to fly to light on warm, humid nights, especially in the tropics and subtropics. I have worked in the vicinity of Tsingtao, and know from personal experience that insects are abundant there at street lights on summer evenings; the local residents sweep and shovel up the massed insects to use as food for poultry!'

BIOLUMINESCENCE

North Atlantic Ocean

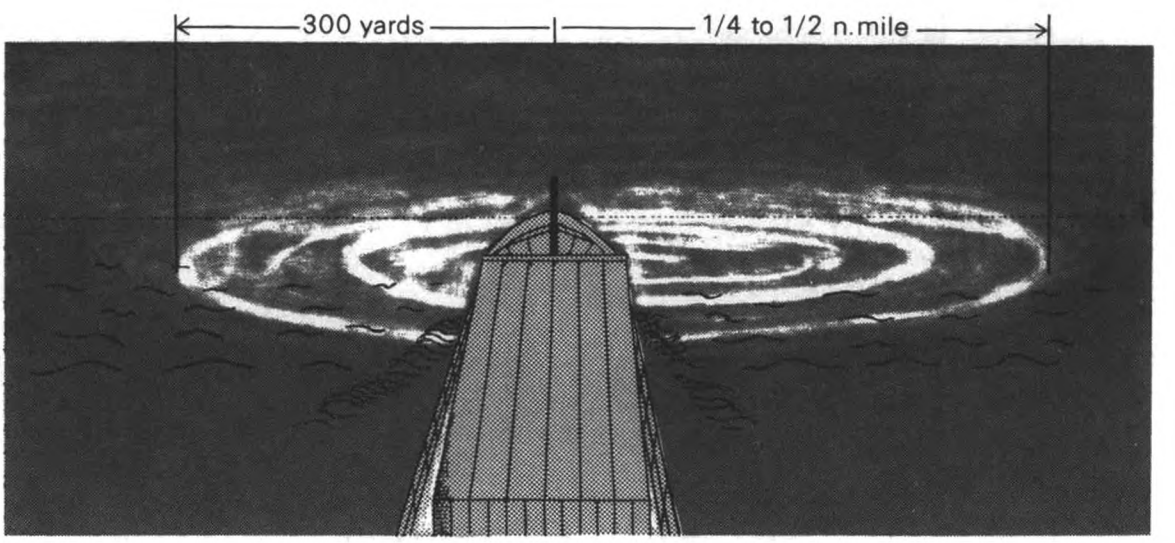
m.v. *Oriental Vanguard.* Captain K. Lehepuu. Liverpool to Cape Town. Observers, Mr G. R. Green, 3rd Officer, Cadet M. Williams, and Mr —. Derbyshire, A.B.

30 April 1981. At 2130 GMT the 8–12 lookout reported a large loom of light dead ahead extending across the horizon; the vessel's course was 154°(T) at 20 knots.

At exactly 2155 GMT a white sea-smoke type mist was observed glowing white between 2 and 5 metres above the sea surface. Further observation revealed that we were entering a large area of circulating bioluminescence of defined spiral form which appeared to be a pale emerald green in colour.

Although the direction of rotation and the centre hub of the wheel could not be determined, the bands appeared to be of great dimension.

Whilst still proceeding through the bioluminescence and observing astern it was noted that the formation of the bands became disrupted and seemed to diffuse a ragged appearance at the perimeter of the wheel to the port side of the vessel.



Judging by the distance of vessels close by—which were being tracked by radar—the extent of the rotating bands to the west could not be determined but they were estimated to be between $\frac{1}{4}$ and $\frac{1}{2}$ n. mile. The duration of the phenomenon was $4\frac{1}{2}$ minutes from entering to leaving the bioluminescence.

Weather conditions: dry bulb 22·7 °C, wet bulb 21·1, sea temperature 22·8, barometric pressure 1011·4 mb, seas slight with N'ly swell.

Position of ship: 11° 37′N, 17° 51′W.

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

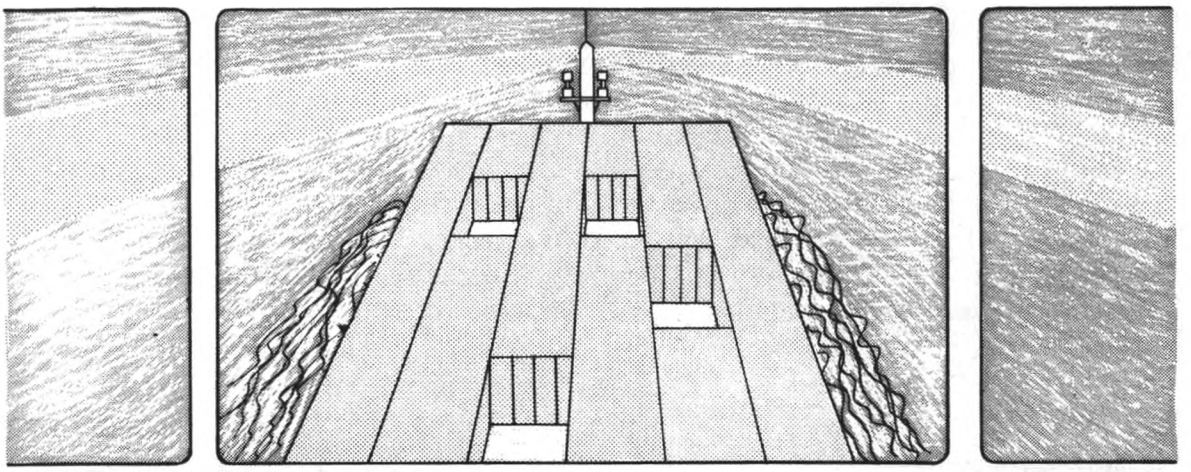
'This report is very similar to descriptions of "Phosphorescent wheels", though the scale of the "wheel" or spiral was clearly much greater than that in many other reports. The position for such a phenomenon is most unusual as almost all other reports are limited to the Indo-Pacific region. I do not know of any other reports from the Atlantic.'

BIOLUMINESCENCE AND LOW-LYING MIST

South African Waters

m.v. *City of Durban*. Captain J. W. Hodson. Cape Town to Southampton. Observers, Mr P. R. Walton, 3rd Officer, and Mr L. Campbell.

25 May 1981. At approximately 2200 GMT the vessel encountered strong bioluminescence along the sides and in the wake. It appeared to be like thick, bright-blue bands along each side, with the vessel's wake looking the same. At the same time the vessel ran into very low-lying mist and the forward mast-head light reflected along it, forming what looked like wings. Even so the mist never came above bridge-wing level and was very patchy. In all, this seemed to enhance the bioluminescence, making the overall picture quite weird.



Prominent throughout the whole experience was a rather fishy smell which may have been attributable either to the phenomenon or to the proximity of the fish-processing plant at Saldanha Bay, which lay 18 n. mile to the east.

Weather conditions: dry bulb 16·3 °C, wet bulb 14·5, sea temperature 16·0, winds light variable, force 1–2.

Position of ship: 33° 23′S, 17° 45′E.

Note. Dr Herring comments:

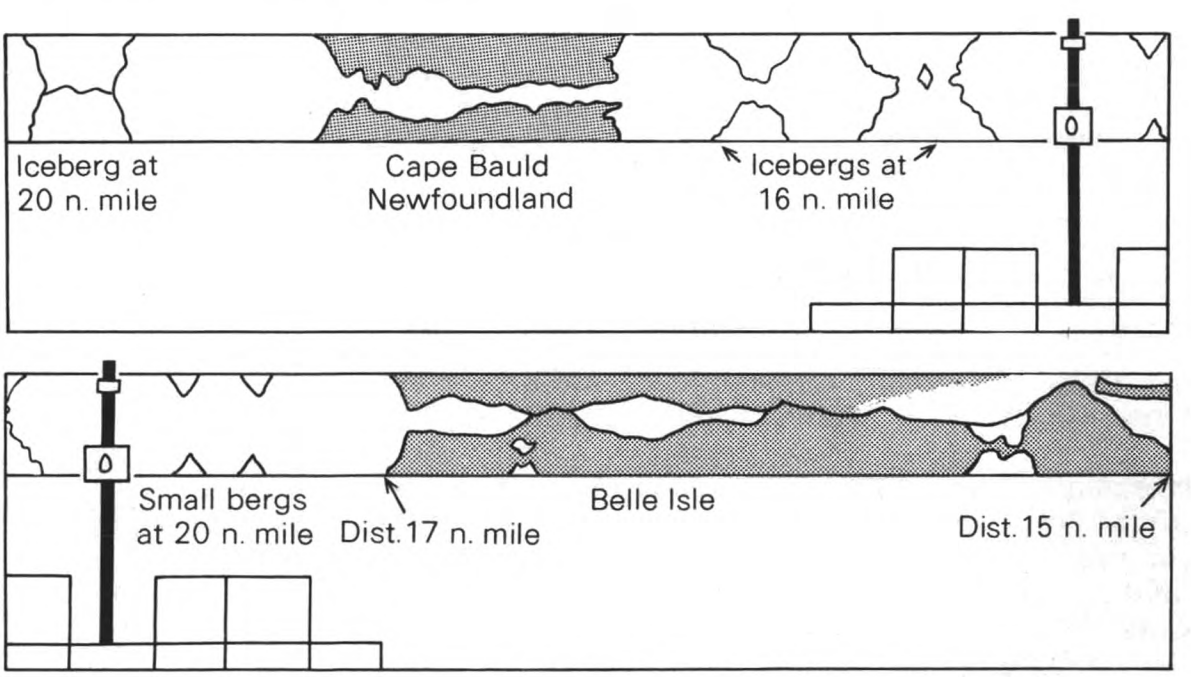
'The bioluminescence was clearly caused by the ship's turbulence, but it cannot be identified further. The combination of mist and luminescence must indeed have been very eerie.'

ABNORMAL REFRACTION

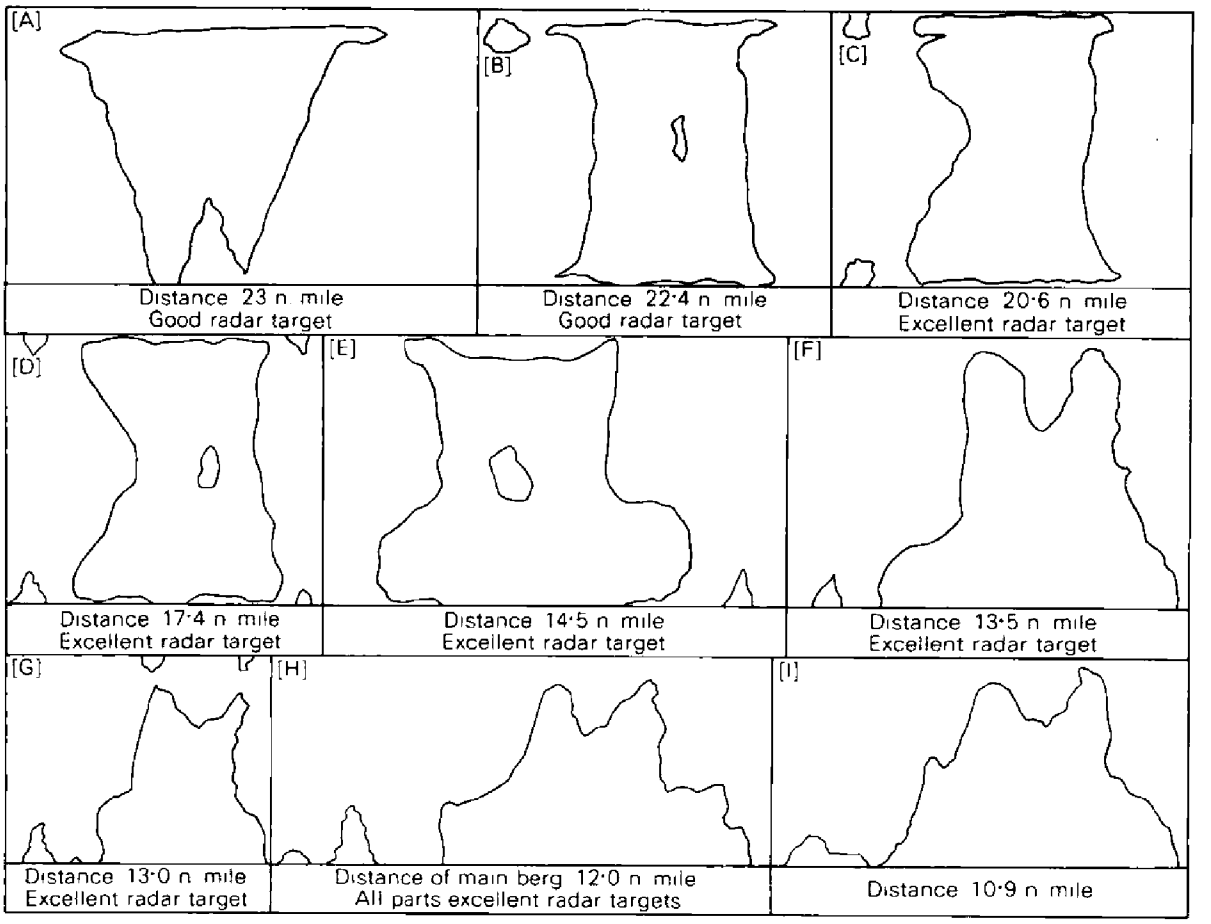
Straits of Labrador

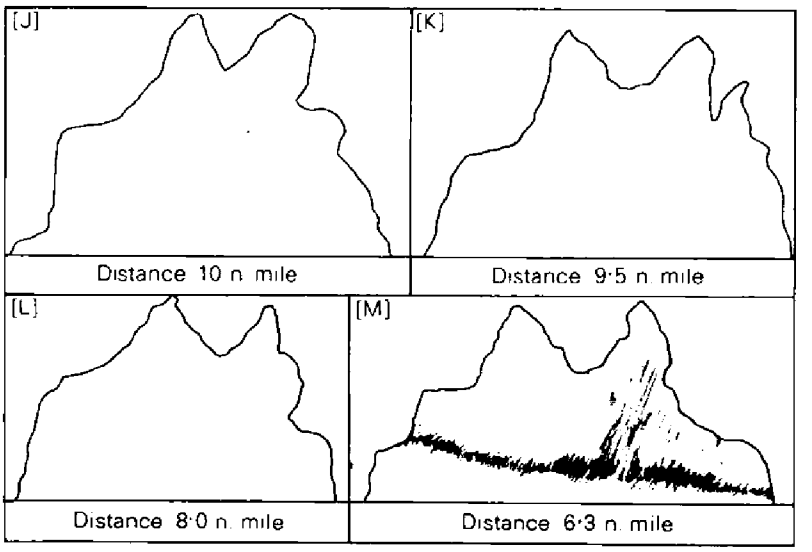
m.v. *Manchester Concorde.* Captain P. D. Cullen. Dublin to Montreal. Observers, the Master and Mr I. Buckley, 3rd Officer.

19 June 1981, 1230 GMT. As the vessel approached the Strait of Belle Isle from the north-east an excellent example of abnormal refraction was observed on the western horizon. The phenomenon was accentuated by the presence of icebergs and bergy bits/growlers.



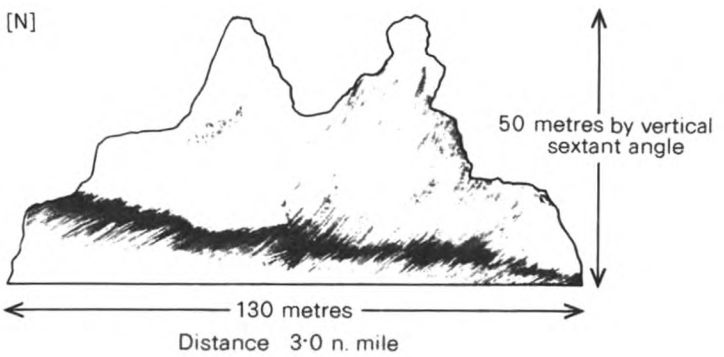
As the Strait of Belle Isle was approached a thick, low band of refraction was observed to stretch across the entrance to the Strait.





Views of iceberg affected by abnormal refraction.

At view [N] the Master took sextant angles to measure the iceberg with the results shown.



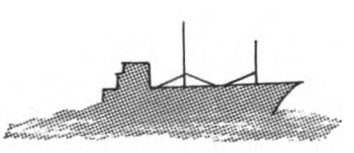
Weather conditions: dry bulb 5·9 °C, wet bulb 5·2, sea temperature 4·1, wind w'ly, force 1, sky cloudless.

Position of ship: 52° 00′N, 55° 15′W.

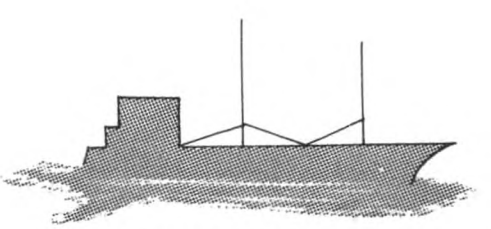
South Atlantic Ocean

m.v. *Rockhampton Star*. Captain A. H. White. Santos to Rio Grande. Observers, the Master and Mr R. E. Lough, 3rd Officer.

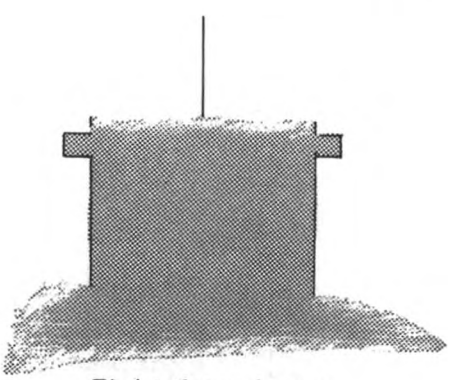
29 June 1981. At 1700 GMT a vessel initially bearing 290°(T) at 6 n. mile, heading 025°(T) passed on our starboard side. When the bearing of the vessel changed to 320°(T) at 12·0 n. mile, the visual image had become approximately four times its normal size. When the bearing was observed to be 350°(T) at 16·0



Normal view
[290° (T) × 6·0 n. mile]



Four times larger
[320° (T) × 12·0 n. mile]



Eight times larger
[350° (T) × 16·0 n. mile]
(Stern view)

n. mile the image had changed to approximately eight times normal size for that distance and gave the appearance of a large block of flats. On taking a final bearing of the vessel of 020°(T) at 20·0 n. mile the image had returned to what was considered normal for that distance.

The bearing of the sun at time of observations was 320°(T), altitude 45°. No distortion was observed in any of the images.

Weather conditions: dry bulb 20·5 °C, wet bulb 19·0, clear skies with excellent visibility.

Course of vessel: 214°(T) at 18·0 knots.

Position of ship: 28° 38′S, 48° 34′W.

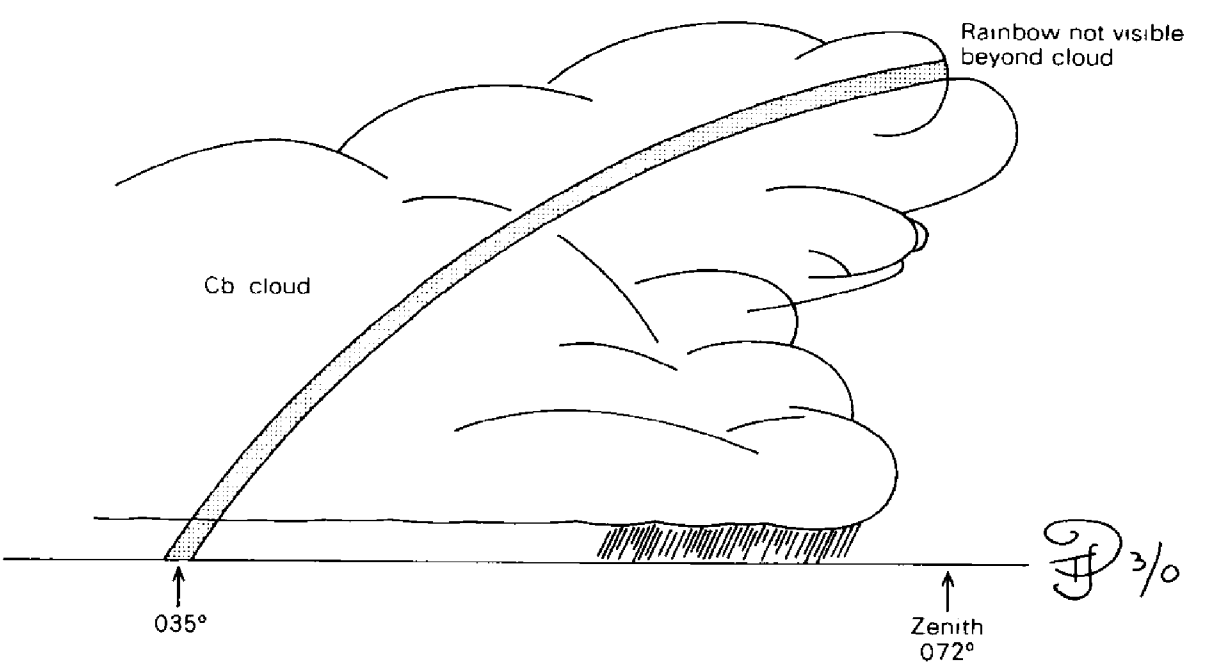
LUNAR RAINBOW

Arabian Sea

s.s. *British Resolution*. Captain M. Dunning. Kharg Island to Rotterdam. Observer, Mr T. Pymont, 3rd Officer.

19 May 1981. At 0100 GMT, 20 minutes after clearing a moderate rain squall, a colourful lunar rainbow was observed. It was only visible against the backdrop of a large anvilled cumulonimbus cloud associated with the squall. At this time the moon was itself obscured by another cloud, which made the sky appear quite dark and the rainbow thus more easily seen.

The red, yellow and green bands were very clearly visible and a slight violet tinge to the inside of the green was also seen. The bow took the form of about a sixth portion of a circle from the horizon (left-hand edge bearing 035°(T)) to its zenith at an altitude of about 20°, bearing 072°. The moon was calculated to be bearing 252°(T) at an altitude of 25°.



As the cloud receded, so did the portion of bow visible, until at 0120 GMT it could no longer be seen. Attempts to measure the thicknesses of the coloured bands or to see more detailed separation through binoculars proved fruitless.

Weather conditions: dry bulb 26·6 °C, wet bulb 25·0, wind SE'S, force 4, cloud cover five oktas of cumulonimbus and scudding cumulus.

Position of ship: 00° 00′N, 49° 36′E.

Note. The following entry appears on p. 109 of the *Marine Observer's Handbook* (Met. O. 887):

Lunar rainbows. Lunar rainbows are formed in the same way as solar ones, but are considerably rarer, having regard to the comparatively short periods that a bright moon is above the horizon. A lunar rainbow is usually fainter than a solar one and it is not always possible to distinguish colour; the appearance is then whitish. Quite frequently, however, colour may be observed; more rarely the whole sequence of colour can be seen. Secondary and supernumary lunar rainbows are very rarely seen, on account of their faintness.

STELLAR SCINTILLATION

Tasman Sea

m.v. *Mairangi Bay*. Captain J. Cosker. Jeddah to Wellington (N.Z.). Observers, Mr C. J. Petty, 3rd Officer, and Mr J. Shute.

19 May 1981, 1540 GMT. The star Altair was first observed to be 'flashing' at a rate of about six times a second and on closer inspection it was noticed that a change in colour was made with each flash. Altair was the highest star seen 'flashing', at an altitude of 32°, and also one of the brightest; at a lower level Vega and Arcturus could also be seen 'flashing' with the naked eye. With the aid of binoculars the same phenomenon could be seen in stars of lower magnitude such as Fomalhaut, Enif and Spica. No other stars above 32° altitude were seen 'flashing'.

The colour changes were rapid and random, the colours seen being bright red, emerald green, violet, white and a bluish colour similar to that seen on a housefly's back. The colours appeared to overlap slightly and were very clear indeed. The stars observed were in clear view and not obscured by cloud. Scintillation continued to be observed until about 1630 GMT.

Weather conditions: dry bulb 11·5 °C, wet bulb 8·1, sea temperature 15·0, barometric pressure 1032·1 mb, light E'ly winds, calm sea and low swell, cloud cover four oktas semi-transparent altocumulus.

Position of ship: 39° 35′S, 148° 55′E.

Note. The following extract is taken from p. 247 of the *Meteorological Glossary* (Met. O. 842):

'scintillation (of stars): Rapid variations of apparent brightness ("twinkling") of stars, much more marked in stars near the horizon than in those near the zenith. Variations of colour may also appear at altitudes less than about 50°. The phenomenon is caused by small variations of REFRACTIVE INDEX of air associated with atmospheric inhomogeneities, mainly in the low atmosphere. A similar effect is visible at times in terrestrial objects, for example the shimmering of objects near the earth's surface on a hot day.'

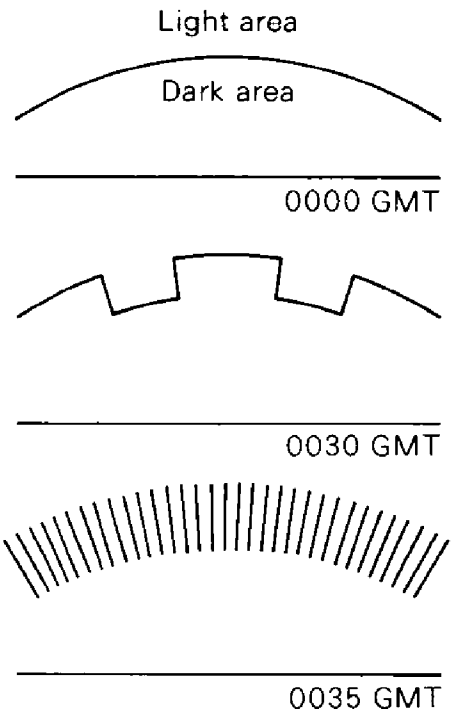
AURORA BOREALIS

North Sea

s.s. *British Norness*. Captain M. Stephenson. Hound Point to Milford Haven. Observers, Mr M. A. Watson, 2nd Officer, Cadet C. Robinson and Mr A. Colemas.

27 April 1981, 0030 GMT. While the 0000 GMT weather report was being completed, the edge of what was thought to be an area of cirrostratus was observed about 20° above the horizon, towards the north. The lighter area curved down towards the horizon towards the east and west. At around 0030 GMT sections of the lighter upper area started to drop towards the horizon very quickly and within a few minutes these had developed into parallel, light and dark bands stretching from about 15° above the horizon to directly overhead.

These faded after a few minutes and the northern sky was left with a milky-white glow which varied slowly in intensity and area over the next hour. Around 0130 GMT the glow was again 15°–20° above the northern horizon in a band



curving towards the horizon. The glow started to flicker and flash, having a similar effect to watching the flames of a fire. This extended from the band 20° above the horizon to overhead. The flame effect seemed to originate at the band above the horizon and the 'flames' travelled in vertical and horizontal bands until overhead. This effect was of quite strong intensity at first and slowly faded until it finally disappeared around 0230 GMT.

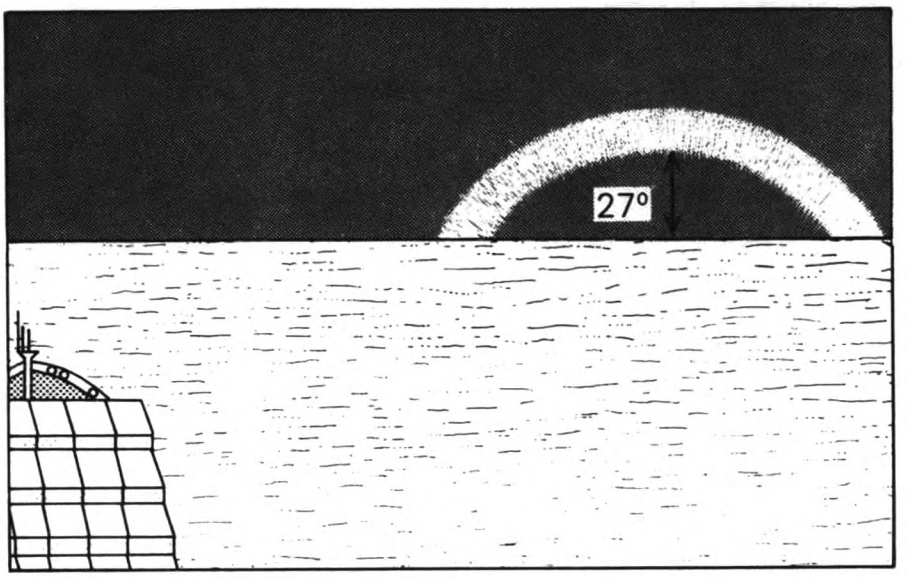
Position of ship: 58° 56′N, 1° 54′W.

AURORA AUSTRALIS

Southern Ocean

m.v. *Resolution Bay*. Captain G. C. Barrett. Auckland to Le Verdon via Cape Horn. Observers, Mr A. Ellis, Chief Officer, Mr I. M. Chadney, 3rd Officer and Mr J. Stockdale.

9 June 1981, 0020–0145 GMT. The vessel's course and speed were 098°(T) at 21 knots, and sunset on the 8th was at 2210 GMT. Initially a glow appeared on the horizon in the form of an arc; it began to get slightly brighter until at 0030 GMT it could be determined to be a homogeneous arc type aurora. Its activity could be described as quiet, with no waxing, waning or flaring, and its brightness as only moderate, yet there were times in the 75 minutes during which it was visible when it did take on a very slight pale green colour, its basic colour for the remainder of the time being a light grey.



Weather conditions: dry bulb 5·1 °C, wet bulb 4·8, sea temperature 7·0, barometric pressure 1015·3 mb, rising, wind NNE, force 3, cloud cover three oktas cumulonimbus with anvil, and visibility at least 10 n. mile.

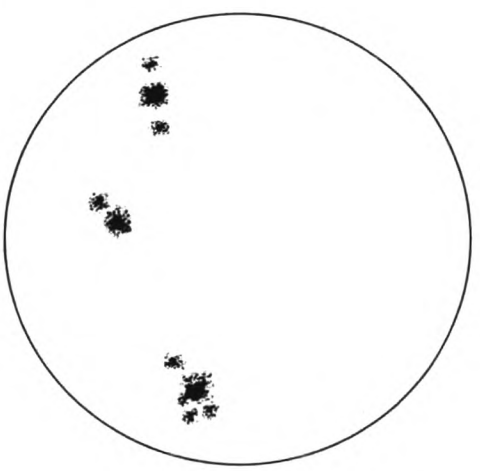
Position of ship at 0030 GMT: 53° 56′S, 96° 22′W.

SUNSPOT ACTIVITY AND ASSOCIATED DIFFICULTIES IN RADIO TRANSMISSION AND RECEPTION

South Atlantic Ocean

m.v. *British Test*. Captain I. B. McNaughton. Douala (Cameroon Republic) to Santos (Brazil). Observer, Cadet T. M. Stone.

3–10 April 1981. Throughout the passage the Radio Officer had been having difficulty both with transmissions and with the reception of distant radio stations, whose signals were sometimes almost completely obscured. At 1200 GMT on the 10th the problems reached their peak, all radio stations transmitting from east to west being completely obscured.



During the passage, while taking noon observations with sextants, it had been observed that the sunspot activity was quite high, which might well have contributed to the interference suffered by the radio signals. When all the stations were obscured at 1200 GMT on the 10th, examination of the sunspots

using the ship's sextants showed a considerable increase in activity over the preceding two days. Three main spots were noticed, with six smaller ones, nine in total. The relative positions of the sunspots are shown in the sketch.

Position of ship at 1200 GMT on 10 April: 19° 35′S, 28° 52′W.

VOLCANIC ACTIVITY

North Pacific Ocean

m.v. *Arafura*. Captains R. M. Coates and J. F. E. Lucas. Trading between Australia and Japan. Observers, the Masters and ship's company.

19 April 1981, 1140 GMT. A strong sulphurous smell was observed to be coming from the island of Farallon de Pajaros (Lat. 20° 32·5′N, Long. 144° 54′E), when it was bearing 078°(T) and distant 11·2 n. mile and the wind ENE, force 5. A similar smell from the same source had previously been noted at 0300 GMT on 7 March 1981, when the bearing and distance were 054°(T) and 26·8 n. mile and the wind was NE, force 5.

30 May 1981, 0014 GMT. The active volcano Mount Pagan on the island of Pagan (Lat. 18° 06′N, Long. 145° 45′E) was observed to be emitting steam. The sides were covered with black volcanic ash and lava. A large fissure could be seen on the NNE side of the cone. Through this fissure a line of lava from which steam was being emitted could be seen. All the trees around the volcano were bare and lava flows reached the shore-line in places.

Note. The *Arafura* is an Australian Selected Ship.

UNIDENTIFIED PHENOMENON

North Atlantic Ocean

m.v. *Scottish Lion*. Captain A. D. Terras. Port Said to Philadelphia. Observer, Mr B. Richmond, 2nd Officer.

31 May 1981, 0415 GMT. A meteor-type phenomenon was sighted. It was large, lime-green in colour and very bright. It apparently travelled in an ENE'ly direction and was observed to the south of the vessel. It was first sighted as it rose above the horizon in the WSW and dropped below the horizon in the ESE. Sparks and flashes were observed to be emitted by the sighting and the ship was brightly illuminated by its transit at an elevation of about 15°.

Position of ship: 36° 21′N, 16° 09′W.

551.5:06(6):551.5(09)

The Founding of the Meteorological Office, 1854–55*

By R. P. W. Lewis, M.A., M.Sc.
(Meteorological Office, Bracknell)

Summary

An account is given of the steps leading to the establishment of the Meteorological Department of the Board of Trade and the appointment of Captain R. FitzRoy, RN as its head in so far as they are ascertainable from contemporary sources.

The present account is intended to amplify, and in certain minor respects to correct, previously published accounts of the history of the Meteorological Office in so far as they are concerned with the actual foundation of that institution in 1854–55 and the appointment of Captain (later Admiral) Robert FitzRoy to be its head. The Office was founded as a department of the Board of Trade, and it is unfortunate that a large number of Board of Trade papers were destroyed towards the end of the last century so that it is possible that some primary documentary sources have disappeared forever; certainly, very little relevant material can be traced today, either in the Public Record Office or elsewhere. However, enough remains for the general course of events to be described clearly enough.

In 1853 the first international marine conference was held in Brussels as a result of the work of Lieutenant M. F. Maury of the United States Navy. (Following an accident which rendered him unfit for further active service, Maury had in 1842 been put in charge of the Depot of Charts and Instruments where he organized a remarkable survey of winds and currents, distributing logbooks to captains and plotting and analysing the results.) As a result of this conference, at which Maury represented the United States, a strong feeling developed in scientific and shipping circles that the British Government should co-operate with the Americans by setting up their own office to collect oceanic and other scientific observations and to tabulate the results. On 26 April 1853 Lord Wrottesley, a senior Fellow of the Royal Society (of which he was to become President in November of the following year) and an expert on astronomy and the observational sciences, made an eloquent speech in the House of Lords; this speech was later reprinted as a pamphlet entitled 'On Lieut. Maury's plan for Improving Navigation, with some remarks upon the advantages arising from the pursuit of abstract science' and makes good reading even now. In February 1854 Captain FitzRoy (as he then was) wrote the following letter[1] to Colonel Sabine,† the Treasurer of the Royal Society:

Febr. 3 1854

My dear Colonel Sabine,

I send a copy of the paper to which I referred yesterday. For the first year it would not be too *difficult* to carry on without a *draughtsman*, but *time* would be lost.

I have made no special allusion to magnetic observations because you are the Magnetic Chief who will say what and how much should be done—and because my "Outline" for Lord Wrottesley was

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*Previously published in the *Meteorological Magazine*, **110**, 1981, pp. 221–227. The author has taken pains to retain the style of the original material.

†General Sir Edward Sabine, K.C.B., F.R.S., 1788–1883; astronomer and geodesist; President of the Royal Society 1861–71.

to bear on Maury's plan alone. The more I think about the subject, the more interested I feel in it—and I shall forthwith prepare for regular work—by going to a convenient house—where I shall have air, *room*, and light—and shall be able to work at *home*, as well as in *other* places.
Mr Heywood, in a note *just received* by me, says—"On Monday, I intend to ask Sir James Graham, in the House of Commons, whether an Office will be established to co-operate with Lt Maury, and if the records of surveying ships, preserved at the Admiralty, may be rendered accessible to the person in charge of that Office. I am glad to hear, from Lord Wrottesley, that the Office will probably be under the Board of Trade, as it will thus be more easily in communication with the Mercantile Marine".

I remain always
Sincerely and respectfully
Yours
Robt. FitzRoy

(I reserve *other* topics and *private* feelings).

At the same time, FitzRoy wrote a memorandum[2] of eight foolscap pages entitled 'Mode of proceeding in Office' which is reproduced as Appendix 1. The Parliamentary Question referred to in the latter was duly put by Mr Heywood on 6 February 1854 (Appendix 2).

On 3 June 1854 the Board of Trade addressed a letter[3] to the Royal Society in the following terms:

Office of Committee of Privy Council for Trade
Marine Department, 3rd June, 1854.

Sir,—I am directed by the Lords of the Committee of Privy Council for Trade, to acquaint you, that, with the concurrence of the Lords Commissioners of the Treasury, My Lords have determined to submit to Parliament an estimate for an office for the discussion of the Observations on Meteorology which it is proposed shall be made at sea in all parts of the globe in conformity with the recommendation of the conference held at Brussels last year; and they are about to construct a set of forms for the use of that office, in which it is proposed to publish from time to time, and to circulate such statistical results as may be considered most desirable by men learned in the Science of Meteorology in addition to such other information as may be required for the purposes of navigation.

Before doing so, however, they are desirous of having the opinion of the Royal Society as to what are the great desiderata in Meteorology, and as to what forms that Society consider the best calculated to exhibit the great atmospheric laws which it may be most desirable to develope.

I herewith inclose a form of Log which will contain all that it is proposed to execute at sea; but it may possibly happen that observations on land upon an extended scale may hereafter be made and discussed in the same office, and in framing your reply it is desirable that such a contingency should be borne in mind and provided for.

I am, Sir, your obedient Servant,
James Booth

To the Secretary, Royal Society

The Royal Society acknowledged this letter on 24 June in a communication[4] signed by Colonel Sabine which informed the Board of Trade that the President and Council of the Society had 'addressed a letter . . . to several of the most eminent meteorologists in foreign countries' asking for their comments and advice. (The final reply of the Royal Society was sent to the Board of Trade on 22 February 1855, and is of considerable length. It is reprinted as an Appendix to FitzRoy's Report[5] for 1857 in which it is oddly and probably mistakenly described as a reply to a letter from the Board of Trade dated 15 January 1854, not 3 June; I have not been able to trace any letter for this earlier date, but there was probably a misreading of 15 June (date of Royal Society Council meeting).)

The next undoubted fact is the appointment of Captain FitzRoy to a position in the Board of Trade on 1 August 1854.[6] In the article on FitzRoy written for

the 9th Edition of the *Encyclopaedia Britannica* not long after FitzRoy's death it is stated that '. . . when in 1854 Lord Wrottesley, the president of the Royal Society, was asked by the Board of Trade to recommend a chief for its newly forming meteorological department, he, almost without hesitation, nominated FitzRoy . . .'. I have not been able to trace any contemporary evidence for this statement, and the Librarian of the Royal Society has informed me that there is no documentary support for it in the Society's archives. However, the article in the *Britannica* was written by John Knox Laughton (1830–1915) who served in the Royal Navy from 1853 to 1885 and then became Professor of Modern History at King's College, London; he was President of the Meteorological Society from 1882 to 1883 (his Presidency covering the time that the Society obtained its Royal Charter) and was knighted in 1907. Although a very young man at the time of FitzRoy's appointment, Sir John Knox Laughton would later have been in a position to hear a good deal about it and may have had the opportunity of seeing papers that have since disappeared. (A minor error in the *Encyclopaedia Britannica* article is the description of Lord Wrottesley as the President of the Royal Society, an office he did not assume until several months after FitzRoy's appointment.) It is nevertheless clear from FitzRoy's own letter that he himself, Lord Wrottesley, and Colonel Sabine were in close touch on the matter. FitzRoy's own account,[7] dated 8 February 1855, is uninformative as to the precise steps leading up to his appointment, and is as follows:

> The importance of accumulating meteorological observations, and tabulating them methodically, for the purpose of future, rather than immediate investigation, having been urged by the Royal Society, while the practical benefits arising from such collections, even at the present time, were proved by the direct consequences of Maury's extensive labours, Her Majesty's Ministers agreed to establish an office under the Board of Trade for receiving and tabulating all such observations made at sea.
>
> It was considered that much information might be compiled with respect to currents, as well as winds, which might be made more generally known to those interested in the passages of ships across the ocean; and that the sooner such authentic compilations could be made generally available, the greater would be their value. It was, moreover, pronounced to be necessary that instruments of a reliable and understood nature should be alone employed; that they should be carefully tested and vigilantly guarded from accidental causes of error.
>
> To meet these objects, an estimate of probable expenses was submitted to Parliament, and the sums proposed were voted, namely, 2000*l*, for the Mercantile Marine and 1000*l* for Her Majesty's ships.
>
> Soon afterwards an officer was appointed to execute the duties of the Meteorological Office, to be subsequently assisted by a few subordinates; but some time elapsed before instruments of the peculiar kind deemed proper by a Committee of the Royal Society could be finished, and an office appropriated for the object in view. Now the preliminary arrangements are made, and the Meteorological Office of the Board of Trade is open at No 2 Parliament Street . . .

FitzRoy's official title, as Head of the new office, seems to have varied somewhat, according to the entries in the *Imperial Calendar*. The first mention is in the 1856 edition where he is listed as 'Meteorological Statist', in the 1859 edition this is changed to 'Chief of Meteorological Department' and in 1864 to 'Chief of Meteorological Division'. Nowhere is there any reference to his being called 'Superintendent', which is the title given him in the list of names of Heads of the Meteorological Office inscribed on the wall of the entrance hall of the Meteorological Office Headquarters at Bracknell. The same list also has the letters 'C.B.' (Companion of the Order of the Bath) inscribed after his name. This is a mistake; FitzRoy never received any official honour or decoration for his work.[8]

The staffing and financing of the Office was on a modest scale. FitzRoy's first Report[9] to the President of the Board of Trade contains the following passage:

The Meteorological Office being but recently established, and not having yet received a large supply of records, only four* persons are at present engaged in it, including the officer in charge.

The sum estimated for 1854–5 was £3,200; but, as no expenses were incurred till half the financial year had expired, a balance remained in hand which may diminish the estimate necessary for 1855–6.

Despite the small number of staff, it is clear from a perusal of FitzRoy's early reports that a very large amount of work was carried out, consisting not only of routine office work and the regular tabulation of data, but of meteorological research and investigation. For example, Appendix No. 6 to the 1863 Report Lists 54 'charts, books and pamphlets' published up to 1 April 1863. Although some were brief, and some were merely new editions, others were of considerable length, e.g. the *'Eleventh Number of Papers'* with 280 pages; indeed, the *'Papers'* series averaged 95 pages each.

As to the name of the office, the first four Reports (1855, 1857, 1858 and 1862) called it the 'Meteorological Department of the Board of Trade', and the next two (1863 and 1864) the 'Meteorologic Office of the Board of Trade'; in the body of his first Report FitzRoy occasionally referred to it as the 'Meteorological Office'. The name 'Meteorological Office' was not officially agreed and made permanent until some time after FitzRoy's death. An interesting account of the way the Office worked and of the financial arrangements is given in FitzRoy's Report for 1862 which is reproduced as Appendix 3.

Acknowledgements

I should like to acknowledge the help of Mr R. E. Anslow of the Public Record Office, Kew, and of the Librarian of the Royal Society, Mr N. H. Robinson, who have provided me with copies of certain documents and other useful information. My thanks are also due to Mr David Stanbury who has made a detailed study of the whole life and career of Admiral FitzRoy.

References

1. London, Public Record Office, BJ 3/61.
2. London, Public Record Office, BJ 7/2.
3, 4. Copies in Minutes of the Council of the Royal Society (meeting of 15 June 1854).
5. *Report of the Meteorological Department of the Board of Trade*, 1857.
6. London, Public Record Office, BT 3/50.
7. *Monthly Notices of the Royal Astronomical Society*, **15**, 1855, 165–158.
8. Communication from the Secretary to the Central Chancery of the Orders of Knighthood (Major General P. B. Gillott, C.B., C.V.O., O.B.E.).
9. *Report of the Meteorological Department of the Board of Trade*, 1855.

*In 1862 the number had risen to ten, but by that time FitzRoy had instituted the collection of daily reports by telegraph, and the issue of storm-warnings.

Appendix 1

On Maury's plan—Ocean Statistics—Mode of proceeding in Office R.F. Feb. 3/54

MEMORANDUM

With reference to Lieut. Maury's project,—It may be assumed that the oceans should be represented by charts or maps, as fully as may be practicable, consistently with clearness. Such charts should shew all the oceanic statistics that can be expressed, at a synoptic view, either by letters, or numbers, or symbolically.

Such statistical information if not all *immediately* useful to Navigation, will be hereafter, if not now, of value to Science.

The following may be a practical method of combining, obtaining and utilising Ocean Statistics.

Employ some nautical man who is interested in such subjects—whose character will guarantee his proceedings, and who will give full time and thought to their pursuing.

Assist him by a draftsman and a clerk. Appropriate an office. Fit it with tables and shelves.

Publish notices of an offence being opened by the Government for the reception of Journals, logs, remarkbooks, and other records of nautical information. Issue skeleton forms, and popular instructions, gratuitously, to all proper persons, on condition of the forms being returned, more or less filled.

On the return of each such form, or on the delivery into office of any other acceptable document—a receipt should be given—for the same expressing its character and value, as estimated according to a scale.

Some mode of reward—by honorary distinction,—such as a testimonial, or diploma, or decoration, may be devised—to encourage those who contribute the more valuable observations.

These oceanic charts, in which meteorological facts should be combined with all others affecting the atmosphere, or the bed of the sea, or the ocean itself—these charts should be subdivided into Squares, more or less extending according to the nature of each tract of sea.

For every such space, or square, there should be twelve, or twenty four or even fifty two minutely (48?) subdivided charts—(for the separated data of each month, fortnight, or week) less or more according to the special importance and (varying) natures of each tract, or region. The original drawings should be projected on a large scale, and copied by lithography.

Reduction, and any kind of compilations may be subsequently effected. All factors recorded on the charts should likewise be registered in books, under letters, and numbers, that would correspond to similar distinctions on the squares of the charts (and places of deposit on the shelves of the office?).

While new information is being gathered, and duly entered, as it is received, (with as little delay as may be)—research should be made in every available repository of nautical information—in all the Voyages of every nation that are accessible—in each log, journal, and remarkbook that may contain useful factors bearing on this subject. Such gleanings, when combined will contribute largely towards this important branch of hydrography—well termed, by Colonel Sabine, "Ocean Statistics".

Much research will be necessary, on the part of the individual charged with the extensive work of which an outline is here sketched. General results should be given by him annually, or from time to time, to [be] subsequently revised as increased knowledge may render advisable.

Libraries—Archives of nautical information, such as those at the Admiralty and India House—and private collections, should be examined, as far as may be practicable, and all facts extracted from such sources, or indeed, from any source, should be forthwith entered in a book—with the particulars necessary for reference to them hereafter, if requisite and for enabling other enquirers to verify any part of the work.

Meanwhile the routine duties of the office, namely receiving, issuing, and copying documents —drawing charts, and entering, or laying down observations, should proceed during the usual, and distinctly specified, hours daily.

From the person charged with these duties will be expected, from time to time, such practical Sailing Directions as may be the earliest return to the Public for their money appropriated for this service.

R. F. Feby 3/54

Appendix 2

Extract from *Hansard's Parliamentary Debates* for 6 February 1854

IMPROVEMENTS IN NAVIGATION—CAPTAIN MAURY'S PLAN—QUESTION.
MR. HEYWOOD said, he begged to ask the right hon. Baronet the First Lord of the Admiralty whether it was probable that an office would be established to co-operate with Captain Maury and the American Government in oceanic and other scientific observations; and whether the important collections of observations on currents, winds, and temperature, already in possession of the Admiralty, would be rendered accessible to the head of the proposed office?

SIR JAMES GRAHAM said, he was happy to inform his hon. Friend that, amidst more pressing and less peaceful occupations, the subject to which he had adverted had not failed to attract the attention of the Government. The President of the Board of Trade and he (Sir J. Graham) sent Captain Beechy to the Conference at Brussels, and in consequence of his report, it was the intention of the Government to appoint an officer to whom the observations made both on board merchant ships and Queen's ships would be referred. A Vote for this purpose would be taken in the navy Estimates; and orders had been issued to the commanders of Her Majesty's ships, directing that meteorological observations should be made every four watches—that was, once every four hours—in every part of the world where Queen's ships were employed. An opportunity of making similar observations would also be furnished to a select number of merchant ships—not fewer than one hundred—and the result of all these observations would be returned to the Board of Trade, where they would be digested. They would then be communicated to Captain Maury, as would also the reports already received.

Appendix 3

Extracts from Chapter IX of the *'Report of the Meteorological Department of the Board of Trade'* for 1862, by Admiral FitzRoy

28. The attendance here is necessarily continuous—between ten and six o'clock daily, for some—from eleven to five for others—of the ten persons employed; only two of whom are yet on the regular establishment of the Board of Trade, namely, Mr Pattrickson and Mr Babington, my zealous and able assistants.

Specially scientific duties are taken principally by the latter, whose Cambridge education and aptitude for meteorology have enabled him to render good public service. General management in the office, with financial business correspondence, and much valuable aid in drawing and calculating, are Mr Pattrickson's particular business.

29. Meteorological telegraphy is satisfactorily attended to by Mr Simmonds and Mr Symons, who, also, are assiduously engaged in extracting and reducing various meteorological observations, collected on an extensive scale, therefore needing much time for discussion and preparation for printing.

Mr Harding and his son attend to records, stores, correspondence, and translation. Mr Strachan has charge of the instruments and optician's duties, aided by Mr Gaster. Two youths carry out our weather reports, or telegrams, and are otherwise actively employed in searching for papers, extracting and copying.

30. Consequent on the progress made, and the results gradually developed, arrangements for weather reporting increased in extensiveness, as has been shown, but the actual time now occupied by meteorological telegraphy is comparatively small, although we are in daily communication with twenty home stations—and with Paris, for six on the Continental coasts.

32. Kew verified instruments were intrusted to the care of clerks in charge of selected telegraph stations, by arrangement with the Directors of the Electric, the Magnetic and the Submarine Telegraph Companies. Gradually and well those telegraphists acquired the duties asked for, then perfectly new, which are now continued with extremely creditable regularity and precision.

33. From the commencement in September 1860, no break, or interruption, not only of telegraphic but harmonious written intercourse, has occurred. The directors of those great companies have liberally reduced their tariff charges by one-third—in favour of our public communications, and have authorized reasonable precedence for our messages along their lines.

34. Being fully convinced that the importance, nationally considered, of this system of weather reporting—hitherto experimental—deserves support as a permanent institution—I ventured to submit to you, Sir, the following financial estimate.

35. In 1860—for the financial year 1861–2 the sum proposed to be voted by Parliament for "Meteorological Observations" was 2,800*l* which, with 900*l* provided for salaries and printing, under other heads (Board of Trade and Stationery Office), made a total or gross sum of 3,700*l*—for all purposes of this office—including an experimental commencement of meteorological telegraphy.

36. The expense of this new undertaking was first estimated at 100*l* monthly—and that estimate was found to be sufficient until the last quarter of the financial year 1860–1.

37. Nearly at that time (February 1861) the *cautionary signals* were first employed—and so well were the found to answer even on the very limited scale tried during the next few months—that in August following an extension of the system was organised by telegraphic communication from outlying stations—by more extended telegraphic *cautions*, and by daily "*forecasts*" of weather, regularly sent—entirely at the expense of the Board of Trade—to all the principal newspapers—which asked to be supplied with them, besides Lloyd's, Liverpool and Glasgow Underwriters' associations. Since that time the Admiralty have directed the Coast-guard to co-operate whenever practicable—adding thus about eighty places of storm warning to the fifty previously in communication

38. These important additions have not caused nearly so great an additional expense as might have been anticipated, because the Telegraph Companies have very liberally reduced their charges on meteorological telegrams for Government, by one-third, in general (and—in the case of Heligoland —one half), while authorizing precedence on the wires, of all ordinary *private* telegraphy.

39. The result is that the system, at present considered to be working *satisfactorily*—can be continued in a similar manner—without asking for a larger increase to the meteorological vote than 100*l* above *last* year; or 4,600*l* instead of 3,700*l*.

40. The gross sum for meteorological observations in 1862–3 being thus estimated at — — — — — — — — — — — £4,600

of which is provided for salaries at Board of Trade, 440*l*, and by Stationery Office, for printing forms, book, papers, table, charts,

&c., 360*l* — — — — — — — — — — —	800
Leaves to be provided — — — — — — — — — —	£3,800

Which will be required for–

Salaries — — — — — — — — — — —	£800
Agencies — — — — — — — — — — —	50
Special printing — — — — — — — — — — —	150
Opticians — — — — — — — — — — —	100
Carriage, packing, and all contingencies — — — — — —	100
	£1,200
Meteorological telegraphy — — — — — — — —	2,600
1 February 1862 Total —	£3,800

41. This estimate shows the heads under which this sum may be divided; but it is to be said that the great expense of supplying *sets of instruments*, gratis, to merchant ships, has almost ceased; because ample results of that judicious annual expenditure, first authorized in 1854, are now in this office, sufficient to occupy all at present employed here during several years. To continue accumulating would tend to overwhelm.

42. Many of these instruments are now employed at telegraph stations—others are still on board a gradually diminishing number of selected ships, and a few are at maritime positions.

43. In addition to these scientific results, the stimulus that has been given to careful observation and record, the information that has been diffused in the mercantile marine—and the consequent direct advantage—in a national point of view—are now well known to have been very beneficial.

44. But having thus shown the way—and demonstrated its advantages—it may remain for others to follow, for their own advantage chiefly, by supplying themselves similarly with instruments, books, and forms—aided, perhaps, by advice—and occasional publications from this department, —but not otherwise continuing chargeable to the public purse.

45. In a scientific point of view, what has been accumulated here, since 1854, may be fully tabulated, discussed, and utilised—it is respectfully submitted, before overloading our shelves, and our minds, with materials increasing continually without advantage.

46. One of the greatest evils of meteorology hitherto has been the practice of incessantly making observations—without very definite objects in view—with the somewhat vague hope that eventually they might become of value; and the natural consequence has been, voluminous records exceeding the grasp of any genius and industry, however combined in individuals.

LONG ASSOCIATION WITH SHIPOWNERS— CANADIAN PACIFIC STEAMSHIPS LIMITED

Our annual article this year deals with Canadian Pacific Steamships Limited. W. C. van Horne, who built the Canadian Pacific Railway, saw the Company as a service stretching from Liverpool to Hong Kong. The Canadian Pacific Railway Company was incorporated on 16 February 1881 to build a railway across North America to link the separate settlements and make the Confederation of 1867 a reality.

The story of Canadian Pacific's involvement with ships began in 1882–83 on the waters of the Great Lakes. During the building of the transcontinental railway the Company hired a small number of steamboats and barges to help with the work of construction.

Even before Canadian Pacific had completed the building of the railway across Canada much thought had been given to securing traffic. As a result, ships were chartered to carry tea, mail and, later, silk from Hong Kong, China and Japan to the Railway terminal on the Pacific coast of Canada for onward carriage to Canadian cities, New York and on to Europe. Seven sailing ships were chartered in 1886 and a year later these were replaced by steamships. In 1891 the first ocean steamships to be built specifically for Canadian Pacific took over the trade. These were the *Empress of China, Empress of India* and *Empress of Japan,* were each of 6000 g.r.t. and quickly became known as the 'White Empresses of the Pacific'.

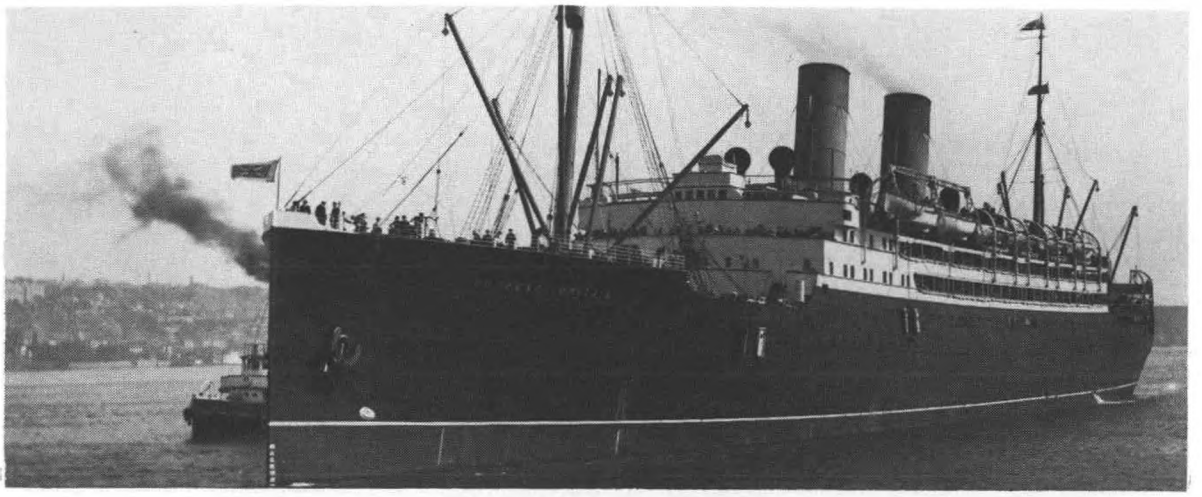
Commercial arrangements were made with a number of shipping companies in the North Atlantic trade but these proved to be disappointing and the Company decided that it would be advantageous to establish their own fleet. This they did by purchasing 15 ships of the Beaver Line from the Elder Dempster Company in 1903. One of the best remembered of these was the *Lake Champlain* which was equipped in 1901 with the first radiotelegraphy apparatus to be fitted on a merchant ship. Another was the *Montrose* which received wide publicity in 1910 when the murderer Dr Crippen became the first criminal to be apprehended as a result of a radio message transmitted from shore to ship. In 1909 the Allan Line consisting of 16 steamships was acquired by the Company for service on the North Atlantic trade.

The first of the Company's ships to be recruited and equipped as a meteorological observing ship was the *Mount Royal* in 1903. She was a steel steamship of 7044 g.r.t., commanded by Captain C. S. Webster and her first voyage after recruitment was a short uneventful one from Cardiff to Galveston and back to the United Kingdom. This recruitment was followed soon after by that of the *Mount Temple.* By 1905 the 'Empress' ships trading in the Pacific were members of the Voluntary Observing Fleet and, later, the *Empress of Britain* and the *Empress of Ireland* which had been built for the Atlantic trade were similarly recruited.

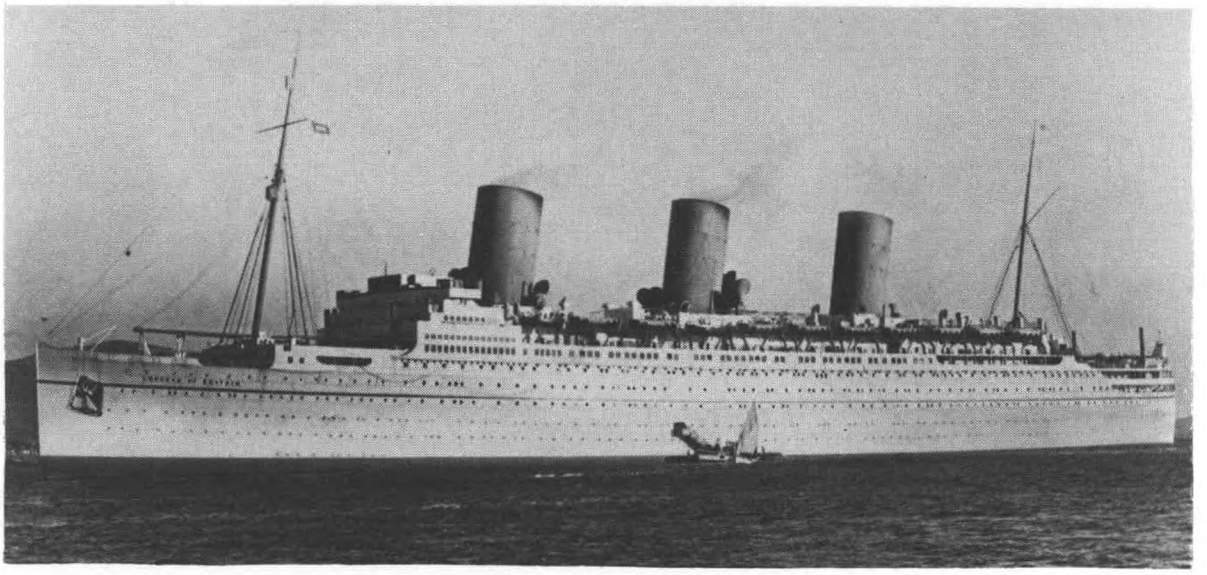
By the outbreak of World War I the Canadian Pacific deep sea fleet consisted of 46 liners on the Atlantic trade and 4 on the Pacific trade. At the termination of hostilities only 22 of these ships survived to continue the Company's peace-time service. To replace the war losses the Company ordered 5 specially designed 'Beaver' class cargo liners each of 10 000 g.r.t. and 4 of the most modern cabin class liners—the 'Duchesses'—which traded on the Europe to St Lawrence route from 1928 until the outbreak of World War II.

In 1939 Canadian Pacific had 14 liners on the Atlantic trade and 6 on the Pacific—of these, only 4 returned to the Company Service after the war. The second and most famous *Empress of Britain,* a luxury liner of 42 000 g.r.t. which had entered service in 1931, became the largest merchant ship lost during

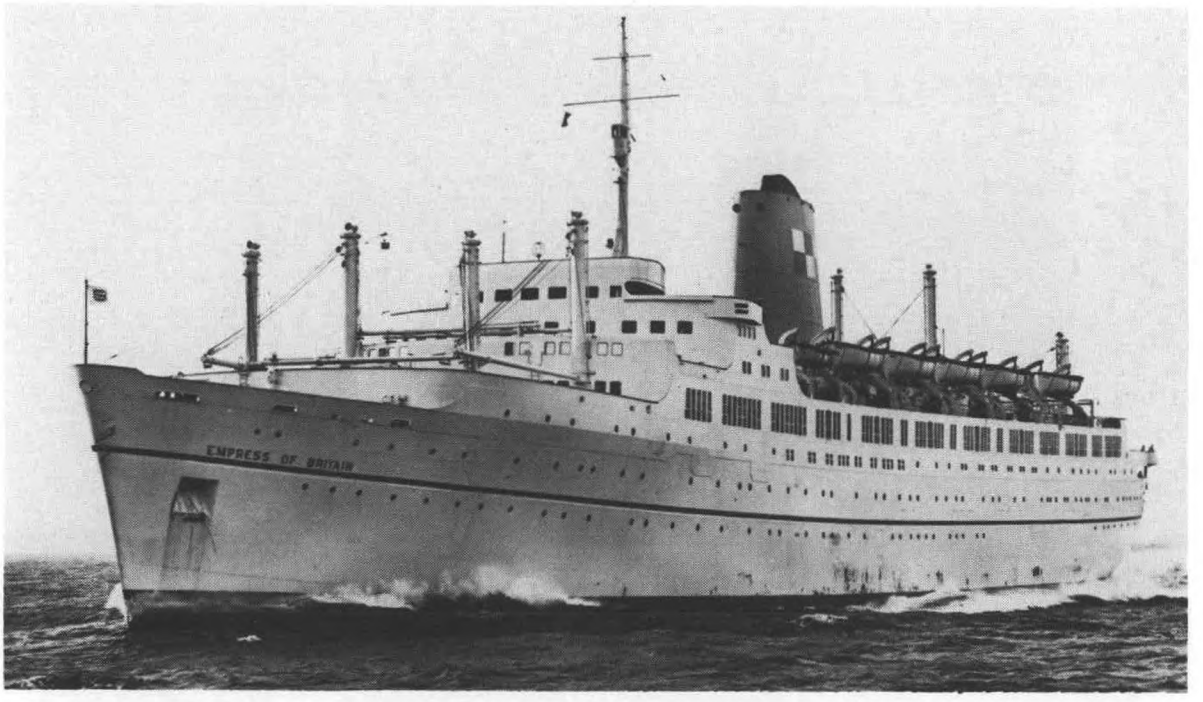
Opposite page 95



Empress of Britain (1906) *Photo: C.P. Ships*



Empress of Britain (1931) *Photo: C.P. Ships*



Empress of Britain (1956) *Photo: Canadian Pacific*

VESSELS OF CANADIAN PACIFIC STEAMSHIPS LIMITED (*see* page 94)

World War II. As a result of these large losses the Company were unable to re-open their Pacific service. However, 4 new 'Beaver' class cargo liners were built and other ships bought.

Between 1956 and 1961 the Company's last 3 passenger liners were built and placed in service. These were the *Empress of Britain*—the 3rd of this name, the *Empress of England* and the *Empress of Canada*—the 3rd of this name. Unfortunately, all 3 had to be sold in 1971 and the passenger service ended.

In 1964 a new subsidiary company, Canadian Pacific Bermuda Limited, was formed to operate tankers and bulk carriers for charter on world-wide trade. This company now has a fleet of 35 ships totalling more than 2 million dead-weight tons.

All the Company's break-bulk cargo vessels had been withdrawn by 1971 and they were replaced by the container ships *CP Discoverer, CP Trader* and *CP Voyageur* which are now trading between Montreal and Europe.

Since 1903 until the present day a remarkably high percentage of Canadian Pacific Ships have been making voluntary observations on behalf of the Meteorological Office. Some of the earlier ships, in order of recruitment, were—*Montrose, Metagama, Montcalm*—the 2nd of this name, *Melita, Batsford, Bosworth, Montcalm*—the 3rd of this name, *Montclare, Duchess of Richmond, Duchess of York* and many others. At the present time, out of a total of 40 ships, 18 make meteorological observations for the British Meteorological Office and several of the remainder observe for the Canadian meteorological service.

The photographs opposite this page show the 3 ships to have borne the proud name *Empress of Britain.* These are of:

1. The first *Empress of Britain* of 14 188 g.r.t. built in 1906. In 1924 she was re-named *Montroyal* and she was scrapped in 1930,
2. The second *Empress of Britain* of 42 348 g.r.t. built in 1931 and sunk by a German U-Boat in 1940 and
3. The third *Empress of Britain* of 25 516 g.r.t. built in 1956. In 1964 she was sold to Greek Line and re-named *Queen Anne Maria.* In 1975 she was again re-named *Carnivale* and is still cruising.

During the 79 years in which the Meteorological Office has been associated with Canadian Pacific Steamships it would be rare indeed to find a year in which our records did not show the name of at least one ship from this famous company. It gives us considerable pleasure to express our gratitude for the many years of valuable service rendered to the Meteorological Office. Our thanks go to all masters and officers involved, both past and present, and we wish the Company every success in all their future business operations.

J. D. B.

AURORA NOTES, APRIL TO JUNE 1981

By R. J. Livesey

(Co-ordinator of Auroral Observing, the Solar Section of the British Astronomical Association).

Auroral observations made by British ships for the period and received at the time of writing are shown in the accompanying table. The following notes on activity incorporate the combined data obtained from the ships and from voluntary land observers in the United Kingdom backed up with data from Canada, Finland and the United States of America. Radio aurora effects were monitored by an amateur radio station in Scotland manned by a professional radio engineer.

Marine Aurora Observations April to June 1981

Date 1981	Ship	Geographic Position	Time (GMT)	Forms
1 Apr. ..	*Admiral Beaufort* ..	57° 05'N 20° 07'W ..	2235–2350 ..	RB,N
3 ..	*Starella*	71° 16'N 25° 40'E ..	2205 ..	R
11 ..	*Anco Enterprise* ..	38° 42'S 144° 00'E ..	1452–1950 ..	N,HA,mR,R
13 ..	*Speciality*	49° 30'N 7° 30'W ..	0330–0430 ..	RA,HB
13 ..	*British Hawthorn* ..	56° 48'N 11° 00'E ..	0000–0035 ..	MR$_1$,R,P,aRA
26 ..	*Trinculo*	35° 30'S 128° 24'E ..	1200–1230 ..	RA
27 ..	*British Norness* ..	58° 56'N 1° 54'W ..	0000–0230 ..	R$_3$,HB,N,MR
3 May ..	*Admiral FitzRoy* ..	56° 46'N 17° 18'W ..	0240–0250 ..	N
5–6 ..	*Admiral Beaufort* ..	57° 06'N 20° 08'W ..	2345–0250 ..	qRA,PR$_3$A,qR$_2$A
7 ..	*Admiral Beaufort* ..	56° 54'N 20° 02'W ..	0240–0250 ..	qMB
11 ..	*Admiral Beaufort* ..	57° 02'N 19° 52'W ..	0400–0150 ..	qR$_1$A
28 ..	*Admiral Beaufort* ..	57° 00'N 19° 52'W ..	0140–0155 ..	N
9 June ..	*Resolution Bay*	53° 56'S 96° 22'W ..	0020–0145 ..	N,HA

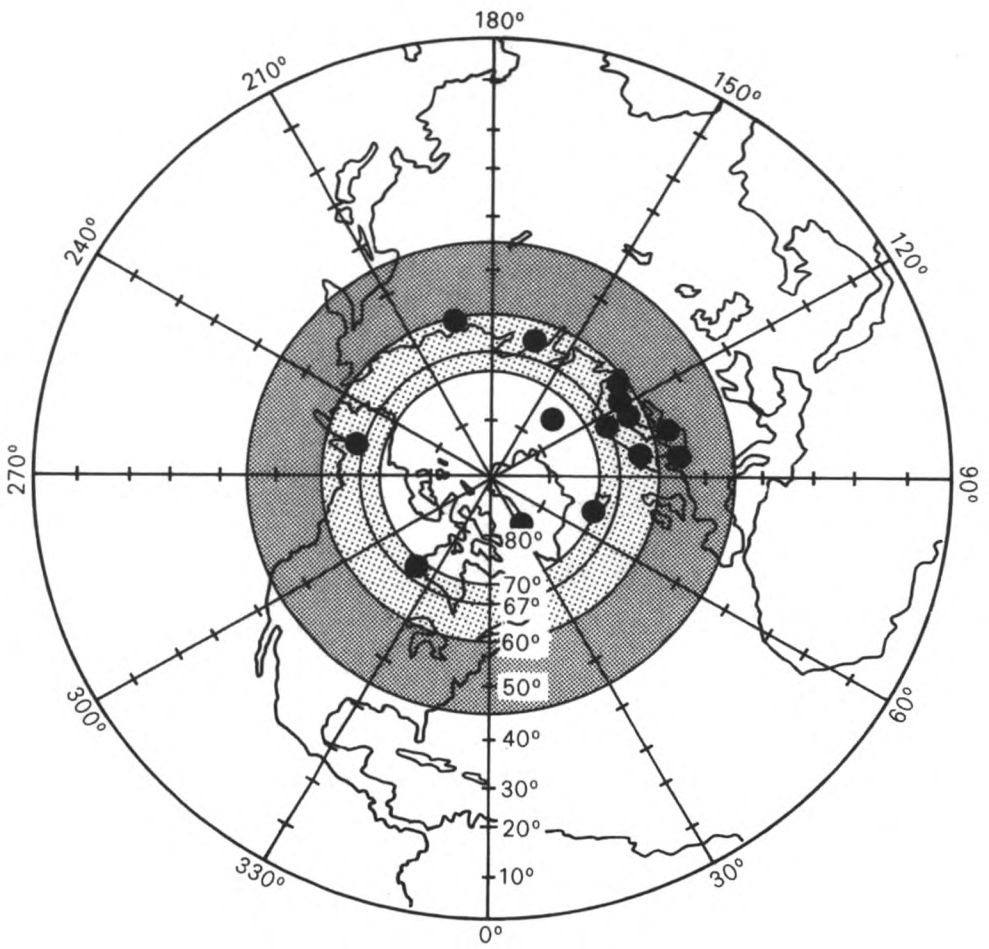
KEY: N=glow, P=patch, R=ray, R$_1$=short rays, R$_2$=medium-length rays, R$_3$=long rays, a=active, q=quiet, MR=multiple rays, HA=homogeneous arc, HB=homogeneous band, RA=rayed arc, RB=rayed band.

April opened with the continuation of quiet visual activity that began on 30 March and ended on 3 April. Activity recommenced on the evening of the 11th with confirmation of comparable aurorae in the northern and southern hemispheres in the form of rayed structures. The evening of the 12/13th saw coronal rayed structures down to the latitude of central Scotland. There was a single report of a rayed arc on the 20th followed by a period of glows and rayed arcs from 25 to 28 April. Radio auroral effects were reported on the 12th, 13th, 19th, 20th, 21st and 26th. Strong disturbances of the Earth's magnetic field were reported on the 11th to 14th, 19th to 22nd, and 26/27th of April, that of the 12th being extensive and coincident with great visual activity.

May began with glows on the 1st and 2nd, and arcs and ray structures were noted on the 4th and 6th. More extensive activity was noted in both hemispheres on the night of the 8/9th and on the 10/11th with active rays. Some quiet glows were seen in central Scotland on 24/25 May. Radio aurorae were detected on 10, 15, 16, 18, 20 and 25 May. Magnetic disturbances were evident on the 9th, 11th, 15th, 16th, 18th, 20th and 25th. That of the 16th was reported to be extensive but no visual aurorae were reported at that time.

With the onset of summer twilight, June was visually very quiet and a single report only was made of a rayed arc on the night of the 15/16th. Isolated suspected glows were unconfirmed and discounted. No radio aurorae were

reported and magnetic disturbances of note were only reported on the 7th and 29th. It was apparently a quiet month all round, although examination of past records indicates that visual aurorae are seldom reported in June.



Zones of auroral visibility from which observations are required

Latitudes and longitudes are geomagnetic co-ordinates. Peak visibility frequency of aurora is at geomagnetic latitude 67°. Inner stippled annulus represents the auroral zone, i.e. location of undisturbed aurora. Outer stippled annulus represents the subaural zone, i.e. the region into which disturbed aurora expands southwards (note that the aurora may expand northwards as well as southwards). Dots indicate locations of auroral observatories.

Again it should be stressed that the above visual aurorae comprise reported events and not all possible actual events, some of which may not have been observed owing to cloudy weather or lack of observers in the right places. The statistics are therefore subjective. Space is too limited to give more detailed information on the individual observations.

After the observed maximum of auroral activity coincident with sunspot maximum in 1979 for the current solar cycle there was a marked downturn in event frequency in the first half of 1980. The visual aurorae started to rejuvenate in the second half of 1980 and to increase on into 1981. It is not unusual to find a secondary peak in visual activity one to three years after sunspot maximum, depending on latitude, which is due to aurorae generated by structures developing in the outer atmospheric envelope, or corona, of the Sun as the sunspots decline in the lower solar latitudes.

The world's principal auroral observatories are located close to the auroral zone, or region where the aurora is most frequently seen. Their locations are given in the accompanying table in descending order of geomagnetic latitude, bearing in mind that the highest frequency in visibility of the aurora is located at 67 degrees in geomagnetic latitude. Our task as amateur observers is to monitor the equatorward expansion of the aurora into the regions where the professional observers cannot follow it.

Auroral Observatories

Station	Geomagnetic Latitude	Geomagnetic Longitude	Geographic Latitude	Geographic Longitude	Country
	degrees and tenths				
Thule	89·0	358·0	77° 29′N	69° 10′W	Greenland
Bjørnøya	79·9	32·5	69° 14′N	53° 32′W	Greenland
Ny Ålesund	75·4	131·3	78° 54′N	11° 54′E	Spitsbergen
Leirvågen	70·2	71·0	64° 11′N	21° 42′W	Iceland
Fort Churchill	68·7	322·8	58° 48′N	94° 06′W	Canada
Tromsø	67·1	116·8	69° 36′N	18° 54′E	Norway
Kiruna	65·3	115·6	67° 50′N	20° 25′E	Sweden
College	64·6	256·5	64° 52′N	147° 50′W	Alaska
Sodankylä	63·8	120·0	67° 22′N	26° 38′E	Finland
Murmansk	63·0	125·8	68° 15′N	33° 04′E	U.S.S.R.
Diksonøya	63·0	161·6	73° 33′N	80° 34′E	U.S.S.R.
Dombås	62·3	100·1	62° 04′N	09° 07′E	Norway
Tiksi Bukta	60·4	191·4	71° 35′N	129° 00′E	U.S.S.R.
Lovö	58·1	105·8	59° 21′N	17° 50′E	Sweden
Nurmijärvi	57·9	112·6	60° 31′N	24° 39′E	Finland
Rude Skov	55·9	98·5	55° 51′N	12° 27′E	Denmark
Magnetic North Pole	—	—	76°N	102°W	
Magnetic South Pole	—	—	68°S	145°E	

Once again, many thanks to all ships and their officers who have taken the trouble and time to observe and to record apparitions of the aurora. A selection from copies of the log entries, together with any photographs received, are displayed annually in May at the British Astronomical Association Exhibition Meeting in London. In 1980, for instance, a third of the total number of visual aurora observations received came from ships of the Voluntary Observing Fleet, and it is pleasing to recognize this contribution by giving publicity to these efforts at the Exhibition Meetings.

ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM SEPTEMBER TO NOVEMBER 1981

The charts on pages 100 to 102 display the actual and normal ice edges (4/10 cover), sea-surface and air temperatures and surface-pressure anomalies (departures from the mean) so that the abnormality of any month may be readily observed. (The wind anomaly bears the same relationship to lines of equal pressure anomaly as wind does to isobars. Buys Ballot's law can therefore be applied to determine the direction of the wind anomaly.) Southern and eastern iceberg limits will be displayed during the iceberg season (roughly February to July). In any month when sightings have been abnormally frequent (or infrequent) this will be discussed briefly in the text.

The periods used for the normals are as follows. Ice: 1966–75 (Meteorological Office). Surface pressure: 1951–70 (Meteorological Office). Air temperature: 1951–60 (US Department of Commerce, 1965). Sea-surface temperature: area north of 68°N, 1854–1914 and 1920–50 (Meteorological Office, 1966), area south of 68°N, 1854–1958 (US Navy, 1967).

September

There was a marked change in pressure anomaly over Greenland with higher than average pressure contrasting with below average pressure during August. Over northern Canada there was an anomally for south-easterly winds instead of cold north-westerly winds. However, temperature remained well below freezing so that the ice which had formed at the end of August in many of the northern sounds persisted during September. Off east Greenland the wind anomaly was reversed from south-westerly to north-easterly. Ice drifted southwards and compacted against the coast. By the end of the month the previous excess of open pack ice had reverted to near normal. There was a small excess of close pack ice in Denmark Strait. Ice conditions were near average over the Barents and Kara seas.

October

Pressure was much higher than usual south of Greenland and over the North Pole. There was a strong anomaly for south-easterly winds over north-east Canada with above average temperature. Surprisingly, new ice formed earlier than usual in Baffin Bay and north of Southampton Island but there was less ice than usual in the eastern half of Foxe Basin. East of Greenland the anomaly for cold northerly winds continued and ice drifted further south than usual through Denmark Strait. Over the Barents and Kara seas an anomaly for south-easterly winds delayed the southward drift of ice resulting in appreciable deficits of ice in many areas.

November

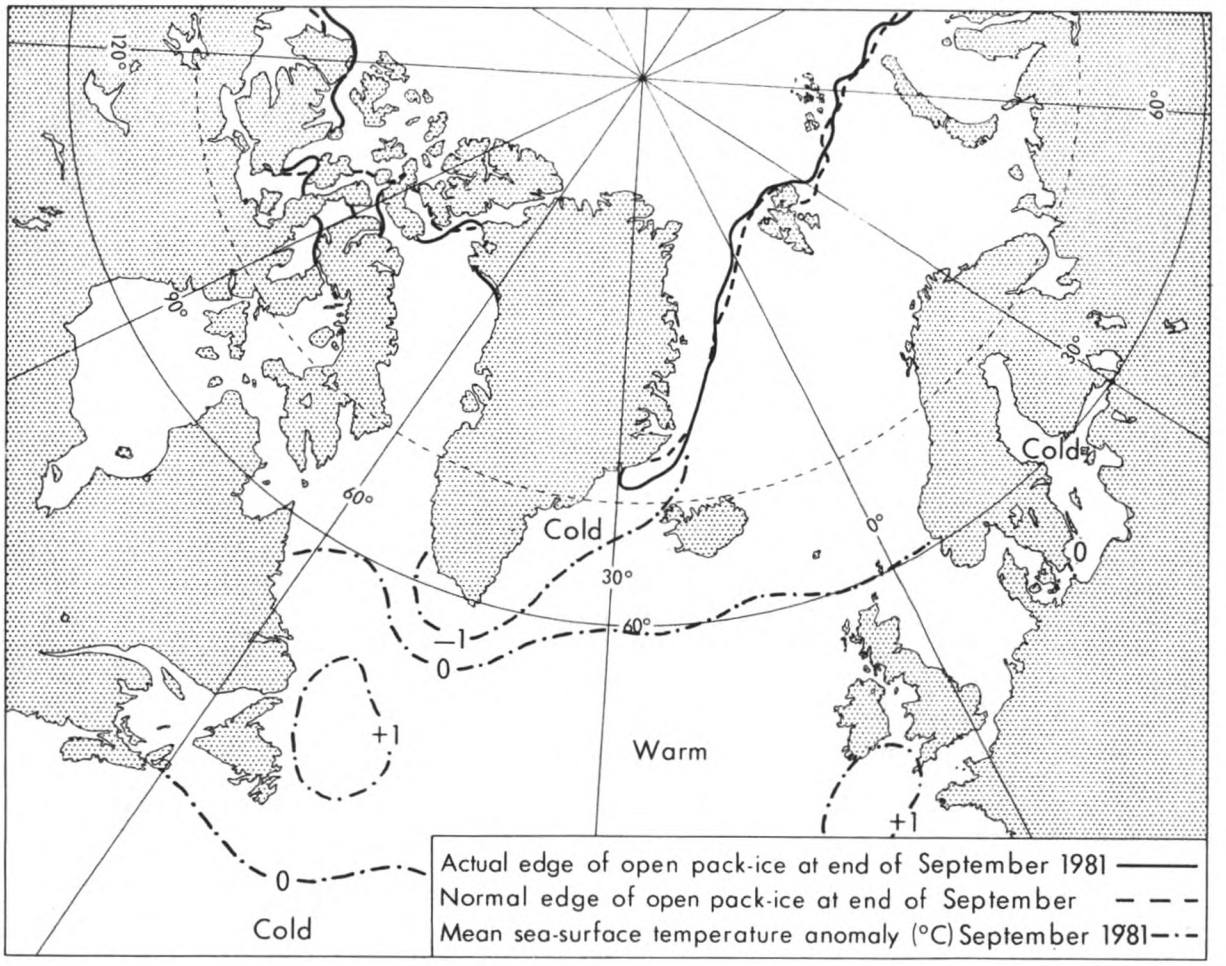
Pressure anomalies were rather weak. Temperature remained above average over much of Canada and with some anomaly for easterly winds ice in Hudson Bay was confined to a narrow belt along the western shores. However, this anomalous easterly flow from the Greenland icecap also resulted in new ice forming earlier than usual in the eastern approaches to Hudson Strait. Off east Greenland and in the Barents and Kara seas the position of the ice edge became near normal with alternating areas of excess and deficit. The first ice of the season formed in the White Sea and along northern shores of Bothnia Bay.

References

Meteorological Office, London	1966	Monthly meteorological charts and sea surface current charts of the Greenland and Barents Seas.
	—	Sea ice normals (unpublished) and various publications.
US Department of Commerce Weather Bureau, Washington, D.C.	1965	World weather records, 1951–60. North America.
US Naval Oceanographic Office, Washington, D.C.	1967	Oceanographic atlas of the North Atlantic Ocean, Section II: Physical properties.

Baltic Ice Summary: September–November 1981

No ice was reported at any of the stations normally included in this Summary during the period.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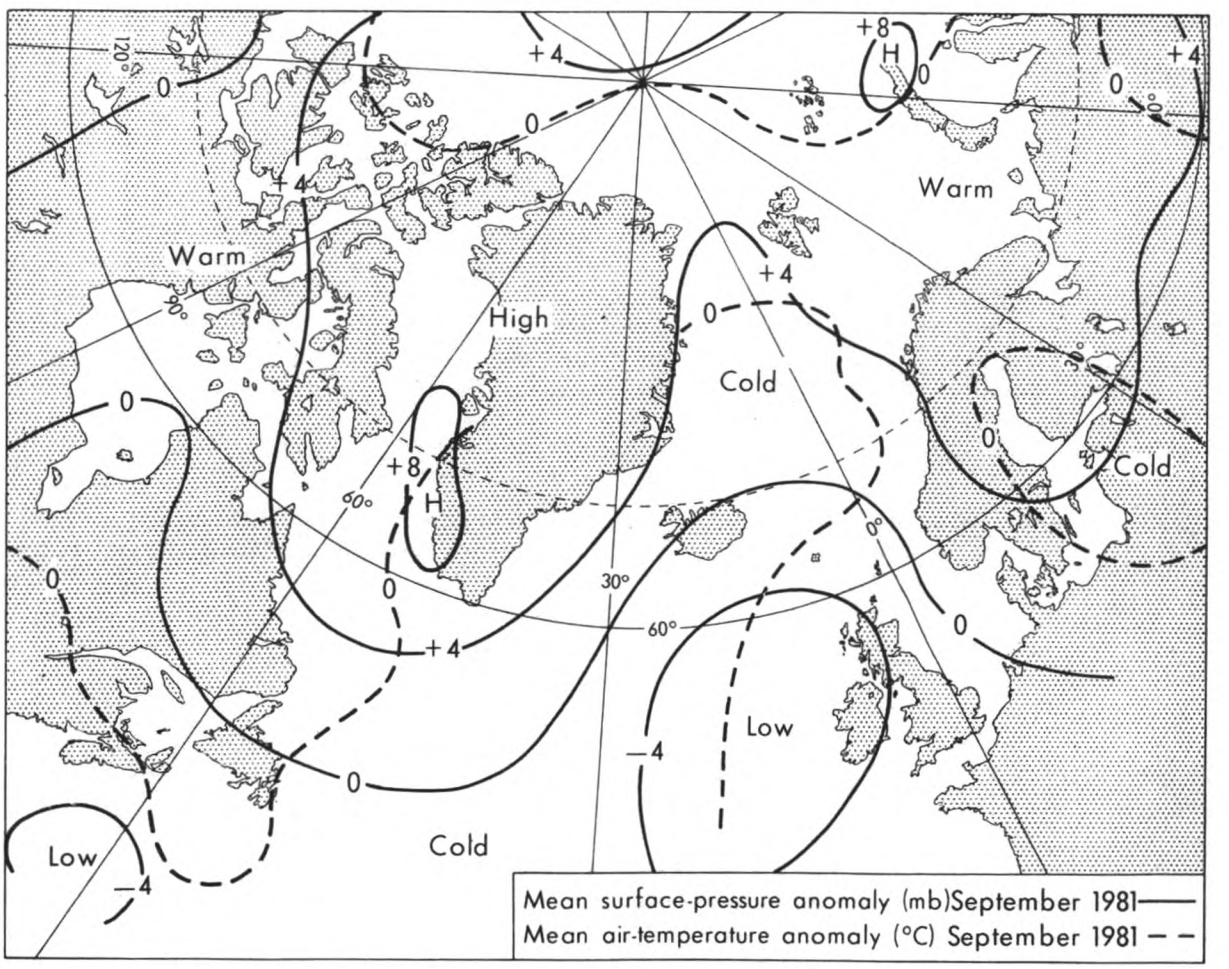
Actual edge of open pack-ice at end of September 1981
Normal edge of open pack-ice at end of September
Mean sea-surface temperature anomaly (°C) September 1981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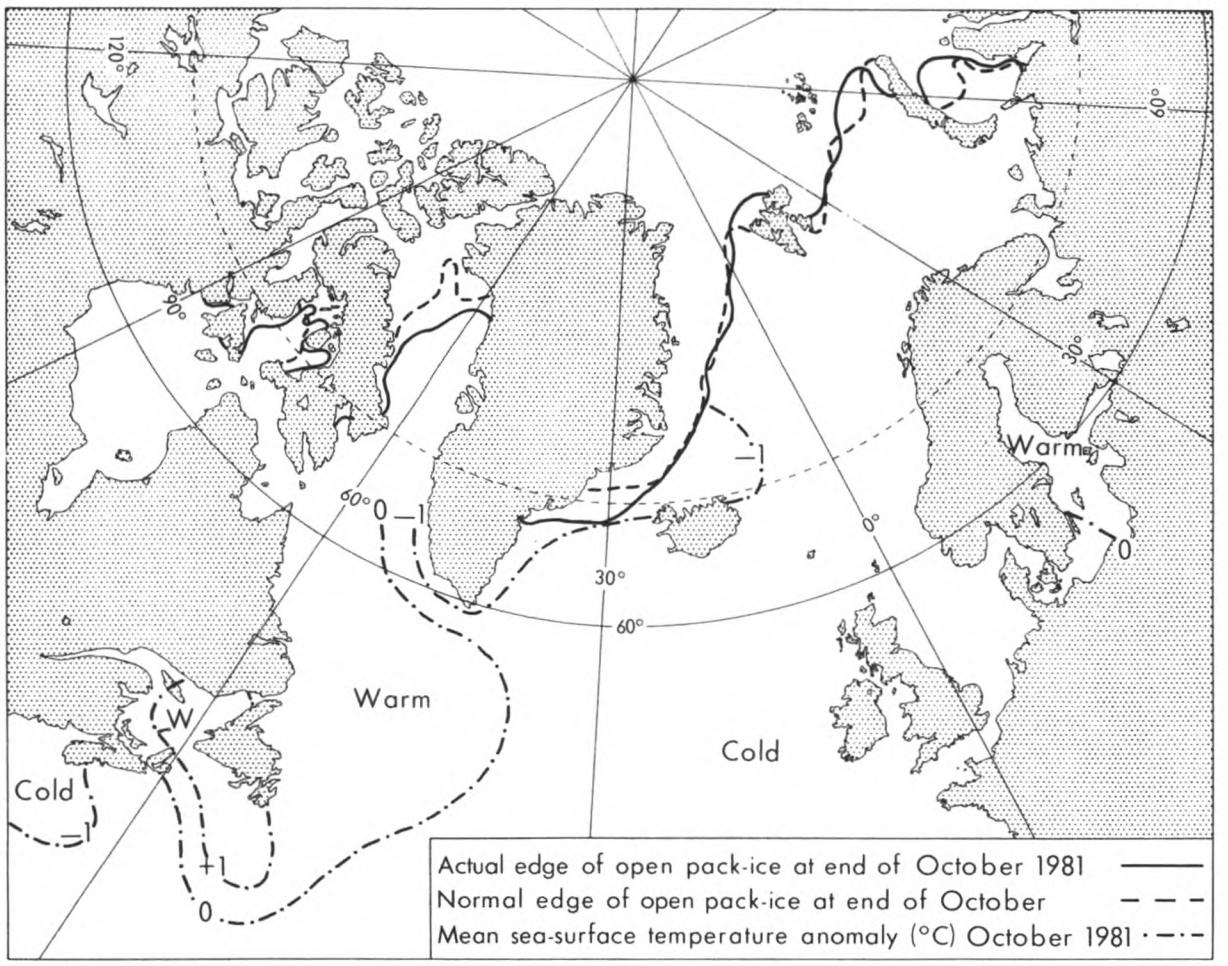
Mean surface-pressure anomaly (mb) September 1981
Mean air-temperature anomaly (°C) September 1981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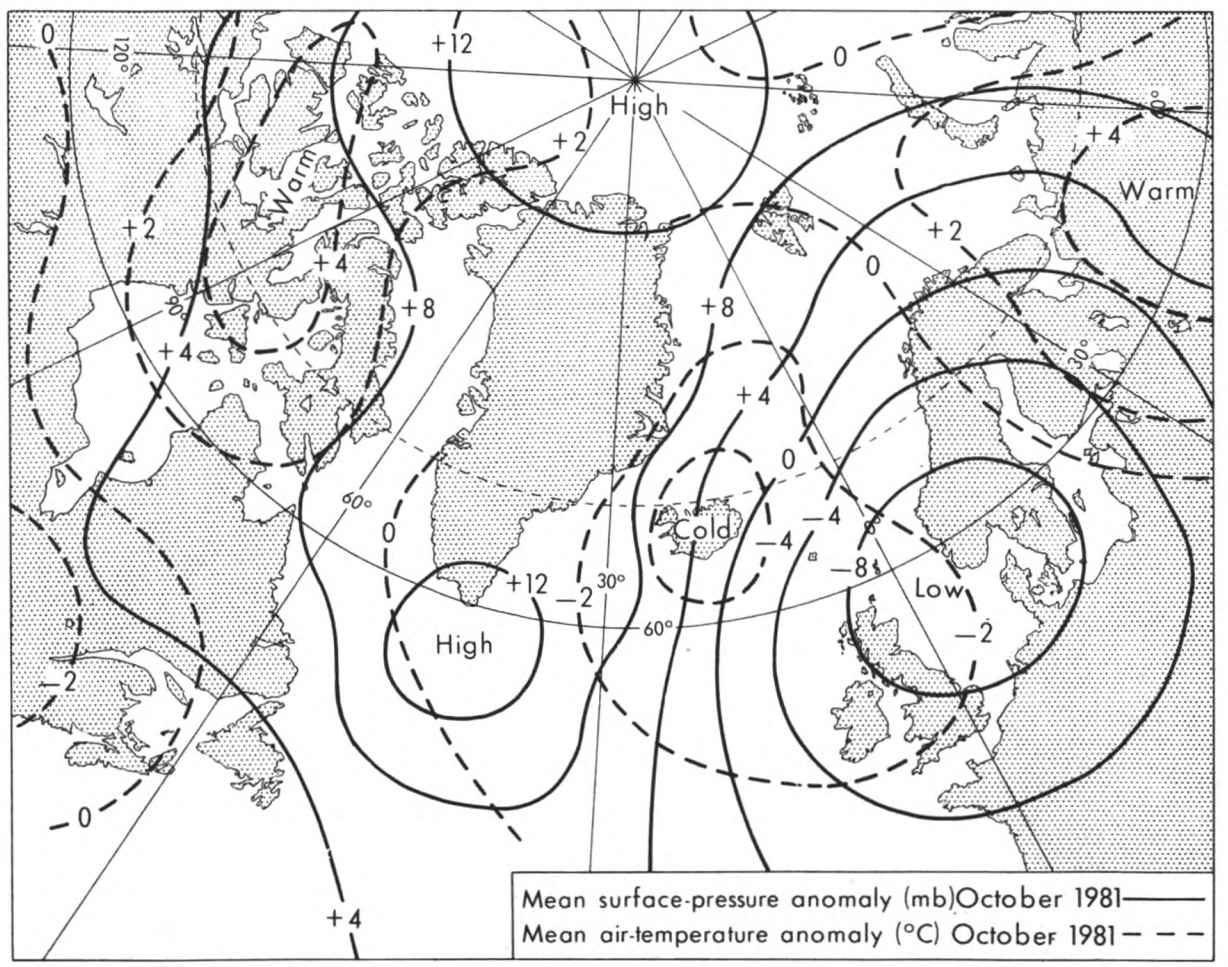
Actual edge of open pack-ice at end of October 1981
Normal edge of open pack-ice at end of October
Mean sea-surface temperature anomaly (°C) October 1981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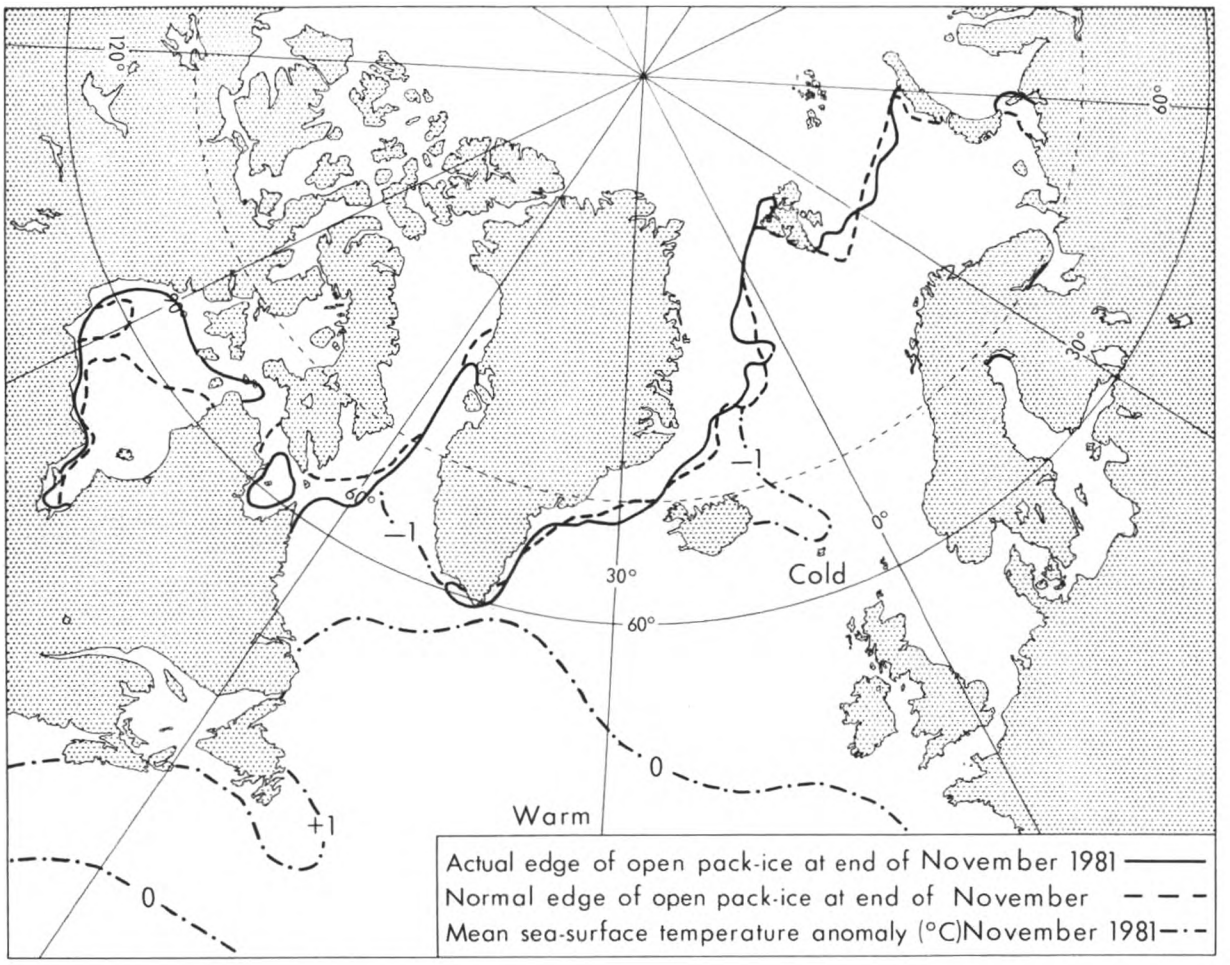
Mean surface-pressure anomaly (mb)October 1981
Mean air-temperature anomaly (°C) October 1981


120°
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Cold
Warm
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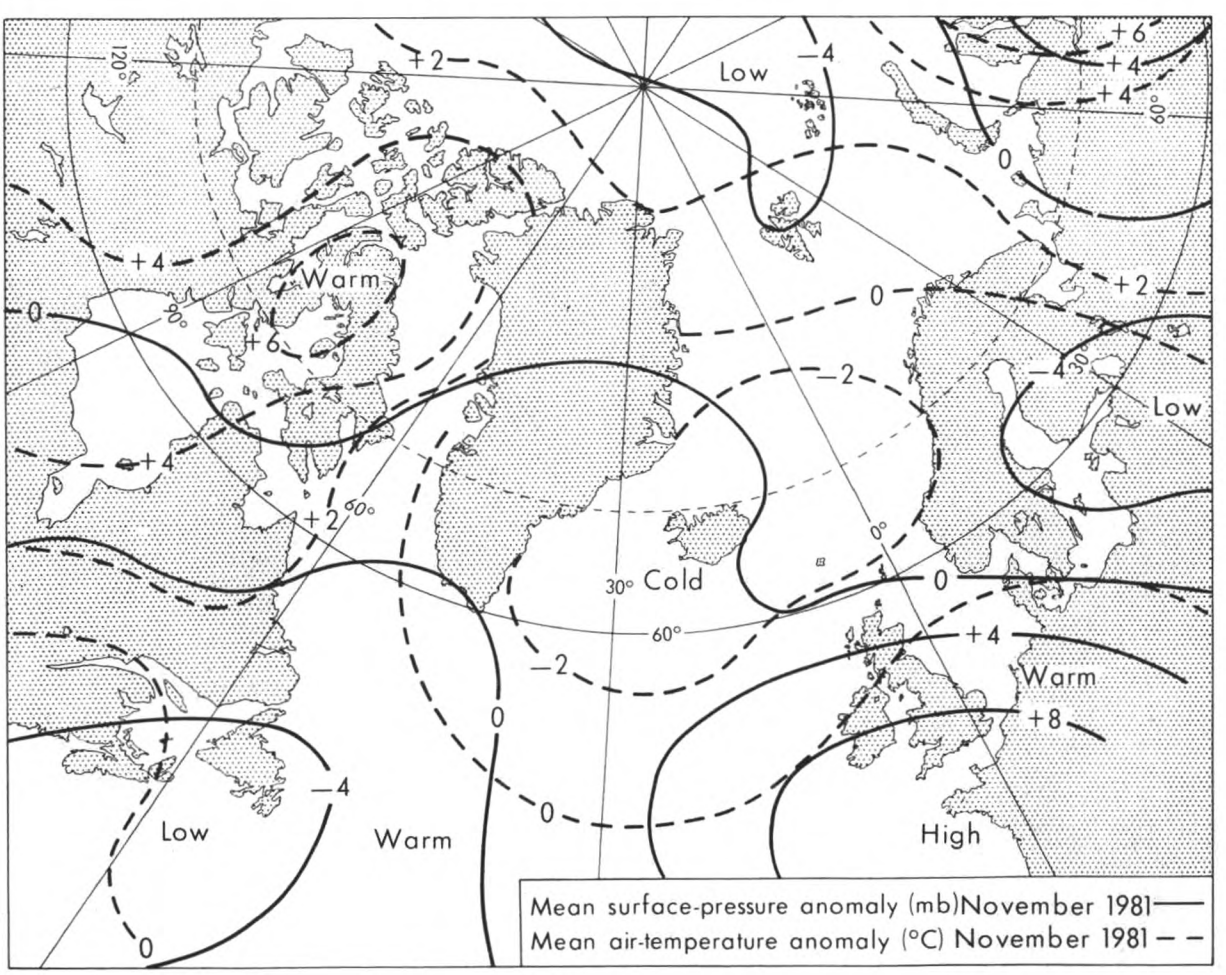
+1
Actual edge of open pack-ice at end of November 1981
Normal edge of open pack-ice at end of November
Mean sea-surface temperature anomaly (°C)November 1981


120°
60°
30°
0°
+2
Low
−4
+6
+4
+4
0
+4
Warm
0
+2
+6
−2
−4
Low
+4
+2
30°
Cold
0
60°
+4
−2
Warm
+8
0
0
−4
Low
Warm
High
0
Mean surface-pressure anomaly (mb)November 1981
Mean air-temperature anomaly (°C) November 1981

Personalities

RETIREMENT.—Mr W. Beverley, Radio Officer, retired last September after serving over 40 years at sea.

William Beverley joined the Marconi International Marine Company as Radio Officer in 1941. Throughout his career at sea he served in many different ships of all types, seldom remaining for more than one voyage in each. His last ship was the *Bessegen* which he left in August 1981.

We received the first meteorological logbook bearing Mr Beverley's name from the *Dartmoor* in 1954. Since then he has sent us a further 22 logbooks. He received Excellent Awards in 1960 and 1971.

We wish him a long and happy retirement.

RETIREMENT.—Mr E. H. R. Dickson, Radio Officer, retired last September after serving 41 years at sea.

Eric Henry Randal Dickson was born in 1922 and joined the Marconi International Marine Company in May 1940. He served throughout the war as Assistant Radio Officer and was on board the *Britannic* in 1941 when the ship was sunk by enemy action. Fortunately, Mr Dickson was soon rescued and suffered no harm. His services with the Marconi Company were terminated in 1946 as he only possessed a 'Special' war time Certificate. However, he quickly obtained his 2nd Class P.M.G. Certificate and was reappointed Radio Officer by the Company in September of that year. He has served in a variety of ships but remained in Ben Line ships for four years and in ships of the United Arab Shipping Company for three years.

Mr Dickson's name first appeared in a meteorological logbook received from the *Brittany* in 1950. Since then we have received a further 21 logbooks bearing his name. He received Excellent Awards in 1961 and 1974.

We extend our best wishes for a long and happy retirement.

RETIREMENT.—Mr J. J. McRory, Radio Officer, retired in September of last year after serving at sea for 30 years.

James Joseph McRory was born in 1919. He joined the Marconi International Marine Company in 1947 and served as Radio Officer in vessels including the *Athenic* and *Rookley* before resigning in May 1951 to take up a shore appointment.

He was reappointed Radio Officer with the Marconi Company in 1955 and served in a wide variety of vessels. He did not remain for any lengthy period in any particular ship but since 1976 he has served chiefly in ships owned by Manchester Liners Limited.

We received the first meteorological logbook bearing Mr McRory's name from the *British Sailor* in 1960. Since then he has sent us a further 18 logbooks. He received an Excellent Award in 1961.

We wish him a long and happy retirement.

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