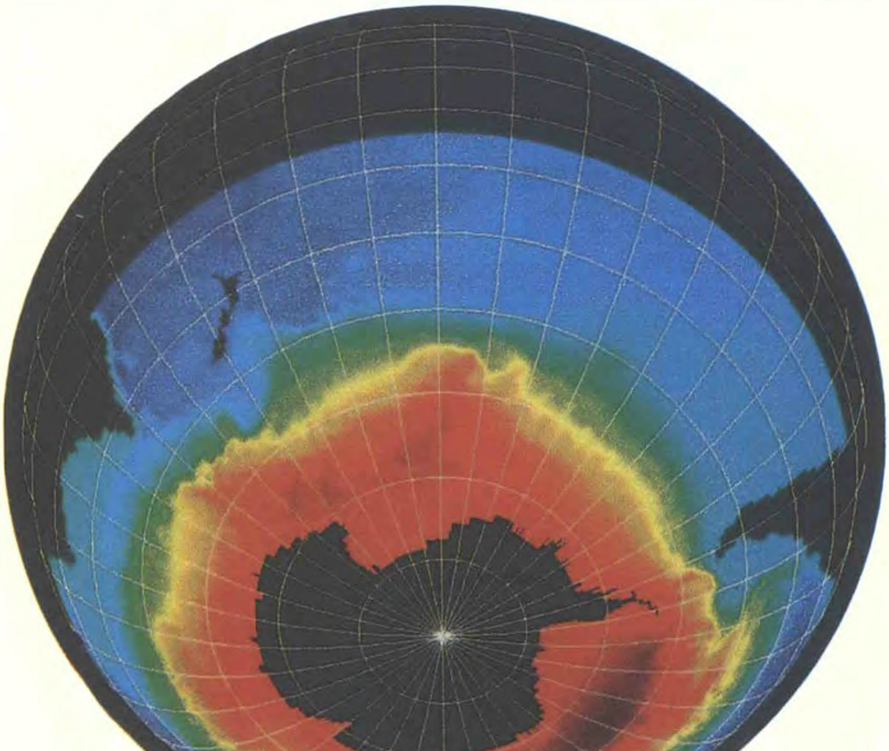
Met.O.995

# The Marine Observer

*A quarterly journal of Maritime Meteorology*



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Met. O. 995

# THE MARINE OBSERVER

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

**VOL. 61** **No. 312** **APRIL 1991**

**CONTENTS**



COVER PHOTOGRAPH: The Fine Resolution Antarctic Model. Figure 1. The stream function in the South Pacific sector of the FRAM model at the end of the first six years of the run. The stream function gives vertically integrated transport of the current field. The transport is largest where the contours are closest together. The total transport eastwards through Drake Passage is 195 million cubic metres per second. (See page 79.)

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

LONDON: HMSO

# Editorial

*Sire, ... there is not a sapling upon Parnassus more severely blown about by every wind of criticism.*

From *Of a vain author*
Boswell's Life of Johnson

In two articles recently published in successive issues of *Meteorological Magazine*, the problems associated with routine weather prediction over the British Isles were given prominence. The first article highlighted the difficulty of specifying the initial conditions to satisfy the needs of the Met. Office mesoscale model for predicting the weather on a 15-km grid. The surface observing network has at best a resolution of 50 km, with upper-air stations being spaced more than 300 km apart. Over the sea areas the problem becomes greater still with relatively few reporting ships and oil rigs providing regular observations.

The other item assessed the impact of the surface and upper-air observations received from just two ships upon the fine-mesh forecast in the North Atlantic of a developing depression on 24 January 1990. This depression deepened explosively and became the storm of 25 January which tracked across the British Isles, causing extensive damage and loss of life throughout a wide area.

The two reports serve to emphasize the important role played by ships' observations in the general scheme of weather analysis and forecasting. On the one hand, the lack of marine data may cause problems; on the other, reliable data from only two ships can verify the existence of a developing deep depression. The two cases are mentioned, not merely to demonstrate the vital part played by marine observations, but in order to underline the difficulties facing forecasters, whose genuine efforts are so often met by ridicule from those uninformed in the intricacies of their profession.

Meteorologists of all countries are doubtless accustomed to receiving verbal brickbats from some sections of the media and the general public. A case in point is the November 1990 storm that by-passed most of the U.K. after being extensively forecast as potentially severe and dangerous. Some national newspapers were sympathetic whilst others claimed the Met. Office over-reacted. On another occasion, the snow storm which blanketed the midlands and north in early December 1990 was accurately predicted for several days before it struck. Despite this forewarning, at least one TV news programme contrived to make an adverse comment by showing only a snow-stranded motorist who, when asked if he had not heard the forecast of the coming bad conditions, roundly criticized the Met. Office for getting it wrong.

Why are we always expected to be absolutely right in our forecasting? And when do we receive credit for getting a critical forecast correct? Which organization can claim 100 per cent accuracy for its public predictions, yet rarely if ever is openly criticized for its inaccuracies? Are retail market trends, made for the benefit of consumers, always absolutely right? If they were, there would not be so many companies in financial difficulty. Do the financial analysts always predict movements of stocks and shares without a single error? If they did, we would all be as rich as Croesus. Does a shipmaster never make an error in his ETA at the next port of call? Of course he does have to make amendments, perhaps several times on a long passage.

There are always sceptics who refuse to believe anything postulated by scientists; but we cannot just accept the *status quo* at all times, doing nothing in case the findings are wrong, but merely hoping that, in the case of climatology for instance, the spectre of a charred Earth will disappear of its own accord. Perhaps the Met. Office should try and emulate the admirable stand taken by Lord Jeffrey Sterling who, as President of the General Council of British Shipping, brought the existence of the Merchant Navy to the attention of the public with the excellent 'British Shipping Month' last year. Unfortunately a Met. Office 'Open Day' is barely feasible owing to our security commitments as a body falling under the control of the Ministry of Defence. The opening of outstations to the public would be equally difficulty to arrange, and so we have to fall back on private visits and publicity via our Press Office and by courtesy of the media for getting our public relations message across.

At least we could be reasonably certain that our voluntary observers on land and sea appreciate the need for understanding of the difficulties involved with weather prediction, and perhaps they are amongst the few who might spread the gospel to the many avowed sceptics who are always ready to disbelieve the weathermen.

J.F.T.H.

REFERENCES

Wright, B.J. and Golding B.W. (1990) The Interactive Mesoscale Initialization. *Meteorological Magazine*, **119**, pp. 234–244

Heming, J.T. (1990) The impact of surface and radiosonde observations from two Atlantic ships on a numerical weather prediction model for the storm of 25 January 1990. *Meteorological Magazine*, **119**, pp. 249–259

# Annual Report of the Observations (Marine) Branch for 1990

### (Including marine work of associated branches)

## 1. Voluntary Observing Fleet (VOF)

On 31 December 1990 the following units had agreed to operate as voluntary observers for the United Kingdom Voluntary Observing Fleet:

(a) 436 Selected Ships provided with full sets of weather observing instruments and stationery on loan. Thus equipped with precision aneroid barometer, barograph, and thermometers air and sea, together with their screens and bucket, a Selected Ship is primed to take synoptic observations every six hours when at sea or at anchor. A few of these ships are also fitted with distant reading and automatic transmission facilities. The U.K. VOF is part of the World Meteorological Organization (WMO) scheme involving more than 7,500 observing ships.

(b) 2 Supplementary Ships, carrying an abridged instrument kit more appropriate to the requirements of their operation, when there are fewer opportunities to carry out the observations.

(c) 47 'Marid' recruits, usually coastal and near-continental traders, which provide all-important sea temperature data to assist in the forecasting of fog and, where appropriate, the possibility of sea ice formation.

(d) 2 automatic light vessels and 1 light tower. New automatic weather installations on the *Smith's Knoll* and *Channel* light vessels have been carefully monitored and have operated satisfactorily.

(e) 1 Auxiliary Ship. A ship may volunteer to make observations on a voyage by voyage basis, perhaps when proceeding to data-sparse areas, when a special form is supplied for the ships to record observations, using their own instruments.

(f) 31 Oil Rigs and Platforms, which use SHIP Code to send in their observations from the North Sea, guided when necessary by the Offshore Advisers at Aberdeen and Bracknell. (There are also about 20 further offshore oil and gas installations which report to the Met. Office, either by automatic means or under alternative observing schemes.)

Port Meteorological Officers (PMOs) at home and abroad have worked to maintain an adequate level of their observing fleets, new recruits being regularly needed to make up for wastage caused by ship sales, losses and scrapping. Further marine volunteers are sure of a cheerful welcome, as fleets are rarely anywhere near full strength. PMOs carried out a programme of liaison visits to U.S.S.R. and other ships from overseas, offering advice on observational matters, including comparison with the 'background field' of pressure readings taken from bulkhead aneroid barometers.

In September, Marine Superintendent Captain Gordon Mackie was invited by the U.S. Marine Observations Program Manager, Mr Vince Zegowitz, to attend the U.S. and Canadian PMOs' Conference at Seattle. He experienced a very useful exchange of views and information on this first occasion of meeting with all his hospitable North American colleagues. With such a wide geographical area to cover, it was appropriate that the 17 U.S. PMOs present first gave overviews of their fields of operation and shipping statistics. Unlike their British counterparts, it was apparent that PMOs were not necessarily mariners or meteorologists although some had been in the U.S. Navy or Merchant Marine. Other items discussed included the placing of marine forecasters aboard observing ships for mutual understanding of what is, and is not, important in making a good marine forecast: arrangements to be made for PMOs to make liaison visits to marine institutions and schools to present the case for voluntary marine observing and the Weather Service in general: and more familiar problems such as delays in equipment supplied from central storage and the lack of central funding for an increase in the number of SEAS units (the U.S. version of our MOSS), seen as saving a large proportion of communications costs. The content and format of our sister journal over there, *Mariners Weather Log*, edited by Dick de Angelis, was discussed and rightly lauded for its excellent publicity and support for the U.S. marine observing program. Captain Mackie hopes to reciprocate the invitation by inviting his U.S. counterparts to our PMOs' Conference at Bracknell, tentatively arranged for September.

The two new P. & O. Container ships were brought into service during the year, having been fitted with distant reading temperature units at the shipbuilders in Japan, to augment the standard observing equipment. Preparations were made to fit British Antarctic Survey's new ship, *James Clark Ross*, launched by Her Majesty the Queen in December, with a prototype Ship's Modular Automatic Weather Station. This will have automatic sensors to observe pressure, air and sea temperatures, wind speed and direction, relative humidity, solar radiation and photosynthetically active radiation, i.e. radiation produced by plant life. There is also to be automatic formatting and transmission of the SHIP message.

The number of ships fitted with the Meteorological Observing System for Ships (MOSS) remained at 24, with the cost of hardware to outfit one ship being in the region of £11,000, although transmission costs are negligible. An average of 14 of these MOSS ships are at sea at any one time, enabling their coded weather messages to be automatically transmitted to National Met. Centres in real time. Plans are still in hand to provide MOSS units to other ships when the necessary resources and hardware are available. Satisfactory operation continued with the MOSS unit fitted on Ocean Weather Ship *Cumulus* on a trial basis the previous year, and adapted to accept radiosonde transmitted data in addition to the surface groups.

The merchant ship upper air programme continued. In March the Automated Shipboard Aerological Programme (ASAP) was reduced to one U.K. ship when the installation on the Belgian recruit, *Canmar Europe*, was withdrawn and the resources transferred to OWS operations. The Office continued to operate the Canadian-owned ASAP unit on *OOCL Challenge*, maintaining one staff member on board to carry out radiosonde launches twice daily, which provide valuable regular data for the forecasters, and assisting the bridge watchkeepers with taking and recording surface observations on North Atlantic crossings. The Scientific Officers involved with these duties have long since been fully integrated into everyday shipboard routines.

The Voluntary Special Observing Project-North Atlantic (VSOP-NA) was suspended on the 10 participating U.K. observing ships, which had persevered stoically, for almost two years for the most part, with the special log sheets and provided much food for analysis by the WMO scientific team involved: forty five ships from six countries took part in the project.

Unmanned buoys, both drifting and moored, equipped with automatic weather observing and transmitting installations, continued to be deployed around the United Kingdom coasts and North Atlantic. Under the U.K. commitment, two new open ocean buoys were deployed, one of which, ODAS 21 GB, at 53°N, 15°W, can be seen in the photograph opposite page 80. In December two drifting buoys were embarked on board m.v. *Geesthaven* at Barry for deployment 100 n.mile apart west of the Azores, in approximate position 37°N, 36°W, during the ship's voyage to the West Indies. The buoys were deployed as part of the European Group of Ocean Stations, both having been tested at the Met. Office Experimental Site at Beaufort Park near Bracknell; one of them was being managed on behalf of the Irish Met. Service.

**2. Ocean Weather Ship Programme**

National operation of OWS *Cumulus* proceeded without problems during the year. Following the termination of the North Atlantic Ocean Stations (NAOS) Board at WMO on 30 November 1989 (see page 85), the Marine Superintendent completed the open tender exercise for the contract to operate and man the ship for the Ministry of Defence until the end of 1992. Marr Vessel Management of Hull were successful in retaining the contract.

The weather ship carried out her normal routines of hourly observations and 6-hourly radiosonde ascents on passage and on station 'Lima' in position 57°N, 20°W. The radiosonde work is one element associated with WMO's Composite Observing System for the North Atlantic (COSNA), which incorporates the VOF, Buoys, ASAP, Aircraft to Satellite Data Relay (ASDAR) and other satellite techniques. *Cumulus* provided visibility sensor trials for the Met. Office and Expendable Bathythermograph work for the Hydrographic Office. Round voyages of 35 days from her home port of Greenock, where about two days are spent for recrewing and replenishment, were only once interrupted, for annual drydocking at Hull.

Under a new Met. Office initiative, Oceanscan Master Service was launched as an associate company of Marr's, with the aim of encouraging colleges and universities to contract the considerable spare accommodation and expertise on board for candidates to learn about meteorology at sea. The revenue from the venture will be used to offset the operational costs of the weather ship. Hull Polytechnic communications and electronics student Helen Young, 17, was the first to undertake a five-week course on board in observational techniques and other seagoing matters. Despite encountering some of the worst weather the North Atlantic could produce in October and November, Helen returned in good spirits and much impressed with her experience.

**3. Marine Products Group**

As a result of reorganization following the Met. Office's Agency status in January, the Marine Advisory Service and Ship Routeing sections were placed within the Commercial Services Division, although still maintaining a close working relationship with the Marine Superintendent and the Observations (Marine) Branch.

The highlight of the METROUTE year was probably the support given to the attempt on the Blue Riband (Hales Trophy) by the SeaCat *Hoverspeed Great Britain* in June. METROUTE monitored the vessel on passage from the builders in Tasmania to New York, and then provided detailed routeing and weather advice during the successful trans-Atlantic passage. Further forecast services were supplied during the subsequent trials of the SeaCat's performance in home waters. Major routeing contracts with the Shell and Esso tanker fleets were renewed, and a wide variety of other, less conventional, vessels were routed during the year, including very large livestock-carriers transporting sheep from Australia and New Zealand to the Arabian peninsula. The automated support for METROUTE introduced over the last two years now enables voyage details to be matched more quickly and efficiently with wind and wave conditions derived from the global forecasting models. The five routeing officers, all Master Mariners, have a range of new facilities to display information on computer terminals, and routes can be plotted on-screen to check vessels' progress. Post-voyage analyses for management usage by owners and charterers are also now routinely prepared by computer. The Tropical Storm Advisory Service for the western Pacific was extended to the Singapore office of a respected U.K. firm of International Loss Adjusters. Overtures were made to the New Zealand Met. Services with a view to establishing an agency for METROUTE. The Sea Ice Service continued to operate in tandem with METROUTE, providing ice charts weekly for the North Atlantic, Baffin Bay and the Baltic Sea.

The Marine Advisory Service had a busy year, with considerable growth in revenue. As always, a large number of requests were received from solicitors, loss adjusters, marine surveyors and insurance brokers, regarding the weather on occasions when loss or damage occurred to vessels or cargo. The exceptionally stormy period in the North Atlantic in January and February gave rise to large numbers of such requests for data and interpretation. Problems relating to coastal protection are also stimulating an increasing number of approaches for advice, both from the U.K. and overseas. It is clear that our global wind and wave archives are increasingly recognized as valuable resources for a wide range of design and planning purposes.

Regarding data archiving and quality control of marine observations, 977 meteorological logbooks were received from British VOF vessels, and these data were added to our Main Marine Data Bank after the usual inspection and assessment. The section continued as a 'Responsible Member' under the WMO scheme for exchange of marine data, and liaison was maintained with the other six Responsible Members to maximise the usage of these data on the global scale. Our additional responsibility as TOGA centre for surface marine observations also continued. TOGA (Tropical Ocean–Global Atmosphere) is an international scientific programme to study the behaviour of the tropical oceans and their effects on atmospheric developments; our task has been to collect ship observations over the decade from 1985, including those from co-operating ships of the British VOF, within the band 30°N to 30°S. Work also continued on VSOP-NA data (see part 1 above). Archiving of these data continued and analysis effort began in conjunction with staff at the Institute of Oceanographic Sciences.

**4. Services to Shipping**

The Marine Superintendent pursued his long-term plan for the establishment of an international forecast service for shipping on a world-wide basis, to be broadcast via INMARSAT on repayment. A service message to all U.K. registered ships was sent out in October, requesting feed-back from shipmasters on the ocean areas and specific meteorological information they might wish to be included.

Six different shipping forecasts are prepared twice daily by the Central Forecasting Office (CFO) at Bracknell, making an annual volume of about 4,380 forecasts. Three of these are broadcast automatically over the NAVTEX system via Portishead Radio and the remaining three are sent directly to Stonehaven, Valentia and Land's End Radio Stations. About 1,000 gale warnings are issued annually.

Two changes to the format of BBC shipping forecasts were introduced as a result of suggestions by users: the insertion of the Jersey station report between Royal Sovereign and Channel light vessel, instead of at the end of the list, and an agreement to include 'nil' station reports for the benefit of those taking down the shipping forecast regularly, possibly under less than ideal conditions.

**5. International Activities**

The Marine Superintendent chaired the first session of the Sub Group on Observations and Telecommunications in Geneva in February, as part of the Working Group on Basic Marine Met. Services (BMMS), which is a constituent of the Commission for Marine Meteorology at WMO. The group discussed the draft plan for new WMO areas for the Global Maritime Distress and Safety System (GMDSS), with compliance commencing in 1992, the future for the NAVTEX service and international monitoring of voluntary observing ships' data. It was agreed that PMOs were in the forefront of the vital aspect of recruitment of ships for weather observing at sea, and to enhance their role an international PMOs seminar was advocated. There were also proposals for the publication of international PMOs' guides and newsletters. Canada was asked to consider compiling and editing such a newsletter in the official languages of WMO, French, English, Spanish and Russian. Captain Mackie also attended the meeting of the Working Group of the BMMS in Geneva in September, the International Oceanographic IGOSS[1] conference in Paris in November and several committees at IMO, London, during the year.

**6. Awards and Publications**

During the year, as usual, four shipmasters with long and efficient observing records were presented at Bracknell Headquarters with suitably inscribed barographs.

Over 330 specially chosen books were presented to Masters, Principal Observers and Radio Officers as part of the Excellent Award scheme. These included additional awards to the officers involved with completing the special VSOP logs. The three books chosen as awards were *Great Journeys*, published by BBC Books, *Collins Atlas of the World* and *Cassell's Concise English Dictionary*.

The brochure *Weather Services for Shipping*, published in its new livery in November 1989, underwent minor revision towards the end of the year, with a view to re-publication in early 1991. Copies can be obtained, free, from Port Meteorological Officers or this office.

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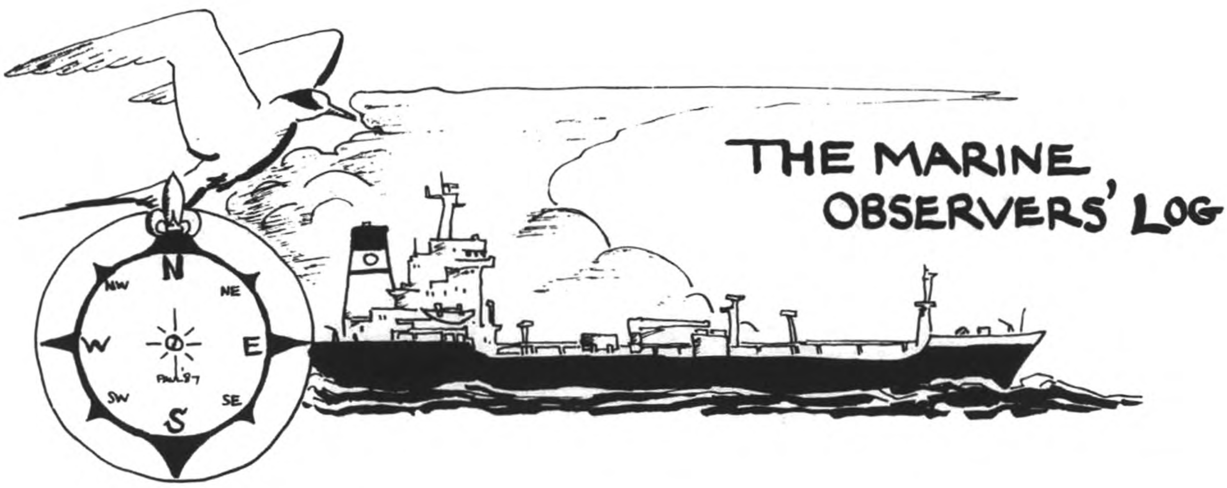
[1] Integrated Global Ocean Services System




# 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.

## TYPHOON 'MARIAN'

### South China Sea

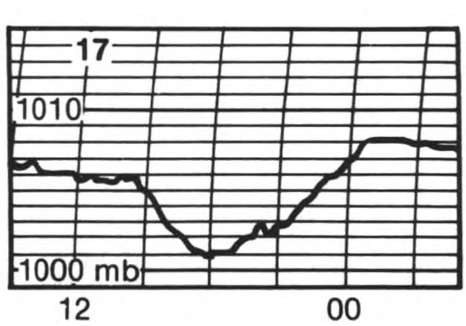
m.v. *Peninsular Bay*. Captain J.H. Hutson. Hong Kong to Suez. Observers: the Master, Mr K. Bradshaw, 3rd Officer and ship's company.

17 May 1990. The vessel departed Hong Kong at 0415 UTC and was clear of Hong Kong Island at 0630, on a course of 182°. At 0600 it had been reported that severe tropical storm Marian had intensified into a typhoon with a central pressure of 965 mb. The pressure at the ship was 1007.0 mb at 0715 and the wind was NE'ly, force 3; squally showers were also observed in the vicinity. By 0830 the pressure was falling steadily whilst the wind veered to SE'ly and increased to force 5.

The following observations were made whilst the vessel was avoiding the typhoon.

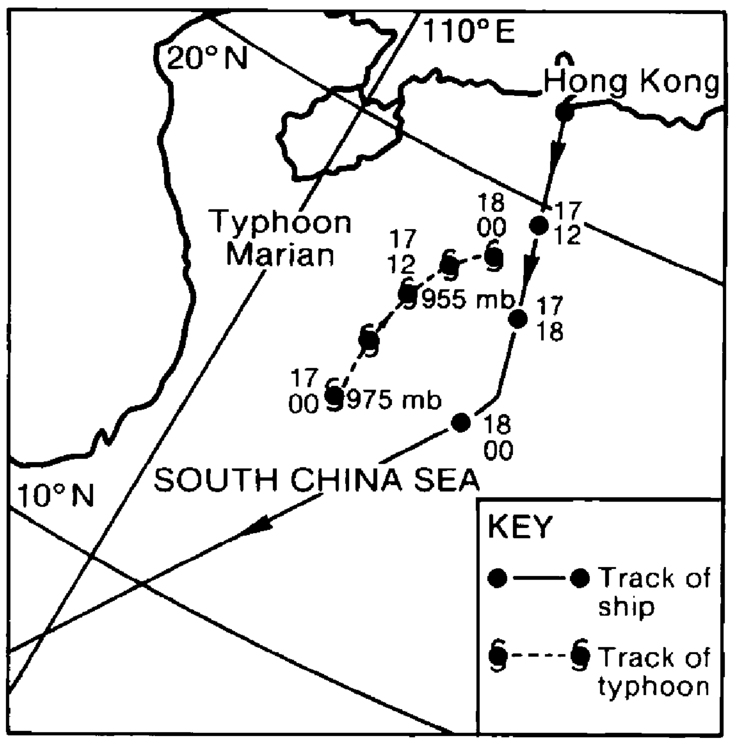
17th 1020: Vessel alters course to 167° to try and avoid typhoon's path.

1200: Pressure steady, wind drops to force 4, sky completely overcast. Typhoon's central pressure given as 955 mb. At 1258 ship in position 19° 36'N, 114° 37'E. Wind SE'ly, swell increasing and veering to south-east. Typhoon centred within 30 n.mile of 17.1°N, 112.7°E.




1330: Rain observed reaching the surface to the west, becoming torrential by 1420, driving horizontally from the south-east. Visibility greatly reduced.

1430: Rain eases and then stops at 1440. Pressure begins to fall, wind veers to SE×S'ly, force 5.
1500: Pressure begins to fall rapidly, wind veers to SSE'ly and increases to force 6. Typhoon centred within 30 n.mile of 17.5°N, 112.9°E, central pressure 955 mb.
1600: Pressure at ship 1004.0 mb, falling. Very heavy rain experienced, ceasing at 1630. Vessel reduces speed at 1645 owing to stress of weather.
1730: Wind veers to S'ly and increases to force 8.
1800: Pressure 1001.5 mb, wind S×E'ly, force 8. Intense, isolated showers observed to north-west at 1845.




By 2030 the pressure was 1002.1 mb, rising and the wind was S'ly, force 9; the cloud cover was thinning although squally showers were still being experienced. About one hour later the wind veered to SSW'ly and decreased to force 6 whilst the swell started to drop, and at 2230 the ship was able to alter course to 180° and resume passage as the danger of the typhoon had passed.

Position of ship at 1849 UTC: 17° 40'N, 115° 10'E.

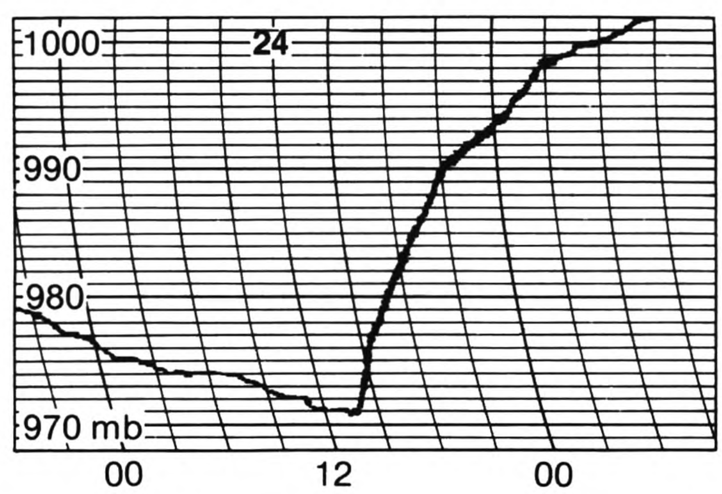
## PASSAGE OF DEPRESSION

### South Atlantic Ocean

m.v. *Falklands Protector*. Captain A. Jagger. Fishery patrol duties within Falkland Islands Protection Zone. Observers: the Master and ship's company.

24/25 May 1990. Whilst on patrol duties the vessel experienced the effects of a storm the centre of which passed to the north and east. First indications of the depression were received from Argentinian facsimile reports and a close eye was kept on the barograph which was registering falling pressure almost 48 hours before the storm blew up. Strong winds were not experienced until the pressure started to rise and, as can be ascertained from the trace, the isobars were packed very closely at this point. The following details have been compiled from the ship's deck and meteorological logbooks.

| Date and time (UTC) | | Wind Dir'n | Wind Force | Dry bulb (°C) | Pressure (mb) |
|---|---|---|---|---|---|
| 24th | 0600 | 270° | 4 | 5.8 | 972.7 |
| | 0800 | 260° | 4 | 5.6 | 970.8 |
| | 1200 | 240° | 7/8 | 4.2 | 970.2 |
| | 1600 | 225° | 10 | 4.3 | 980.3 |
| | 1800 | 200° | 10 | 4.0 | 985.7 |
| | 2000 | 200° | 9 | 3.5 | 990.7 |
| | 2200 | 210° | 8 | 3.5 | 994.5 |
| 25th | 0000 | 220° | 8 | 3.7 | 996.9 |
| | 0400 | 225° | 8 | 3.6 | 1000.7 |
| | 0800 | 220° | 6/7 | 5.0 | 1003.6 |




At the height of the storm the vessel experienced gusts of wind up to 60 knots and seas were estimated by the bridge watchkeepers to be 12–14 m high. When the vessel was between two crests of waves the observers appeared to be looking at a solid wall of water for a few seconds before falling freely, as if on a roller-coaster, as the vessel passed over the wave. Constant reports were transmitted back to Stanley, and although the vessel was only about 100 n.mile away to the south-west, the Falkland Islands seemed to be about four hours behind the above sequence of events. By 0800 on the 25th the sea had calmed sufficiently for patrol duties to be resumed, not that much illegal fishing would have been done during the previous 24 hours.

Position of ship at 1200 UTC on the 24th: 52° 55′S, 60° 19′W.

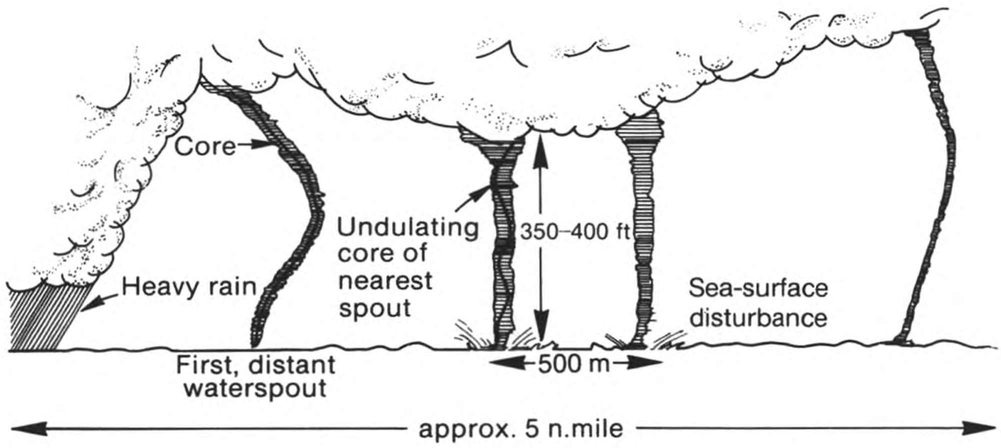
## WATERSPOUTS

### South China Sea

m.v. *Helikon*. Captain P.R. Dew. Al Jubail to Kaoshiung. Observer: Mr T. Andrews, 2nd Officer.

18 May 1990. At 1200 UTC a waterspout was observed at a distance of 5 n.mile from the vessel, on the outer edge of a cumulonimbus formation. The spout was clearly defined as it was in silhouette against the clearer sky beyond the rain

cloud, and was estimated to be about 2 n.mile from the main precipitation area. Within the next 10 minutes, three more spouts were formed, two of them being much closer to the observer, see sketch. In all cases, they initially appeared as dark funnels forming below the cloud base whilst the sea surface beneath them became disturbed as spouts finally developed between the funnels and the surface. The two closer waterspouts were about 500 m apart and were vertical with diameters estimated at 20 m at the surface; those further away appeared to have similar diameters but were much less upright, at times being very curved. The direction of rotation was noted as being clockwise.




The core of the spout nearest to the observer could clearly be seen in silhouette extending the full height (350–400 feet) and appeared to undulate in a wave form within the spout; in addition, movement of 'vapour' was clearly observed, rising in the spout closest to the vessel and loosely resembling a series of chevrons pointing upwards.


Weather conditions were: air temperature 29.7 °C, wet bulb 27.2°, pressure 1007.0 mb, wind SW×S'ly, force 3–4. The sky was becoming overcast with cumulonimbus.

Position of ship: 11° 11'N, 111° 43'E.

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

'This is an excellent, detailed description. Several of the details (height, width, direction of rotation presence of a core) are not often mentioned in such accounts, especially the last two features. Theoretically, a spout north of the equator should rotate anticlockwise, but there have been a number of reports of clockwise rotation.'

## CORPOSANTS

### South China Sea

m.v. *Zidona.* Captain D.C.J. Still. Mina-al-Fahal to Negishi. Observers: the Master, Mr G.M.A. Jones, 2nd Officer and Mr D.N.A. Morrice, 3rd Officer.

2 April 1990. At about 0630 UTC, whilst on passage north of the Horsburgh lighthouse, a loud buzzing noise could be heard emanating from the starboard side of the bridge wing and signal mast. On going out for closer investigation the observers found the hairs on their arms to be 'on end' and the buzzing noise increased in intensity. Nothing was heard on checking the port bridge wing. While trying to find the source of the noise the Second and Third Officers received shocks off various structures notably the dodger and searchlight. The Second Officer felt quite a 'jolt' which left an irritating sensation, likened to pins-and-needles, for 10–15 minutes after the event. It was noted that the discharge received was to the ringed fingers of each observer.

At the time, large shower clouds of stratocumulus and cumulus of moderate vertical extent were approaching the vessel from the north-east, with moderate rainfall visible. The buzzing noise rose to a maximum just prior to the rain reaching the vessel and, once the rain was at the ship, the noise rapidly diminished until it could be only faintly heard from the mast. When the rain ceased at 0650, the noise ceased also. It was thought to have been St Elmo's Fire, but no visible colours were seen on the ship's structures as given in the description in the *Marine Observer's Handbook.*

Position of ship approximately: 02° 30′N, 105° 06′E.

### South China Sea

m.v. *Benavon.* Captain W.A. Mason. Singapore to Hong Kong. Observers: Mr M.N. Sherwood, 2nd Officer, Mr W. Wright, SG1A and Mrs Sherwood.

17 May 1990. A thunderstorm slowly approaching the vessel had been observed on radar since about 1640 UTC, with both sheet and fork lightning being visible and one particular fork having a distinct, yellowish colour. No thunder was heard.

At 1840 the wind suddenly veered and increased to force 6, the barograph trace showing a small but clear fall and rise at this time and a few rumbles of thunder were then heard. On the tip of the starboard bridge-wing whip aerial, St Elmo's Fire was observed at the same time, its greenish glow gradually intensifying and then becoming visible at the top section coupling also, before slowly fading and disappearing altogether by 1900.

Up until this point very little rain was felt at the vessel although heavy rain was clearly visible in the frequent flashes of lightning within 1–2 n.mile of the vessel's starboard side. At 1910 moderate rainfall was experienced which lasted for 20 minutes by which time the thunderstorm was visibly astern of the vessel and moving slowly away. Lightning was still visible for some time afterwards.

Weather conditions at 1930 were: air temperature 27.1 °C, wet bulb 24.8°, pressure 1007.6 mb, wind S'ly, force 6.

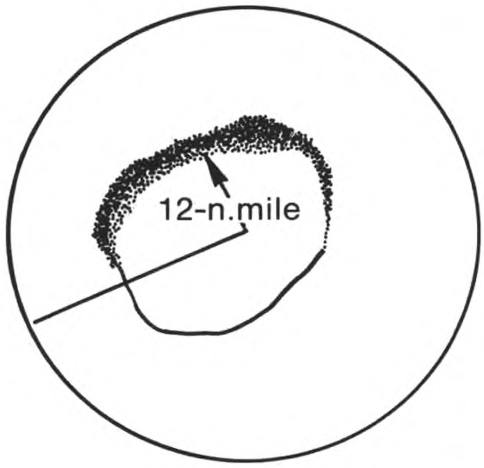
Position of ship at 1840 UTC: 09° 18'N, 109° 36'E.

## DUST

### Red Sea

m.v. *Lampas*. Captain E. Wilkinson. Suez to Ras Tanura. Observers: the Master, Mr N. Jenkins, 3rd Officer, Mr M. Alleyne, AB and ship's company.

23 June 1990. At 1700 UTC whilst the vessel was drifting, a sand or dust image was observed on the 3-cm radar at a distance of about 12 n.mile on the 24-n.mile range, and it appeared to be closing in on the vessel at approximately 2 n.mile every 12 minutes. The sketch shows the effect seen.




24-n.mile range
1700 UTC

This was the second observation of the phenomenon on the same day, the previous one occurring during the morning and showing exactly the same characteristics. By 1830 the phenomenon was not observable on the radar indicating penetration by the radar pulser. The visibility had decreased to about 3 n.mile by 1930 and remained so for the next 90 minutes. On the morning of the next day the vessel was covered by a fine layer of sand.

At the time of the observation the dry-bulb temperature was 30.8 °C, pressure 1004.6 mb, wind N'ly, force 3 and the sky was cloudless.

Position of ship: 18° 21'N, 39° 44'E.

## CURRENT

### Western North Pacific

m.v. *Cardigan Bay*. Captain P.J. Clark. Busan to Kobe. Observers: the Master, Mr B.G. Ball, 3rd Officer and Mr R. Maclean, SM1.

6 May 1990. At 0130 UTC a line of disturbed water was observed, its axis running approximately east/west. The sea-water temperature had been taken by rubber bucket at 0118 and a value of 21.2 °C was read. Twelve minutes after

crossing the line a second sea-water temperature was taken and it was found to read 19.0°. Numerous fishing boats were seen operating in the area of warmer water just inside the line of turbulence.

The axis of the line corresponded to the approximate axis of the Kuro Shio current as depicted on the 10-day mean surface current analysis promulgated by Meteo Tokyo for the period 11–20 April. During the hour before the observation the vessel's speed was 24.5 knots whereas in the following hour it had reduced to 21.9 knots, indicating a loss of favourable current. Wind direction and speed throughout was NNE'ly, force 5.

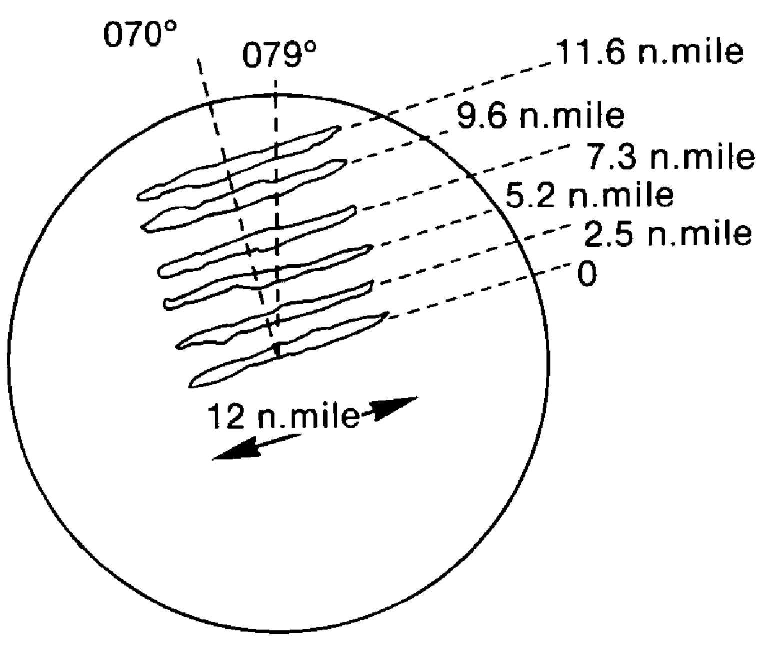
Position of ship at 0118 UTC: 32° 39'N, 133° 31'E.

## RADAR ECHOES

### English Channel

m.v. *Monmouth.* Captain P.J. Burden. Belfast to London. Observers: the Master, Mr B.C. Crombie, Mate and Mr D.S. Smales, Chief Engineer Officer.

26 April 1990. At about 1200 UTC some unusual echoes were observed on the radar screen. As shown in the sketch, six broad, well-defined bands, each about 12 n.mile long and initially 7 cables wide, were seen slowly overtaking the vessel and advancing on a course of about 070°. The orientation of the bands was from 160° to 340°.




The six bands were visible for about an hour and then became shorter in length and less well defined before disappearing from the screen. There were no bands or ripples visible in the overcast sky.

At the time of the observation the dry-bulb temperature was 12.0 °C, pressure 1024.0 mb, wind SW×W'ly, force 4–5. The sky was covered with 8 oktas of altocumulus.

Position of ship approximately 50° 18'N, 02° 36'W.

## Bay of Biscay

m.v. *Liverpool Star*. Captain K.F. Steven. Haifa to Ellesmereport. Observers: the Master, Mr P.W. Jackson, Chief Officer, Mr J.C. Hague, 2nd Officer, Mr K. McNeill, Cadet and Mr B. Smith, Chief Engineer Officer.

17 June 1990. At 0935 UTC an elongated 'U' shape aligned north-east/south-west on the starboard bow was sighted on the PPI over a 12-n.mile range, with a second 'U' being formed outside the first one, on a similar alignment. They appeared to be from moving aircraft the bodies of which completed the 'U' shape, and their heading was north-east. The radar in use was the Racal Decca BT 502 on 12-n.mile range offset to south-south-west on north up, stabilised display. Controls were set to target enhancement, tracking to three-minute trail, background colour blue, solid echoes yellow-white, weak targets brown-red, trail light blue.

The observers had experienced many low-flying aircraft on this display in the past, and the norm was for the aircraft itself to show as a yellow-white target with a three-minute trail of a light-blue colour, which length, of course, was dependent on the flying speed. It was expected that the display would quickly disappear, with the only question being why the trail remained yellow-white. After some minutes the display showed two complete, elongated 'U's of yellow-white (good, solid targets) the form and definition remaining constant. A polaroid camera was quickly loaded with film and a number of pictures were taken, one of which appears opposite page 80; although the radar screen was of daylight type, reflectance was high, hence the number of personnel shadows on the screen as attempts were made to reduce the glare.

It was noticed that the targets, which were approximately at right-angles to the wind, were moving in accordance with the wind direction and at a slightly lower speed, that is, the ship was overtaking them on a slight convergence. A sharp lookout was maintained but nothing unusual was sighted either at sea or skywards as the left-hand edge of the target passed through the vessel. Throughout, the targets remained at constant yellow-white brightness and their form/delineation remained constant until the vessel reached their end at about 1110. None of the observers had experienced this phenomenon before.

Weather conditions were: air temperature 16.8 °C, wet bulb 15.2, pressure 1017.3 mb, wind SSE'ly, force 3. Cloud cover was 6 oktas of altocumulus, there was slight haze and the visibility was in excess of 3 n.mile.

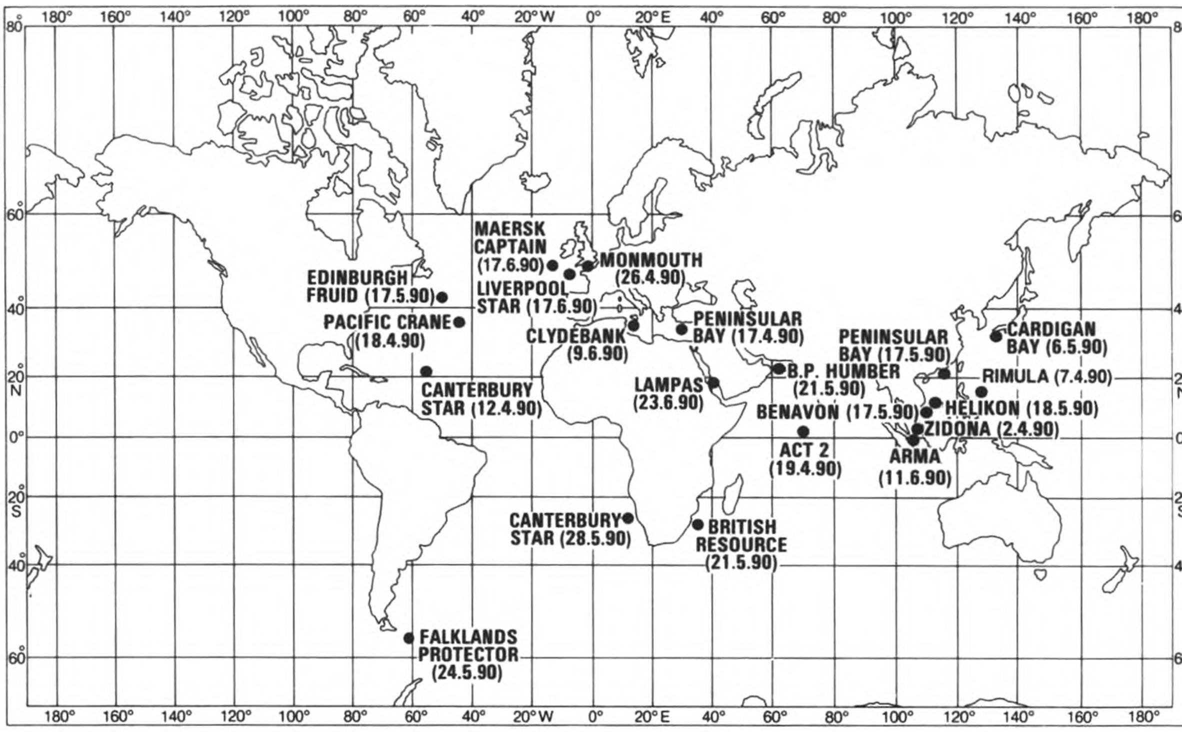
Position of ship at 1110 UTC: 48° 30'N, 07° 20'W.

*Note 1.* Mr E. Buckley, of the Defence Services branch, Met. Office, comments:

'For the dates in question, upper-air data from the nearest radiosonde site, together with the ships' reported surface weather conditions were processed through the Integrated Refractive Effects Prediction System (IREPS). On each occasion, a surface or very low ducting layer was evident and this was the most likely cause of the phenomena. The question arises as to what the radar 'target' was. The more likely explanation is long-period swell waves, particularly as the echoes were reported as moving, the orientation of the waves observed by the *Monmouth* being consistent with waves progressing along the Channel.

'In the case reported by the *Liverpool Star*, the closed "U" shape is difficult to explain simply as swell waves. The two "U" shapes show similar characteristics and it may be that the one further away is a secondary image of the same target. This could be due to the differing path lengths travelled by different parts of the radar wave; this may also have lead to some interference and may explain the closed "U" shape of the echo. Radar ducting gives rise to very much extended ranges over that which is normally the case for a specific radar. The target itself may be some considerable distance from the observation point, but may appear very close to the ship on the radar screen because the normal time between radar pulse and receipt of the echo has been considerably increased and is, therefore, out of phase.'

*Note 2.* On page 11 of the January 1991 edition of *The Marine Observer*, a similar example of radar echoes in the English Channel was reported by the *City of Edinburgh.* Mr Buckley considers these echoes were also caused by swell waves, finding that the their orientation aligned almost exactly with those reported by the *Monmouth.*




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

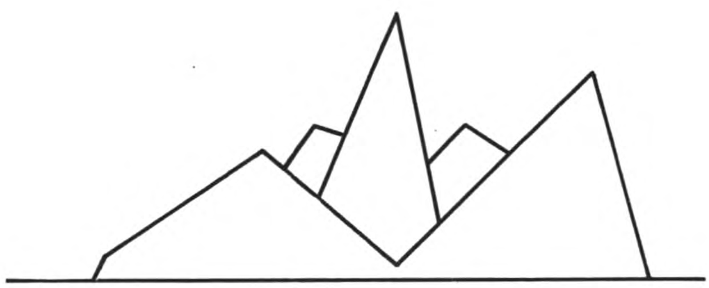
## FOG AND BERGY BIT

### Western North Atlantic

m.v. *Edinburgh Fruid.* Captain M.P.F. Tennant. Freeport to Sture. Observers: the Master, Mr J.S. Philips, Chief Officer, Mr S.K. Maini, 2nd Officer and Mr M. Velayudhan, Radio Officer.

17 May 1990. Between 1000 UTC and 1200 while about 20 n.mile from the southern tip of the Grand Banks of Newfoundland, the vessel encountered shallow fog in patches which was thought to be sea smoke. By 1030 the fog had thickened and visibility was almost nil. On comparing the sea temperature of 4.0 °C with the air temperature of 4.5° the possibility of sea smoke was ruled out and it was thought that the fog was a result of the meeting of the Gulf Stream and Labrador Current. The dense fog lasted for only about 10 minutes and soon the visibility increased to 5 n.mile. In the poor visibility the wind speed dropped from NE×E'ly force 5 to force 3 whilst the sea height diminished from 2.5 m to 1.5 m. The swell remained north-easterly throughout.

These conditions lasted until 1110 when the wind speed increased to force 5. Five minutes later a target was seen on the radar at a distance of 11 n.mile and the radar plot showed it to be on a heading of 250° at a true speed of 1.5 knots. When



View from port side

the target was 5 n.mile off it was sighted visually and turned out to be a bergy bit approximately 6 m high and about 50 m wide, in position 42° 00′N, 50° 42′W. It was not reported as the Ice Report from Halifax showed it had been tracked.

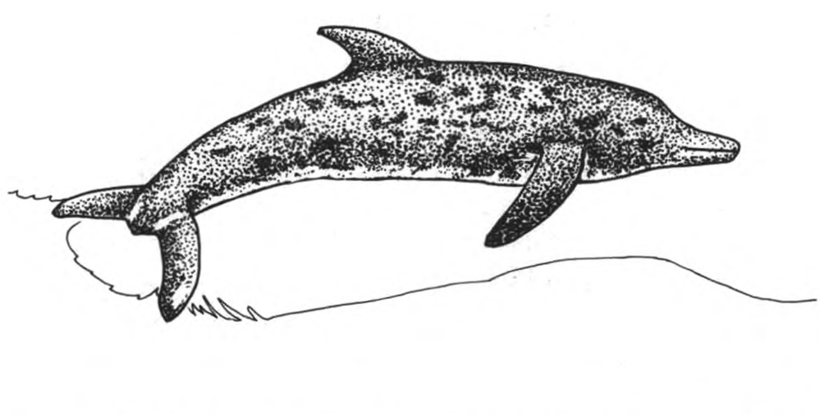
Position of ship at 1200 UTC: 42° 00′N, 50° 36′W.

## CETACEA

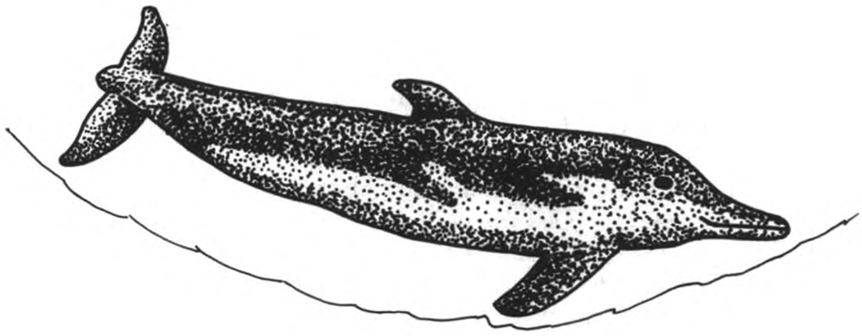
### Mediterranean Sea

m.v. *Clydebank*. Captain D.L. Jones. Port Said to Hamburg. Observers: Mr S.J. Alletson, 3rd Officer and Mr T. Brown, 5th Engineer Officer.

9–11 June 1990. At 0800 UTC a single, large dolphin as shown in the sketch was sighted. The dolphin seemed to race the ship, travelling parallel with it for a short time, occasionally leaping clear of the water. It then gave one final leap and cut across the vessel's bow before disappearing. As indicated on the sketch, the dolphin was a mottled, grey colour with a lighter underside and darker flippers and dorsal fin; it was at least 2 m long and was thought to be a Spotted Dolphin.



Two days later, when the vessel was about 45 n.mile south of Cartagena, approximately 12 dolphins were sighted travelling in a W'ly direction, jumping and porpoising in the bow wave and wake. They were 1.2–1.8 m long with dark-grey upper sides and light-grey or cream undersides with a dark patch extending down from the dorsal fin, see sketch. They were identified as probably



being Striped or Common Dolphins. About 15 minutes afterwards, a further four dolphins were seen behaving similarly to the earlier ones. These seemed to be slightly larger at 2 m long and were of a distinctly lighter colour but with a similar shading pattern. It was thought that they were Striped Dolphins as the 'reverse dorsal fin' was prominent.

Position of ship on the 9th: 36° 33′N, 13° 44′E.

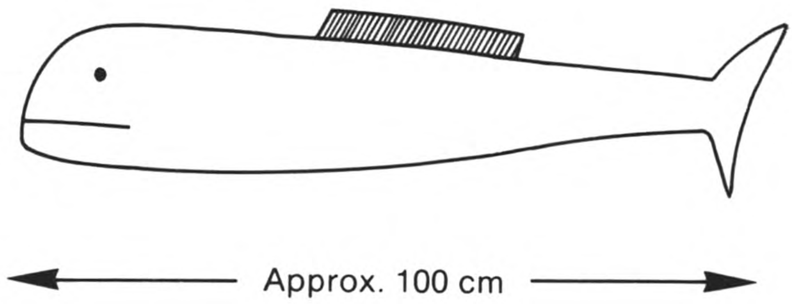
Position of ship on the 11th: 36° 48′N, 01° 10′W.

## FISH

### Indian Ocean

s.s. *ACT 2*. Captain M. Thwaite. Fremantle to Jeddah. Observers: the Master and Mrs Thwaite.

19 April 1990. At 1130 UTC the observers were watching flying fish escaping from the bow wave by 'flying' above the water. Suddenly, a large fish about 100 cm long, see sketch, leapt out of the water and gave chase after one of the




flying fish. When first seen it was very close to the bow of the ship and offered a good view. It was a bright, shimmering emerald-green colour and had a pronounced, 'bull nosed', rounded forehead with the mouth towards the bottom of the head. The position of its fins was somewhat speculative.

It went after the flying fish in a series of 'bounds' during each of which it completely cleared the water to a height of 1 m or so, and covered a distance of roughly 4–5 m. Four such bounds were counted and the fish travelled at great speed the whole time. Perhaps it then caught its quarry because it was not seen again. It was the first time in almost 35 years at sea that the Master had witnessed such a spectacle.

Position of ship: 01° 00′N, 69° 30′E.

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

'The fish leaping so actively from the sea was a dorado, (*Coryphaena*), of which there are two very similar species in warm seas. As adults they live largely on flying fish. It is not really unusual for them to sail into the air in pursuit of their prey, which they do with a great commotion, swimming flat out and smacking back into the sea with a resounding splash.

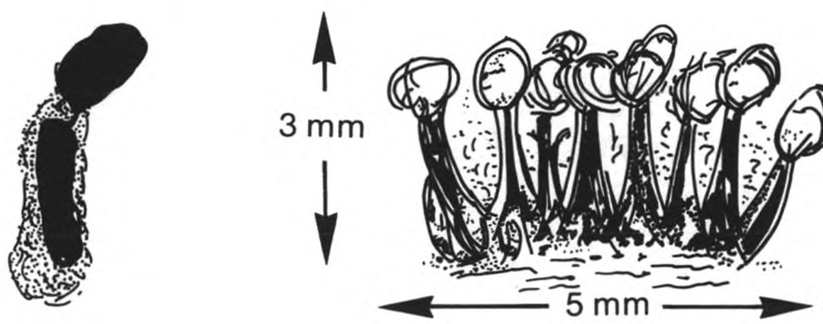
'A similar account is quoted in *The Marine Observer*, July 1986, p. 122. In the air they may be sighting their prey but I know of no work on the eye of the dorado which would reveal whether or not it would function out of water; the eye would need two refractive qualities, one for air and one for water, and some fish (also crustacea) have this, often in the form of a 'split eye' (which the dorado does not have). It may simply be be that the fish covers more ground by successive leaps than by constant swimming, and that the creature is semi-blind in air, but I suspect, evolution being the efficient tool it is, that the dorado eye may hold a secret or two for us to unravel.'

## MARINE LIFE

### Eastern South Atlantic

m.v. *Canterbury Star*. Captain N.D.T. Johnson. Cape Town to Port Vendres. Observers: Mr R.G. Pressler, 2nd Officer and Mr E.T. Bibby, Extra 2nd Officer.

28 May 1990. At 0845 UTC large clouds of some brownish-green coloured substance, first thought to be oil or the tank cleaning residue from another ship, were observed in the ship's path. As the vessel passed through the clouds which were between 10 m and 25 m long by 2–3 m wide, it was realised that they were, in fact, made up of algae or spawn. A sea-water sample was taken by bucket and several small groups of algae were obtained. The first sketch shows how each individual cell appeared, while the second shows how they looked in a group.




It was thought that the objects could well have been a kind of spawn owing to their shape which had a distinct 'head' and 'body', and the fact that they seemed to be encased in a gelatinous substance similar to frog spawn. At the base of each cell were observed small black specks whilst the colouring of the actual cells when out of the water was a creamy-white.

Position of ship: 25° 43′S, 10° 58′E.

## BIOLUMINESCENCE

### Eastern North Atlantic

m.v. *Maersk Captain*. Captain A.K. Froggatt. Lake Charles to Antwerp. Observers: Mr P. Messenger, 2nd Officer and Mr L. Mearns, GP1.

17 June 1990. Whilst taking the 0000 UTC observation, bioluminescence was seen down the length of the vessel, in the wash and also the bow wave but not in the wake. The effect was of white pin-points of light caused by the upwelling of

sub-surface water which made them flash as they came to the surface then die away fairly quickly. The most numerous and strongest lights were observed running along the ship's side.

When the sea-water temperature was taken, a sample of bioluminescence was caught in the bucket and it flashed when the bucket was shaken but dulled and died away after about a minute. On closer inspection of another sample, small particles not more than 1 mm in diameter could be seen in the water.

An Aldis lamp was flashed onto the sea surface but caused no change in the quantity or intensity of the lights which continued until about 0430 when the day became too light to make any more observations. The sea-water temperature at the time was 15.1 °C.

Position of ship: 49° 14'N, 13° 48'W.

## VARIED WILDLIFE

### North Atlantic Ocean

m.v. *Pacific Crane*. Captain P.G.H. Hobson. Cristobal to Barrow in Furness. Observers: the Master and members of ship's company.

18–23 April 1990. Between these dates a variety of wildlife was observed, the following account being a record of those species seen.

On the first day two sets of whale blows were observed about 1 n.mile to the north-west although the whales themselves were not seen. Successive jets indicated a slow, south-easterly movement of the whales which travelled as a pair. The blows were unusual as each consisted of two distinctive jets from a common base.

The following day a steady stream of Portuguese men-of-war was noted passing down the ship's sides from 1210 onwards. Although their numbers were not huge, two or three could usually be seen at any given time and this continued until around 1830. Owing to the sea state their tentacles were not clearly seen but the sails were opaque pink in colour, becoming darker pink/purple at the base. The sails were generally about 10 cm high and 30 cm long; however, some were much smaller while others were about half as big again.

Basking sharks were spotted on the 20th at 2124. The vessel passed through them as they swam just below the surface, presumably feeding, as they moved very slowly. Although no sharks were seen wholly their unusually large dorsal fins were unmistakable. The majority ignored the ship with only those directly in its path diving clear. A total of 19 were observed, the average length being estimated at 3–4 m.

On 23 April a flock of Kittiwakes accompanied the ship, the first, an adult, being seen at 0720. Very little seabird life had been seen, but by 0830 there were eight birds at the ship. They consisted of five adults and three immature birds, but after that, their numbers dwindled leaving two at 0910 and none by 1115.

Position of ship on the 18th: 35° 11'N, 46° 29'W.

Position of ship on the 23rd: 46° 50'N, 20° 00'W.

*Note.* Dr F. Evans comments:

'I am always pleased to receive records of Portuguese men-of-war, indeed of any jellyfish, since they are an important fraction of life at the sea surface (together with, for example, seabirds, sun-fish and turtles which eat them). The 80 n.mile over which they were sighted represents a lot of jellyfish.

'I am also pleased to have the report of Basking Sharks to add to my records. This is a large number to be seen at one time and tells us something of the navigational and homing power of these wide-ranging creatures. The records will be passed on to the Basking Shark recording scheme.'

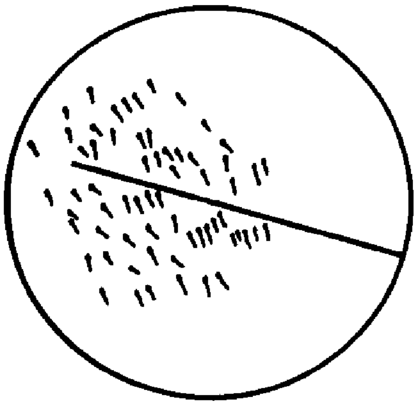
[Editor's note: The amateur 'observers' of the Marine Branch feel that the whales seen on the first day were probably Right Whales as these are the only whales to produce the distinctive twin jets when they blow.]

## BIRDS

### Mediterranean Sea

m.v. *Peninsular Bay*. Captain J.H. Hutson. Hamburg to Port Said. Observers: Mr D.J. Bailey, 1st Officer and Mr K. Bradshaw, 3rd Officer.

17 April 1990. Between 0430 UTC and 0650 hundreds of small but sharp echoes were observed on both the 3-cm and 10-cm radars and on all ranges. They travelled at approximately 40 knots on a course of 340° and were detected at a distance of 8–9 n.mile to the south-east, eventually passing over the vessel. The sketch shows what was seen.



Second trace echoes were thought unlikely, so migrating birds seemed to be the only plausible explanation. Although there was no cloud and only a slightly hazy sky, binoculars revealed no sign of birds. Some of the echoes joined into lines at right-angles to the direction of travel so added to the belief that birds were the targets.

Position of ship: 32° 20′N, 30° 00′E.

*Note.* Commander M.B. Casement, of the Royal Navel Birdwatching Society, comments:

'This record is of very high interest to me personally because it duplicates almost exactly my own experience in this area in 1961–62. The main direction of travel confirms the analysis made then. It is impossible to identify any species, but the speed suggests groups of ducks, waders or possibly quail. More records of this type would be of great interest.'

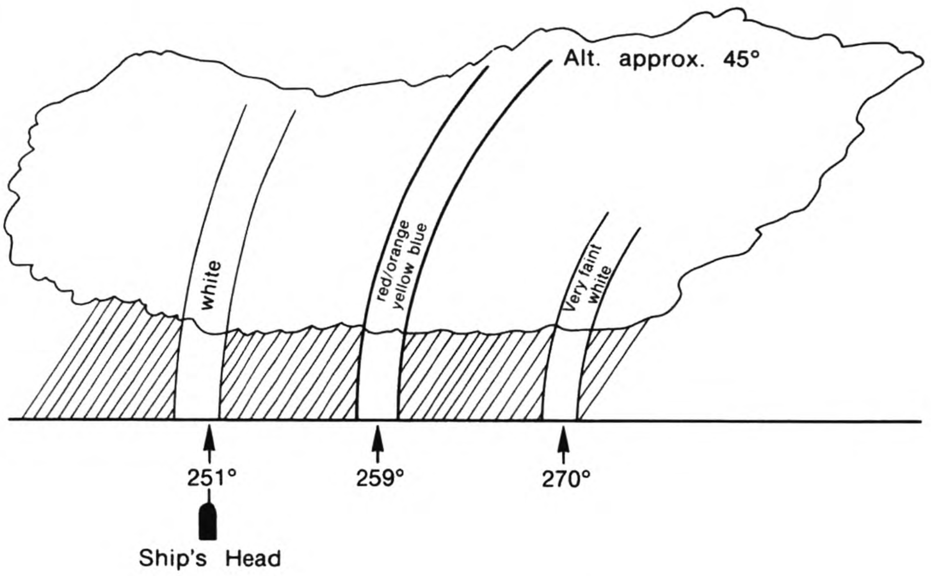
## RAINBOW

### North Atlantic Ocean

m.v. *Canterbury Star*. Captain C. Jackson. Savona to Moin. Observers: Mr M.W. Speers, 3rd Officer and Mr A. Howes, Watchkeeper.

12 April 1990. At 0004 UTC a bright, white arc was seen on the starboard bow and was quickly identified as a lunar rainbow. The moon was one day after its full phase and was just rising; it had little colouration but was unusually bright. A

faint, secondary bow became visible outside the main bow at 0010 while the latter, at the same time, began to show colouring; it was possible to see a slight, reddish-orange colour on the outside, merging into yellow, then to a bluish colour on the inside edge. See sketch. Unfortunately, measurement of the width of these bands was not possible as they were not clear enough. During this time, the outer secondary bow together with a third, inner bow remained faint and were white in colour, the inner secondary bow being nearly too faint to see. The




outer secondary bow remained visible until about 0115, the inner one having disappeared a couple of minutes earlier. By 0020 the main bow had turned white and had started to fade at the top and bottom, completely disappearing at about 0033. The likely reason that the bow remained visible was that the wind was from astern and was approximately the same speed as the vessel.

Position of ship: 20° 48′N, 56° 24′W.

*Note.* Dr R. White, of the Institute for Research in Meteorological Optics, comments:

'Generally, this is fairly standard, though the radius of the primary bow (and that of the "outer" secondary) is rather less than the theoretical value. Lunar rainbows usually show little colour owing to the eye's difficulty in perceiving colours in faint light, and the observation of a secondary lunar bow is rare. The colours suggest a raindrop diameter of about 3 mm.

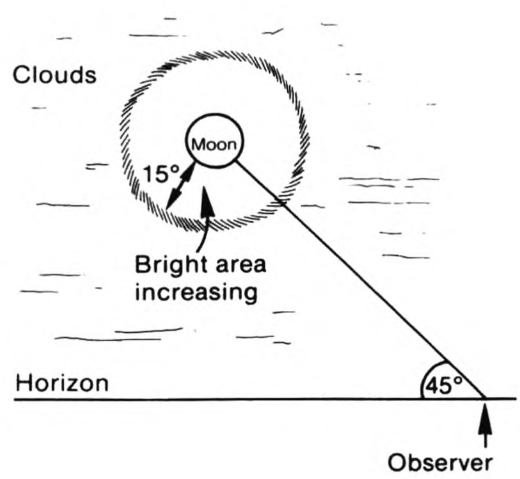
'The observers refer to both outer and inner secondary bows, but the theory predicts no such inner secondary bow, and I suspect that the observers have misinterpreted some locally enhanced brightness of the cloud, and perhaps also of the precipitation, as another bow at this point.'

## CORONA

### Singapore Strait

m.v. *Arma*. Captain C.B. Kulkarni. Pasir Gudang to Singapore. Observers: the Master, Mr B.K. Jha, Chief Officer, Mr R. Sarda, 2nd Officer and members of ship's company.

11 June 1990. At 2222 UTC when the vessel was approaching Singapore, a large, bright circle of light approximately 15° in diameter was observed around the moon, and increased as day was breaking. See sketch. The moon's altitude




was 45° and it was over the western horizon. Although the night sky was nearly overcast the observers considered cirrostratus was present to cause what was thought to be a halo.

Position of ship: 01° 21′N, 104° 00′E.

*Note.* Dr R. White comments:

'It seems pretty clear that what was seen here was a diffraction corona rather than a refraction halo. The latter would have been a narrow, bright ring centred on the moon, with the sky inside it, if anything, darker than that outside, and would not have shown any change in radius. The fact that the corona was increasing in size shows that the cloud particles were evaporating.'

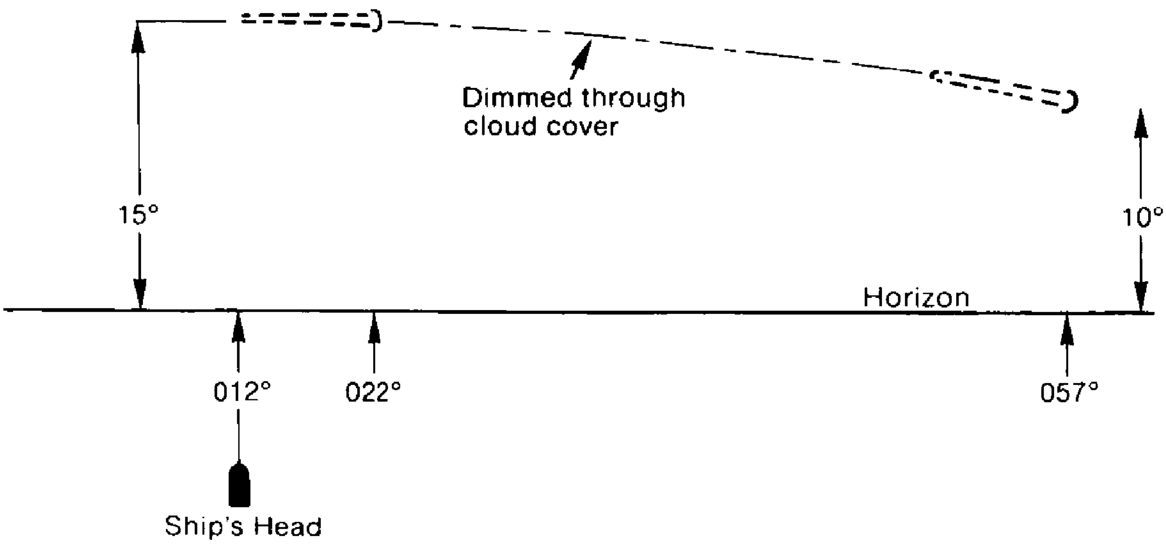
## METEOR

### Western North Pacific

s.s. *Rimula*. Captain R.A.H. Lawson. Sepetiba to Oita. Observers: Mr B.J. Rennie, 3rd Officer, Mr C.S. Opao, Watchkeeper and Mrs Rennie.

7 April 1990. At 2245 UTC all observers were on the bridge and the Third Officer had scrutinized the 3-cm radar screen which showed no apparent echoes on the 24-n.mile range. Their attention was suddenly drawn to a very intense, white light approximately 50 m in diameter, travelling in an easterly direction and at very high speed; it was estimated that the range of the object was 8–10 n.mile. The light left a white trail, also very bright, approximately 200–300 m in length as it passed through the sky, and appeared to have a slight, orange, glowing tint at its start.

As shown in the sketch, the object came into view at 15° above the horizon, bearing 022° and disappeared at 10° above the horizon about 3–4.5 seconds later, bearing 057°. During the observation the light dimmed for about half a second as it became obscured by cloud cover, which suggested some indication of range. After the light disappeared the area of sky was scanned with binoculars but nothing more was seen and there was no disturbance of water or noise from where the object would have crashed as suggested by its trajectory. Throughout




the period there were no distress transmissions on Channel 16 and no distress flares or signals were seen by any of the observers. On alert, the Master was promptly on the bridge and, given the relevant details, ascertained that the object was a meteor; official entries were made in the movement and official deck logbook.

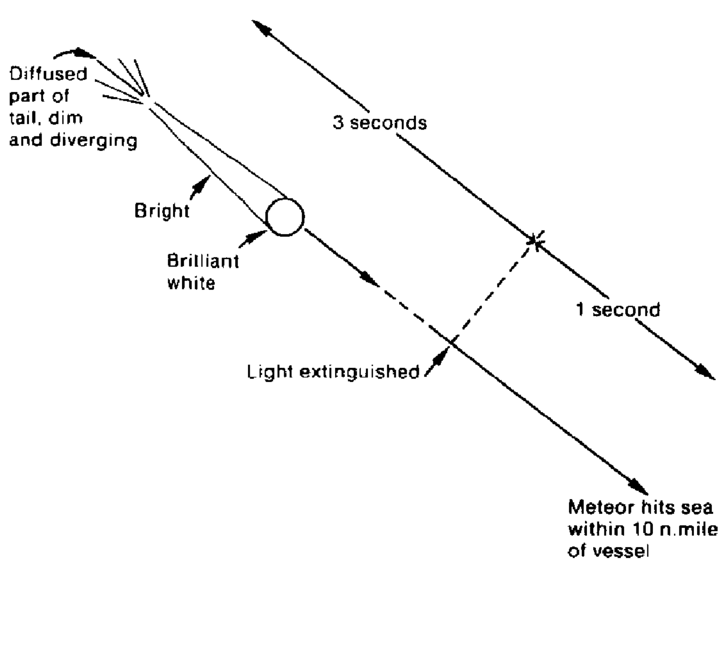
Position of ship: 14° 12′N, 128° 20′E.

## METEORITE

### Indian Ocean

m.v. *British Resource*. Captain J. Bovaird. Kharg Island to Rotterdam. Observers: Mr A.J. Fitch, 3rd Officer and Mr S. Currie, Supernumerary.

21 May 1990. At 1800 UTC whilst the vessel was travelling down the east coast of South Africa a large meteor was sighted to seaward, lighting up the whole sky. It was first sighted about 5 points abaft the port beam at an altitude of about 60°, mid-way between the stars Arcturus and Antares. The diameter was about half that of the moon but was much brighter than a full moon and shone brilliant white. A tail was clearly visible, also shining a bright white, and was approximately four times the length of the meteor body, converging to a well-defined point and then diffusing outward for another two lengths; this part of the tail was much dimmer. See sketch.



It was travelling to the south and descended quite rapidly at about 30° to the horizon. When it was just forward of the beam the brilliant light was extinguished (at an altitude of about 20°) but a faint afterglow remained, continuing to descend and hitting the sea four points on the port bow, below the Southern Cross between the vessel and the horizon which was roughly 10 n.mile away. The total duration of the object's passage was no more than 4 seconds.

Position of ship: 26° 48'S, 34° 13'E.

*Note.* Mr H. Miles, Director of the Artificial Satellite Section of the British Astronomical Association, comments:

'This is an excellent description of a brilliant fireball and the observers are to be congratulated for recording so much detail in a form which is useful to analysts. The cone-shaped tail is quite common but the diverging component beyond the apex of the cone is unusual. Another unusual feature is the sudden extinguishing of the object without flaring or breakup but with the body still travelling while faintly visible, suggesting that it had slowed up sufficiently to arrest the ablation and was cooling off. It is doubtful whether it actually hit the sea at the point suggested; more probably it passed over the horizon and possibly hit the sea much farther away.'

## SATELLITE

### Gulf of Oman

m.v. *B.P. Humber*. Captain R.A. Jarrett. Jebel Ali to Madras. Observer: Mr A.K. Birley, Chief Officer.

21 May 1990. During the night a light was observed passing through the sky at high altitude. It passed close to and south of Spica and was, for the most part, of equal brightness to it. However, it briefly flashed much more brightly for a single moment, very similar to one flash of an aeroplane's warning light, before dimming back to its original intensity.

The object travelled in a south-south-easterly direction before disappearing behind low cloud near the horizon. It was thought to have been a satellite, but why the sudden increase in brightness?

Position of ship: 23° 07'N, 60° 35'E.

*Note.* Mr H. Miles comments:

'Although no indication is given of how long it took to cross the sky, the appearance and behaviour of the object seem to suggest that it was a satellite as indicated by the observer. Satellites and associated rocket cases can be very irregular in shape. They are seen from the Earth by sunlight reflected from their surfaces, and if the object is tumbling, the reflection comes from various parts of the structure. If, by chance, the reflection comes from a flat surface, then the intensity of the light is increased considerably, just like reflections from a window of a house many miles away when the sun is in a critical position. The brightness of satellites can vary considerably as they transit the sky. It is quite common for rockets with a shape similar to that of a milk bottle, to tumble rapidly and hence they can flash rapidly or slowly, and in some cases be visible between flashes.'

# The Fine Resolution Antarctic Model*

By Dr D. Webb
(Institute of Oceanographic Sciences Deacon Laboratory (IOSDL), Project Co-ordinator for FRAM)

## FRAM — The Ship

*Fram*, which means forward, was the name of the ship used by Fridtjof Nansen for his long drift through the pack ice of the Arctic Ocean. The ship entered the ice field in September 1893 and drifted with the ice for almost three years. It finally broke free in August 1896. Observations made during the drift showed, for example, that the Arctic Ocean was a true ocean basin of great depth. In November 1893 *Fram* reached its most northerly point 360 miles from the North Pole. Later the ship was used by Sverdrup for two further successful surveys of the Arctic. The ship finally went to Antarctica when it was used by Roald Amundsen for his dash to the South Pole.

## Introduction

FRAM, the Fine Resolution Antarctic Model, is one of the largest and most detailed computer models of the ocean ever constructed. Running on the Rutherford Cray X–MP, it is enabling a group of U.K. researchers to study the circulation and heat transport of the Antarctic Ocean in more detail than has previously been possible.

The FRAM project is the first part of a NERC community program to develop the ocean modelling skills and manpower needed for the 1990s. These are required for research into long term climate change. They are also required for studying and predicting the shorter term changes occurring in the physics and biology of the ocean.

Although computer models are widely used to study and predict the circulation of the atmosphere their use in oceanographic research has been limited because of the small scale of many oceanic features. In the atmosphere the scale of the major high and low pressure regions is typically a thousand kilometres. In the ocean the corresponding scale of the equally important ocean eddies is only a hundred kilometres. As a result, models of the ocean need about one hundred times more storage and computer power than corresponding atmospheric models. Because of the limited power of computers in the past, it was only possible to construct relatively crude models of the ocean. Usually the eddy field was left out altogether and this led to serious concern about the validity of the results.

With the introduction of multiprocessor vector processing computers, like the Cray X–MP, it became possible to construct and run eddy resolving models which covered large regions of the ocean. In the U.S.A. this led to a community project for an eddy resolving model of the North Atlantic. West Germany also collaborated in this project. In the U.K. we decided to be more adventurous and go for the Southern Ocean, developing a model which covers almost 40 per cent of the ocean's surface. The Southern Ocean is important to the world ocean

* Reproduced from *NERC News*, July 1990, by kind permission of the Editor.

circulation because its major current, the Circumpolar Current, tránsports heat, nutrients and other water properties between the rest of the world's oceans. It also affects the climate of the region by acting as a barrier between the cold water surrounding Antarctica and the sub-tropical water to the north.

The FRAM model covers the whole of the Southern Ocean south of 25°S using a grid with a resolution of a quarter of a degree in the north–south direction and half a degree in the east–west direction. At 60°S this gives a resolution in both directions of about 27 km. This is larger than we would have liked (10 km would be preferable), but much better than the 100 or 200 km resolution that has been used in the past. The model has thirty two vertical levels. This number of levels is needed to represent the detailed vertical structure and bottom of the ocean. The bottom topography affects both the path and the magnitude of the major ocean currents.

**The Scientific Study**

The first problem being tackled with the FRAM model is to determine which physical processes control the size of the Circumpolar Current. We know from observations that the total transport in the current is about 130 million cubic metres of water per second. This is driven primarily by the strong winds which blow unimpeded from west to east around the Southern Ocean.

Because of the great depth of the ocean, the direct effect of bottom friction on the current is small. We would therefore like to know what it is which balances the wind and prevents the current accelerating to greater speeds. Two candidate mechanisms have been proposed. In the first, the wind stress is balanced by pressure forces generated by the flow across the deep ocean ridges. In the second, the wind stress is balanced by the stress due to the small scale (100 km) eddy field.

Although it is too early in the model run to start making definitive statements, the results so far indicate that both mechanisms are important. Their effects are illustrated in plots of the stream function, which is a measure of the total current flow at all depths (Figure 1, see cover). The main Circumpolar Current shows up as a band of rapidly changing contour values encircling Antarctica. The current is smoothest where it crosses the deep ocean basins. It becomes convoluted and produces most eddies as it tries to cross oceanic ridges and by-pass other shallow regions of the ocean. The effects are well illustrated in the South Pacific sector where the current skirts a shallow continental shelf south of New Zealand and crosses the Pacific–Antarctic rise through the Udintsev Fracture Zone.

Researchers within the FRAM group are also studying the transport of potential vorticity within the model ocean. Potential vorticity is a conserved property, similar to angular momentum, but one which is more convenient for oceanographers as it contains the effects of both rotation and stratification. It is significant because although it is carried around by ocean currents like any other passive tracer, the resulting distribution of potential vorticity then determines the new pattern of currents.

Other investigators are studying the unusual heat transport of the Southern Ocean. In the other major oceans, poleward flowing currents, such as the Gulf Stream, and their return flows transport large quantities of heat to high latitudes. However, this can only occur if the ocean has a continuous western boundary. In the Southern Ocean there is no such boundary and instead the Circumpolar Current acts as a barrier to the polewards flow of heat. Warm water can cross this if it is mixed across by the ocean eddy field. In fact the FRAM model has shown




Meteorological buoy ODAS 21 GB moored in position 53° N, 15° W by Royal Auxiliary Service Salvage vessel *Pochard*, out from Greenock. (See page 57.)

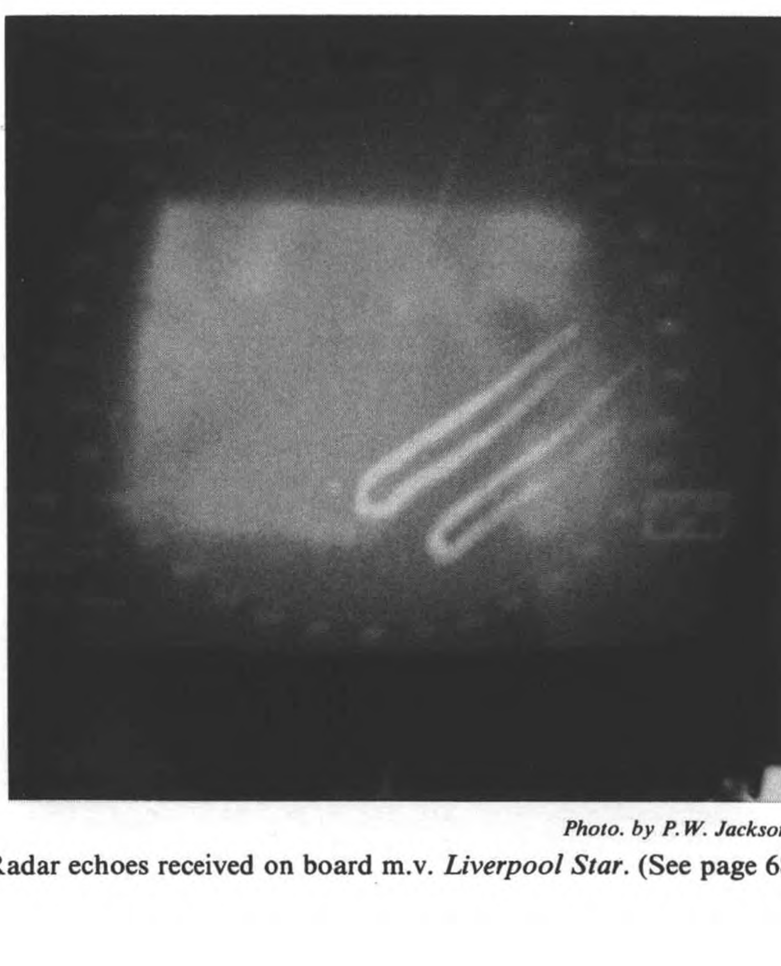


*Photo. by P. W. Jackson*

Radar echoes received on board m.v. *Liverpool Star*. (See page 68.)

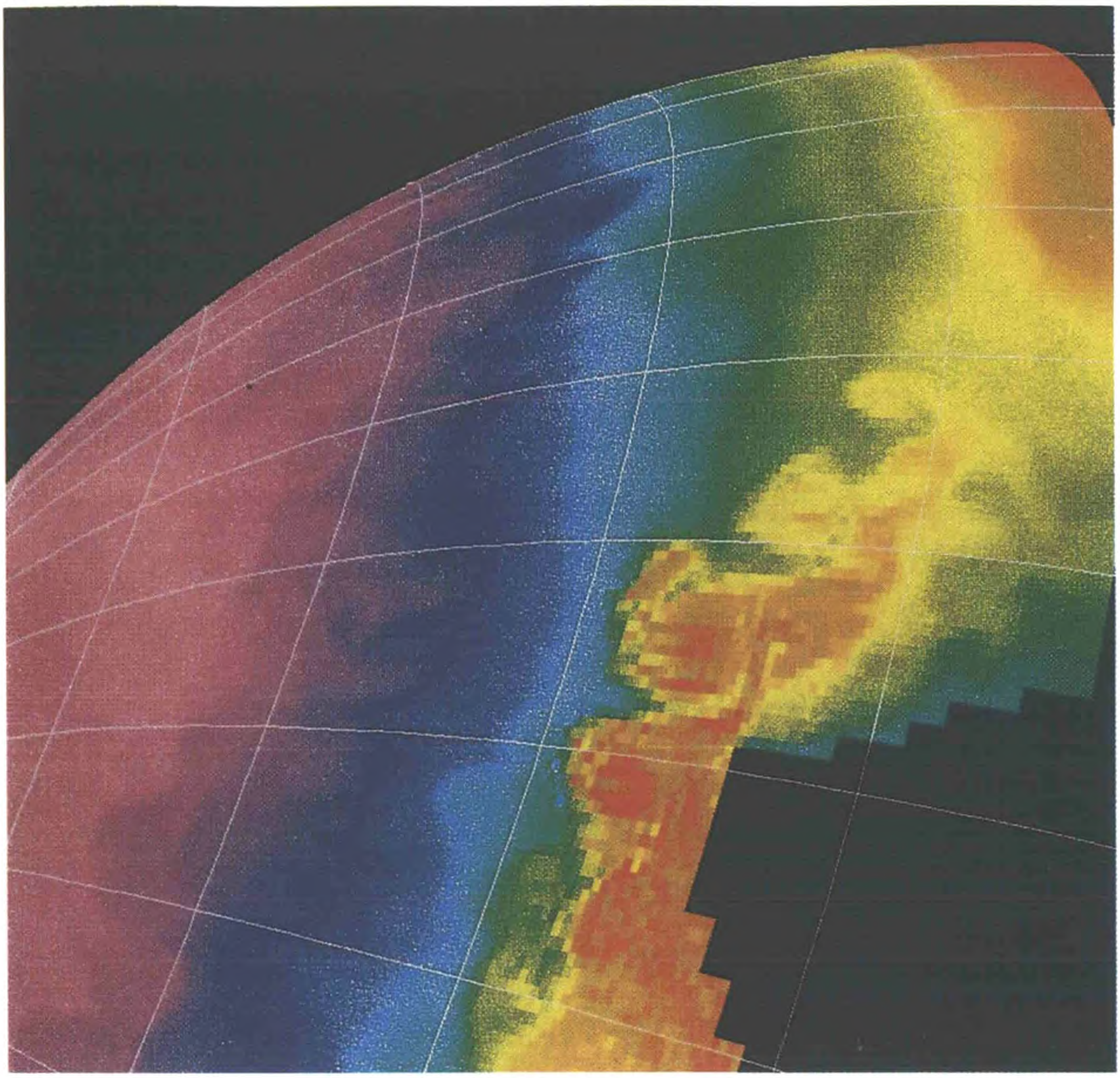


Figure 2. The temperature of the surface layer of part of the model ocean at the end of six years. Just south of South Africa, eddies generated by the Agulhas Current transport warm water into the South Atlantic. Further south, large meanders are seen in the strong front that marks the core of the Circumpolar Current.

that a band of energetic eddies is formed along the path of the Circumpolar Current and that these help to transport a significant amount of heat across the current.

One suggestion the FRAM researchers are investigating is that the heat transport is related in a simple way to the drag on the Circumpolar Current caused by the same eddy field. Once across the main current, heat can be transported further south by the gyres in the Ross and Weddell seas. It is interesting to note that in the past when Drake Passage was closed Antarctica would have been a much warmer continent.

The South Atlantic sector covered by FRAM is of special interest because unlike the other major oceans of the world it is known to transport a large amount of heat towards the equator. Most of this is transported across the equator and raises the mean temperature of the North Atlantic. One hypothesis that has been put forward to explain this ability to export so much heat, is that part of it enters from the Indian Ocean in the form of the warm ocean eddies generated by the Agulhas Current. The model has successfully generated a succession of these eddies (Figure 2) and shows that they do indeed transport a ribbon of warm water westwards into the South Atlantic. At present a new eddy is being formed about every 160 model days.

The other major western boundary currents in the model, the East Australian and the Brazil currents, are also realistically reproduced. This is an unexpected bonus because the currents have their source in the open boundary region which connects the model to the oceans to the north. As the influence of the other oceans can only be represented approximately by the model, large errors were expected. The FRAM model uses a new open boundary scheme developed by Dr David Stevens of the University of East Anglia, which is being shown to be very effective.

The FRAM group is also using the model to study the formation, mixing and transport of different water types by the Circumpolar Current. The largest mass of water entering the region is North Atlantic Deep Water, which is transported and mixed by the Circumpolar Current into the other major ocean basins. The other important water mass is Antarctic Bottom Water, formed in the shallow seas around Antarctica. It sinks first into the deep ocean basins surrounding the continent and is then transported by the Circumpolar Current into the other major ocean basins. Both North Atlantic Deep Water and Antarctic Bottom Water are involved in the long term cycle of carbon dioxide in the oceans.

Finally the FRAM group is using the model of the sea ice to study the Southern Ocean. Antarctica is encircled by a barrier of pack ice, with an area which may vary from less than $5 \times 10^6$ km$^2$ in summer to over $20 \times 10^6$ km$^2$ in winter. During the winter months the pack ice prevents the cooling of the ocean and the warming of the atmosphere above it. As it melts in spring it forms a shallow stratified layer at the ocean surface which is ideal for the growth of plankton. This produces a period of very large biological production and is responsible for much of the rich marine life found around Antarctica. The group is incorporating a sea ice model into FRAM and will use it to study the growth and movement of the pack ice field and its effect on the ocean circulation and structure.

**Progress with FRAM**

In planning the FRAM project, it was assumed that the model would take ten to twenty model years for a realistic eddy field to develop and that a further ten years would be needed to build up statistics on the momentum, heat and other fluxes. The main run started in the spring of 1989 and after a year (when this article was being written) had reached year ten.

During the early part of the run the FRAM model could only use one of the Cray's four processors. Given the other demands on the system this gave us about 30 hours computing each week. A multiprocessor version of the model is now running and this should increase the throughput each week by a factor of two to three.

Research using the model output is being carried out by eleven principal investigators and nine students and assistants funded under a NERC Special Topic. Individual projects include the study of the eddy field of the Southern Ocean, flow over topography, frontal dynamics, water mass transformation in deep winter convection and sea ice modelling. A small core team based at IOSDL is responsible for the day to day running of the model and helps in the development of analysis software.

Although the main run is not yet completed, the FRAM model is already having an impact on the international oceanographic community. One of the major programs planned for the next decade is WOCE, the World Ocean Circulation Experiment. A large part of this program is devoted to the experimental study of the Southern Ocean. The early results from the FRAM model have therefore been of special interest to the experimentalists who are planning research in the region. The results are being used for the detailed planning of some of the research cruises and they are also being used to identify areas where there remain important problems to be solved.

**The Future**

The results from FRAM and the other U.S. and West German eddy resolving models show that such models produce very realistic representations of the ocean circulation. There are still some problems, for example deep convection in the North Atlantic and the Weddell Sea is not being represented well, but for many problems and especially for climate prediction they are much better than the present coarse resolution models. Their drawback is that they are expensive in computer resources, much too expensive for regular research projects using the current generation of computers. It has been estimated that a forty year run of a global model with a suitable fine resolution grid requires $10^{17}$ computer instructions. Present day computers would take 1000 days for just one such run. However, by the end of the decade multi-processor computers should be available which will cut the time to just a few days.

Schemes are also being developed to include chemical and biological processes in the models and to assimilate many of the satellite data which are now becoming available. The satellite data contain a lot of information on sea surface features but in order to learn about the deep circulation numerical models have to be used to combine it with the *in situ* measurements made by WOCE and other experiments. In the next few years the computer power available will increase by a factor of three to five. This is insufficient for a climate research program using eddy resolving models. When planning a project to follow FRAM we are therefore giving priority to the analysis and improvement of present models. When the very fast computers do become available we will be ready to make good use of them.

**A quick look at the results**

SUN[1] graphics work stations are used to browse the very large datasets produced by the FRAM model. Standard plotting packages were found to be too slow at plotting the 160,000 variables at each model level for regular use. New software which emphasises speed of plotting has therefore been developed. This was used to produce Figures 1, 2 and 3. Other software has been developed to send compressed data sets across the JANET[2] network. As it is impractical to send datasets containing the full 20 million model variables over the network, a selected subset is sent back each night from the Cray to the graphic workstations for rapid plotting. This scheme has been very successful for following the development of the model and for rapidly identifying any problems that arise.

All the six major groups involved in FRAM now have access to a similar workstation. Further analysis of the results is carried out using programs running on either the Cray or the workstations. For the workstations data is stored on small Exabyte cassette tapes. Each of these can contain two Gbytes of information, enough for 20 complete models.

1. SUN = Stanford University Network. 2. JANET = Joint Academic Network.

# Basking Sharks

(Marine Conservation Society)

The Basking Shark (*Cetorhinus maximus*) is the second largest fish in the world, reaching lengths of over 11 metres. (The largest fish is the Indo-Pacific Whale Shark). They appear in northern European waters during the spring and early summer, but they are believed to 'hibernate' during the winter in deeper water. Their common name comes from from their habit of 'basking' at or near the surface of the sea on warm sunny days, when they feed on dense patches of plankton, a drifting collection of tiny animals and plants that forms their primary food source. Basking Sharks can occasionally be seen from cliff-tops or boats, and are easily recognizable by the distinctive 'double fin' arrangement of the high dorsal fin and tail. In some years, few are encountered, in others, shoals of several dozen may congregate in plankton-rich waters. Reports indicate a general decline in numbers of Basking Sharks in recent years and research is vital to establish whether such a decline is taking place and why.

Basking Sharks have small teeth, about 5 mm high, but they feed entirely on the small, surface-floating plankton. They sieve the plankton through their gill rakers. A 7-m shark can filter up to 330,000 gallons per hour. Muscles attached to the base of the rakers make them stand erect when the fish opens its mouth, so that they stick out between the gill arches, forming a fine sieve through which the water passes. The plankton is caught in mucus which is squeezed into the mouth when the jaws are closed. In a large adult, the stomach can contain up to half a ton of plankton. Oil is produced during digestion and is stored in the liver which makes up between 18 per cent and 25 per cent of the body weight of the shark, of which up to 75 per cent is oil. It is this oil that accounts for the commercial interest in the fish.

Basking Sharks have been fished for centuries in Europe and North America, supplying oil for lighting and tanning. They were caught either by hand-harpooning or netting. These local fisheries finished because of a falling market for the oil and, possibly, a decline in stocks. Recent well-documented fisheries include those at Achill Island in Co. Mayo, Ireland and the Scottish fisheries based in the Inner Hebrides and the Firth of Clyde. The latter has been revived recently and is operating seasonally from a single boat. Norwegian whaling ships catch Basking Sharks out of the whaling season, and a new Portuguese deep-water shark fishing industry, again for liver oil, may be taking Basking Sharks as an incidental catch. The incidental catch of sharks during drift netting operations, both legal and illegal, round European coasts adds an unknown number of sharks killed each year. No precise figures exist for this incidental catch, but discussions with fishermen indicate that the mortality figures could run into the hundreds in some years.

The liver oil, squalene, is used as an additive in the manufacture of hydraulic oil for high-altitude aircraft, and for cosmetics. In Japan, and in many health shops throughout the United Kingdom and Europe, shark oil pills are used as a 'cure-all' medicant. The fins are cut off, and exported to the Far East. Little else of the shark is used, though a market is being developed in the United Kingdom for the meat.

In 1987, the Portuguese established a deep-water shark fishing industry. There is more squalene in the livers of deep-water sharks, which increases with each species in proportion to the depth at which the sharks swim. The Basking Shark is a mid-water shark, and its liver contains less squalene than deep-water sharks. Until recently, Basking Shark livers were valued at £1,100 per tonne, but this has fallen to £400 since the Portuguese industry started.

An experimental programme under way in Norway suggests that shark-liver oil may contain anti-carcinogens. One of its ingredients is *alkysoksylglycerol*, which is said to strengthen the immune system of the shark. Sharks are believed to be the only living creatures never to develop cancer. The oil is currently being tested for other medical applications.

Unfortunately, though a number of uses for the shark products are developing, and the fishery may be coming more popular, we know little about the biology and the behaviour of the Basking Shark. We do not know how many there are, or where they go in the autumn. Even during spring and summer, when they are visible, we do not know whether they form local populations, or whether they continue to migrate northwards along the European coastline. If they form local populations, over-fishing may render them extinct in that area.

The majority of Basking Sharks caught in European waters are female, but in North America, incidentally caught Basking Sharks are mostly male. The differences are a mystery; but it is possible that there could be a pan-Atlantic migration. We simply do not know. We know very little about how often they breed, how long gestation takes, and how many sharks are born. We certainly know far too little to undertake any sort of commercial fishery and, until we are aware of what current stocks are, and how they can be managed without threat to the species in European waters, there should be no further fishery. The same holds true for the deep-water sharks, of which even less is known.

At the moment, there is a European Community quota of 400 tonnes of shark livers to which both the Norwegian and United Kingdom fisheries adhere. But because of the lack of information on Basking Sharks, and the unknown

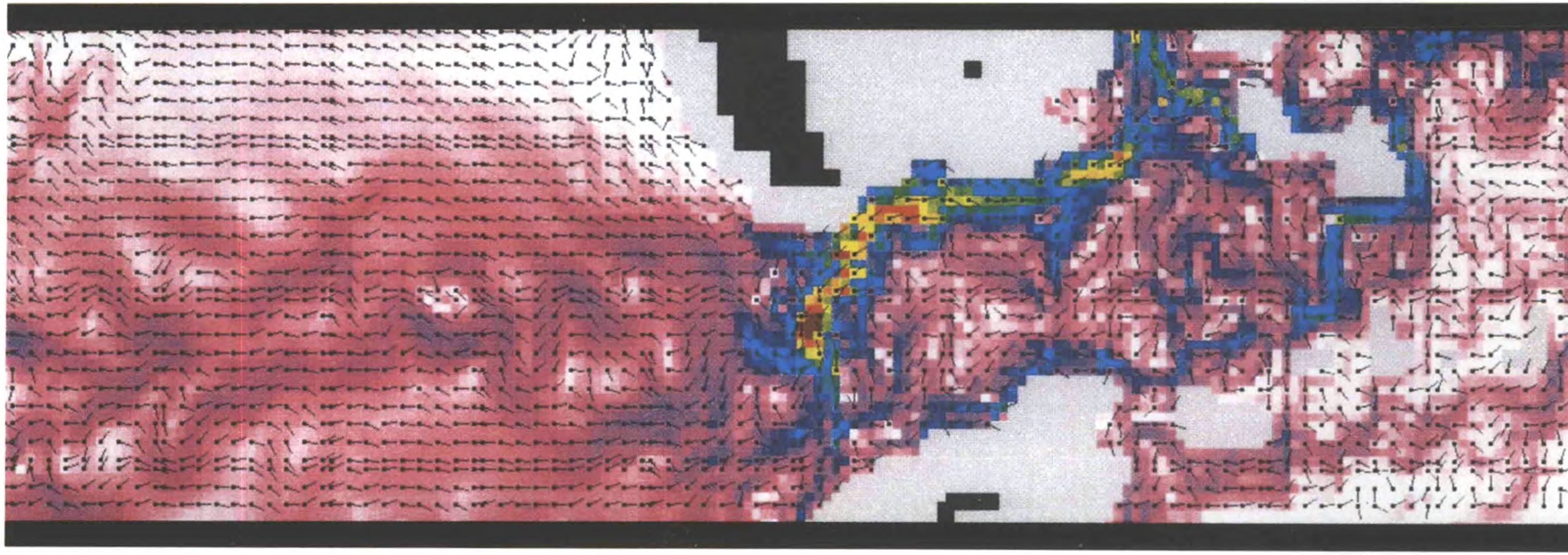


Figure 3. Current velocities at a depth of 210 m in the Drake Passage sector of the FRAM model at the end of the first six years of the run. Colour gives the current speed, the arrow indicates direction. Here, as elsewhere, the model shows that currents in the Southern Ocean are often organised into narrow jets.

**THE FINE RESOLUTION ANTARCTIC MODEL. (See page 79.)**


*Photo. L. Bianco*

Participants at the final meeting of the North Atlantic Ocean Stations Board at Geneva, 22–23 August 1990. Standing, left to right: Mr N. Vassalli di Dachenhausen (Italy); Mr B. Kamp (Netherlands, observer); Mr M. Klöppel (Germany); Dr Z.K. Abouziarov (U.S.S.R.); Mr G. Cartwright (U.S.A., observer); Mr C. Belandia (Spain, observer); Mr H. McCombie (WMO Secretariat). Seated, left to right: Col. F. Falcone (Italy); Dr T. Mohr (Germany); Mr F.H. Sigurdsson (Iceland); Dr E.A. Sobchenko (President of the Board, U.S.S.R.); Captain G.V. Mackie (Vice-President of the Board, U.K.); Ms L. Svendsen (Norway); Mr F. Singleton (U.K.); Dr B.P. Himich (U.S.S.R.). Absent: Mr S. Mildner (WMO Secretariat). (See opposite page.)

numbers caught in legal and illegal drift nets, we believe that the quota should be reduced to zero until sufficient research is carried out to establish the true status of the Basking Shark. This should be done before the largest fish in North Atlantic waters goes down the same track as the largest whales — the road to commercial extinction.

[Basking Shark Watch: The Marine Conservation Society's form for logging observations of Basking Sharks appears on page 96, and should be duplicated as necessary. Completed forms can be returned direct to The Marine Conservation Society at the address given on the form, or to any United Kingdom Port Met. Officer.]

## End of the Weather Ship Era in Sight

After more than forty years of North Atlantic Ocean Weather Ship (OWS) operations, the end of an era is in sight. Due to the withdrawal of funds by contributing countries over the past few years, OWS operations under the auspices of WMO's North Atlantic Ocean Stations (NAOS) Board ceased at the end of 1989. Funds from the contributing countries, which included not only the participating members, but also most other countries bordering the North Atlantic, and therefore benefiting from the derived data, were diverted to newer weather gathering systems: these resources were therefore not altogether lost to the meteorological community.

It was in 1946 that the forerunner of the World Meteorological Organization, the International Meteorological Organization (IMO), recommended the establishment of stationary meteorological ships in certain areas. This resolution was confirmed by the International Civil Aviation Organization and as a result a total of 13 stations were established in the North Atlantic in July 1947. Seven of these stations were manned by the United States, two by the United Kingdom and one each by France, Norway jointly with Sweden and U.K., Holland and Belgium jointly, and Canada and U.S.A. jointly. The stations were spread across the North Atlantic from 37° N to 66° N and 2° E to 69° W. The main purposes of weather ships were to collect and transmit meteorological and oceanographical observations, to provide search and rescue facilities for shipping in distress and, in particular, navigational aids to aircraft in flight at a time when rapid expansion of the civil aircraft services was expected. Over the next few decades the number of stations was progressively reduced and manning patterns altered as the resources and needs of the various participants changed. By 1989 only three stations remained, manned by the United Kingdom, Norway and the U.S.S.R.

At the outset the U.K. employed four ex-Naval corvettes of the 'Flower' class as Ocean Weather Ships. Between 1958 and 1961 these were replaced by larger frigates, formerly of the 'Castle' class, based at a new berth in Greenock. By 1974 the United States had withdrawn all their weather ships as the need for aircraft monitoring facilities was much reduced due to more reliable aircraft and navigation systems and route diversification. In 1976 the U.K. commitment was reduced to two refurbished ex-frigates, which were renamed *Admiral FitzRoy* and *Admiral Beaufort*, thus perpetuating the memory of of the Naval Officers who established the Met. Office and the Beaufort Scale of wind force respectively. In 1982 these two ships were replaced by a single ship, the ex-trawler

*Starella*, manned by her owners J. Marr & Son, operating at station 'Lima' in position 57° N, 20° W, alternately with the Netherlands OWS *Cumulus*. Four years later the U.K. assumed full responsibility of manning the station with *Cumulus* only, having nominally purchased that ship from the Royal Netherlands Met. Institute, on the understanding that she be handed back when no longer required.

At the final meeting of the NAOS Board in August 1990, members of the contracting countries met to wind up the Board's affairs, decide on future action and destination of the balance of funds. In the immediate future, the U.K. and Norway decided to continue national OWS operations, based mainly on the original NAOS stations, whilst the U.S.S.R. was continuing with general research, including meteorological and oceanographical work, on and around station 'Charlie' in 52° 45'N, 35° 30'W. Norway's Ocean Station Vessel *Polarfront* will also be carrying out hydrographic and oceanographic programmes around the area of station 'Mike' in 66° N, 2° E, but keeping up the general observations on the station, though less often, and subject to annual review of the whole operation. *Cumulus* is expected to continue operating only until the end of 1992.

The Headquarters building of WMO in Geneva, where the final NAOS Board was convened, was inaugurated on 12 July 1960. Before this date, the Organization had invited all those Members who so wished to send gifts to headquarters, not only to help furnish and decorate the building, but also to give the interior an international character, as a reminder to staff and visitors alike that the Organization exists to serve all its Member countries in all parts of the globe. The response to this invitation was very gratifying and no less than 43 countries made contributions of various kinds to the interior of the building — some useful, some decorative, and many both. Not only have these gifts greatly improved the interior of the building but they demonstrate the Members' support for and goodwill towards the Organization which has for so long been a feature of international meteorology.

In the photograph opposite page 85, showing the participants at the final NAOS Board held in the building's main conference room, part of the gift presented by Belgium can be seen in the background, although the illustration does not do full justice to the beauty of the work. The tapestry, measuring 7 m × 4 m, depicts the four seasons of the year and was specially designed by Mr J. Ransi, Professor in the Brussels Academy of Arts.

## SPECIAL LONG-SERVICE AWARDS

Four presentation barographs enhanced with shining plates inscribed with their names, even now await presentation to the four shipmasters nominated to receive these awards, for their long and painstaking service to weather recording up to the end of 1989. Needing 18 or more observing years to their credit to be nominated, the following duly arrived at the head of the short list, to be chosen by the Chief Executive to receive their awards at Bracknell Headquarters:

CAPTAIN DOUGLAS C. BLACKMAN, P. & O. Containers Limited.
CAPTAIN DAVIS N. BOON, Geest Line Limited.
CAPTAIN AUSTIN J. CHIVERS, MNI, Blue Star Ship Management Limited.
CAPTAIN HUGH K. DYER, Blue Star Ship Management Limited.

Our congratulations go to these intrepid observers, who follow in a long line of recipients, since the Director of the Met. Office inaugurated these special long-service awards in 1948.

Captain Blackman submitted weather data during 22 observing years, when he provided 39 meteorological logbooks, 21 of them marked 'Excellent', and has recieved two Excellent Awards. His first log came from N.Z.S. Company's *Paparui* in February 1952.

Since Captain Boon's first log was received from Elders & Fyffes *Golfito* in March 1952, there were only four years when we received no records from him, making 34 observing years and a total of 95 logs received, 10 of them assessed 'Excellent'. He has received Excellent Awards on three occasions, and his retirement was recorded in the October 1990 edition.

Captain Chivers contributed 60 logs in 26 years of observing, 23 of these logs being 'Excellent': he also received 7 Excellent Awards. His first log was sent from Blue Star's *Patagonia Star* in June 1955.

Captain. Dyer's perseverance during 29 years of observing resulted in the compilation of 68 logs, 14 of these being 'Excellent', and the receipt of an Excellent Award. His first records came from the *Columbia Star* in August 1951.

The presentation ceremony was due to take place at about the same time as this edition of our journal is published, and further details will be forthcoming in a later issue.

## AURORA NOTES APRIL TO JUNE 1990

By R.J. Livesey

(Director of the Aurora Section of the British Astronomical Association)

In Table 1 are listed the observations received from ships for the period under review, the lack of numbers being compensated for by their content. The report

**Table 1 — Marine Aurora Observations April to June 1990**

| Date | Ship | Geographic Position | Time (GMT) | Forms in Sequence |
|---|---|---|---|---|
| 17/18 Apr. | *Strathconon* | 48° 20'N, 123° 11'W | 0850 | aRB |
| 19/20 | *Vigilant* | 57° 00'N, 07° 12'W | 2300–0100 | G.G+$m_2$RR.$p_1$RR |
| 20/21 | *Vigilant* | 58° 00'N, 09° 31'W | 0005 | G.RB.pRR |
| 29/30 | *Mahsuri* | 45° 44'S, 171° 02'E | 1100–1200 | G.a$p_1$m$R_2$R.mPG. m$R_1$R.m$R_1$R |
| 30 Apr/ 1 May | *Mahsuri* | 45° 00'S, 60° 30'W | 1120 | RA |
| 21/22 | *Falklands Protector* | 48° 20'S, 60° 30'W | 0230–0730 | G.QHA |

KEY: a = active, m,$m_2$ = multiple (2 forms), $p_1$ = flaming, G = glow, HA = homogeneous arc, Q = quiet, RA = rayed arc, RB = rayed band, RR = ray structure, $R_1$R = short rays, $R_2$R = medium rays.

from f.p.v. *Vigilant* was accompanied by a photograph by Mr M.P. Donnelly, 2nd Officer, which showed that the camera had appeared to move, possibly with the motion of the ship, and the width of the auroral rays had been spread out sideways. However, the camera motion had been recorded by the trailing of distant lights across the negative and gave a clue as to how to interpret the photograph. I can only encourage readers to have a go with their cameras.

The report of 29/30 April from the *Mahsuri* (a Selected Ship of the Australian Voluntary Observing Fleet) in the Southern Hemisphere included a bright, active group of rays that appeared for between only 30–60 seconds. This aurora was amply confirmed by observers in South Island, New Zealand. The aurora observed by f.p.v. *Falklands Protector* on 21/22 May was thought to be perhaps the loom of squid boats and their lights lying below the horizon, but again the observers of the Royal New Zealand Astronomical Society Aurora Section were able to confirm auroral activity that night. The report from the *Mahsuri* for 30 April/1 May is likewise confirmed. As this society now correlates all Southern Hemisphere auroral observations, I automatically pass on copies of appropriate marine observations to them and they copy data to me in return.

In the Northern Hemisphere. the aurora was particularly active from 10/11 April to 20/21 and 28/29 April to 30 April/1 May. Activity in May and June was not particularly marked although the dates 9/10 May, 22/23 and 25/26 together with 6/7 June and 12/13 were aurora nights. The aurora of 12/13 June was not reported by any United Kingdom observers but was seen in Denmark, Novia Scotia and North Dakota. British magnetometers recorded an active magnetic storm with three sudden storm commencements between 12 June and 14 June sufficient to generate a good aurora, so it is surprising that little was seen. The period 10 April to the 21st was magnetically very active with three sudden storm commencements, two active storms and a long period of highly disturbed field conditions, the cause of the April aurorae. On 20 June the magnetic field went down to virtually zero disturbance. When the field does reach zero disturbance, on occasion even the the polar auroral oval may fade and practically disappear.

As a result of the aurora report for July to September 1989 in which the correlation between aurorae observed in North Dakota by Jay Brausch was made with reports from the same corrected geomagnetic latitude at Fair Isle, Dave Wheeler, who operates a synoptic meteorological station on Fair Isle sent in his auroral statistics collected since 1974. Excluding auroral glows that might amount to between 20 and 30 apparitions per annum, 396 aurorae were recorded between 1974 and 1989; there was a maximum of 62 event nights in 1989 and a minimum of 7 in 1976. This latter figure is of considerable interest for the British Astronomical Association records showed an unusually low count of aurorae that year. At the time it was thought that the low value in 1976 related to the run-down of the old Balfour Stewart Laboratory observing network and the development of the new, BAA network. The Fair Isle data suggests that this auroral minimum was real and not an artifact. If any other reader of this article can substantiate this minimum from observations at another observatory I would be pleased to receive a copy of the records.

Calculations made by Dave Wheeler from his cloud statistics show that on average, he might have seen 3.5 times as many active aurorae given clear skies all year round. Ignoring unreported glows, this gives a total of 1351 auroral event nights in 16 years. From the BAA records it is estimated that there could have been at least 1600 event nights in the period, give or take some errors owing to the lower number of observers in northern Great Britain in the earlier years of the period. For the period 1976 to 1989, the BAA records show that about 33 per cent of all event nights reported comprised quiet aurora showing only as glows or arcs without rays or activity. If 17 per cent of these were glows only, then calculations can be made which give the total number of auroral nights for Fair Isle as 1627. Considering the difficulties in auroral observations with few observers and problems with cloud, this would appear to be a fair comparison between the BAA and Fair Isle data.

Low cloud is the enemy of the auroral observer; Dave Wheeler has calculated that he may see only about 28 per cent of the aurorae due to cloud cover. Data from United States Air Force sources suggest that the probability of having a clear sky sight line at Fair Isle with an altitude of 10° above the horizon may be in the order of 25 per cent, and at 30° about 35 per cent. For overhead aurora, the cloud clear percentage is in the order of 42 per cent. Thus, the closer to the horizon that the aurora is the less likely it is to be detected. Estimates from the United Kingdom Met. Office records suggest that cloud cover at Fair Isle may amount to 0–2 oktas for 17 per cent of the time, 3–6 oktas for 23 per cent and 7–8 oktas for 60 per cent.

For comparison, sight line cloud statistics for Jay Brausch's location are estimated to be of the following order: at 10° altitude 53 per cent, at 30° altitude 57 per cent, and at 90° (overhead) 63 per cent. An elementary analysis seems to suggest that there is a correlation between the aurorae recorded by Jay Brausch and Dave Wheeler at the same geomagnetic latitude that has some relationship to the degree of cloud cover experienced. It is not often that there is the opportunity to be able to compare data from two observatories, on opposite sides of the Atlantic, so ideally placed at the same magnetic latitude.

Dr David Gavine has been processing the observations of noctilucent clouds (NLC) made in 1990. So far, observations have been received from 41 individuals and eight meteorological offices in the United Kingdom, 11 Dutch meteorological offices, four individuals in Denmark, one in Belgium and one in Eire. The Finns have correlated observations made by themselves and the Estonians, and there is a separate group of observers in Canada. Unfortunately, New Zealand is too far north to see the southern NLC. In Table 2 are the dates of the evenings preceding a night of NLC observations. Those in italics are the nights upon which NLC were visible from the Midlands southwards, in Belgium or in The Netherlands.

**Table 2 — Observations of NLC in 1990**

| Month | Dates | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| May | 5 | 7 | 9 | *14* | 20 | 21 | *26* | 30 | | | | | | | | | | | |
| June | 4 | *5* | 9 | 10 | 13 | 14 | 15 | 16 | 17 | *18* | 20 | 21 | *22* | 23 | 25 | 26 | *27* | 29 | *30* |
| July | 1 | *2* | *3* | 4 | 6 | 7 | 9 | 10 | 12 | *13* | 14 | 15 | *16* | 17 | 19 | 20 | 25 | *31* | |
| Aug | 3 | | | | | | | | | | | | | | | | | | |

The general opinion is that it was a quiet year for NLC. Dr Gadsden, of Aberdeen University, has analysed observations over a period of years and has come to the conclusion that there is a secular increase in the frequency of NLC modulated by a rise in activity related to sunspot minimum and a fall related to sunspot maximum. We have just passed sunspot maximum in 1989 and this may have had an effect on the NLC activity in 1990. A secular increase in the frequency of NLC in the Northern Hemisphere would suggest that the high atmosphere at the mesopause, at an altitude of around 83 km in summer, is progressively becoming colder or that there is more moisture to condense. At the level of NLC, temperatures are as low as −130° to −160 °C and the barometric pressure is one hundred-thousandth of the sea-level value. There are many things yet to be found out about NLC, and observations of this phenomenon are in great demand. For example, the aurora adds heat to the upper atmosphere and NLC requires cold conditions to form, and yet both have been observed to occur together.

## LETTERS TO THE EDITOR

### Tidal Streams by Computer

Today personal computers are fast becoming part of the normal equipment aboard ships. However, a number of shipboard calculations are still time consuming and prone to human errors. To state a point, the calculations involving Tides and Tidal Streams for Secondary Ports where only Harmonic Constants apply, is still a tedious procedure.

The 'Simplified Harmonic Method, NP 159' though simple, is still very time consuming and prone to human errors. Thus more time is spent in obtaining the data than in making use of them, and the required data are not obtainable as quickly as would be necessary in an emergency situation.

I therefore present a computer program in BASIC language which is small and effective. I have tested the results on numerous occasions and have found the results to be acceptable, but I ask you to perform your own tests or checks and change or edit the program as required. I agree to this program being published in your journal should you deem it fit, and I attach no copyright.

Any comments or improvements from readers are also welcome. I am sure that, with tidal heights and tidal streams at secondary ports made easier, more valuable data will be obtainable from remote places, thus making for safer seas.

Mr Neville F. Printer, Chief Officer, *Merchant Pioneer*, V-Ships (U.K.) Ltd.

Thanks to Mr Printer for his ingenious program for calculating secondary port tides. Limitations of space do not allow us to print his program and worked example in full but any reader interested in receiving copies of this work may apply to the Editor. The program has been slightly modified by our Products Development Branch in respect of one suspected error and a dubious assumption.

# Personalities

(Readers are invited to notify the Editor of Observing Officers retiring from the Navigating or Radio Departments.)

OBITUARY — CAPTAIN A.C. BENNELL, Master of the Cunard liner *Queen Elizabeth 2* from August 1987 until the onset of cancer compelled him to give up his command early last year, died on 19 September 1990, aged 58.

Alan Charles Bennell was born at Wallington, Surrey, on 26 September 1931, and after school underwent pre-sea training at H.M.S. *Conway* before joining Shell Tankers as a Deck Cadet. Following six years in general cargo ships, in 1957 he obtained his Master's Certificate and joined the Cunard Company. In the same year he also sent from *Scythia* the first of his 12 meteorological logbooks, three of these being assessed as Excellent. His ships were doubtless recruited by other countries to carry on weather observing during his 30 years service in many of the famous Cunarders sailing in other regions: but he returned to the U.K. Voluntary Observing Fleet with co-operation from the QE2 in the form of six logs during his last two years at sea.

Captain Alan Bennell was known to say that the position of Master of a luxury cruise liner nowadays was as much that of a host and PR man as of a professional mariner, and there is little doubt that he possessed all the right professional skills, though he was always modest in talking about them. Amongst his managerial and entertainment skills, which he genuinely enjoyed, he would give impromptu recitals on the ship's grand piano, but he also nursed deep emotions about being in charge of such a prestigious ship.

The funeral service was held at Bournemouth Crematorium on 27 September last, followed a fortnight later by a Memorial Service at the Missions to Seamen Chapel. Both ceremonies were well attended by his colleagues and friends. His ashes were committed to the deep from *Queen Elizabeth 2* in mid-Atlantic on 17 October 1990. He leaves his widow, Sheila, and a daughter, and we offer our sincere condolences.

RETIREMENT — It was not until the retirement presentation to his Fleet Marine Manager, Captain J.R.G. (Dick) Hannah, at Beagle House in November last, that we heard from CAPTAIN J.K. BLACKBURN of his premature retirement due to ill health in December 1989.

John Kinsgwell Blackburn was born in North Shields in January 1932 and educated at Fettes College, Edinburgh. He was apprenticed to the P. & O. S.N. Company from 1948 to 1952, his first ship being m.v. *Soudan*, which he joined in August 1948. We received his first meteorological logbook from P. & O.'s *Socotra* in May 1952 and in his 23 observing years, Captain Blackburn provided a total of 50 logs, 20 of which were 'Excellent'. He received Excellent Awards on ten occasions during his time in command of container ships.

John Blackburn was awarded his Master's Certificate in London in December 1958; in 1967 he was standing by the building of the first of the three 'Superstraths' in Japan, later sailing as Chief Officer in the ship. After standing by *Flinders Bay* and *Discovery Bay*, two of the earliest Container Fleets ships, during their construction at Hamburg in 1968 and 1969, he transferred to Overseas Containers in 1969 and a year later, was promoted to command *Botany Bay*. He went on to command all of the six original Bay ships as well as many of the second generation, including *Osaka Bay* for most of his last seven years at sea.

Captain Blackburn tells us that he came from the Tyneside seafaring families of the Kemps and the Wards, is married with four children and lives in Hampshire. We wish him happiness and peace in retirement.

RETIREMENT — CAPTAIN D.C. BLACKMAN retired recently after serving 43 years in ships of the P. & O. Group of companies.

Douglas Charles Blackman was born in Sydney, N.S.W., in November 1929 and educated at Sydney Boys High School. He joined New Zealand Shipping Company's Training Ship *Durham* in April 1947 as an indentured apprentice. He obtained his Masters' Certificate in July 1956; promotion to command came in August 1963 when he was appointed to N.Z.S. Co.'s *Wharanui*, travelling across the Atlantic as a passenger on R.M.S. *Queen Elizabeth* to join the ship at Todd's

Shipyard, Brooklyn. From 1964 until 1971 he was appointed to shore and relieving duties on attachment to the N.Z.S. office at Wellington. He remained with N.Z.S. until the restructuring of the P. & O. Group in 1971, when he was seconded to implement the new conditions of service for officers. He remained with P. & O. General Cargo Division until transferring to Overseas Containers in 1983, serving with that company, latterly P. & O. Containers, until his retirement.

Captain Blackman's 23 years of dedicated weather observing culminated with his nomination for a barograph award for his long service up to 1989, and the presentation was due to take place at Bracknell in the spring of this year. The relatively small figure of his logbook contribution, 36 in all, is explained by his shore appointments mentioned above, and the fact that he also served on voluntary observing ships recruited by the Australian Met. Service which operates independently of the U.K. scheme, although on very similar lines and with close co-operation. Sufficient to say that 60 per cent of the logs he presented to us were classed as 'Excellent' and he was given Excellent awards in 1986 and 1987.

Captain Blackman describes two weather-related incidents which happened to him, one relating to the rescue of 42 survivors and a dog from a derelict Cypriot ship in a North Atlantic storm in 1973, the other when a cargo hold was flooded following a collision with an uncharted submerged wreck in the China Sea in 1983. He says his father was at sea, training in H.M.S. *Warspite* and later serving in sail and steam, two of his uncles and a cousin also being seafarers.

Our thanks to Captain Blackman for his excellent voluntary assistance over the years, and may he enjoy the best of weather and health in retirement.

RETIREMENT — CAPTAIN J.D.THOMSON retired on 30 September 1990, his last command being P. & O. Containers' newest member of the fleet, *Oriental Bay*.

James Douglas Thomson was born in March 1935 and educated at Colchester Grammar School and The Royal Hospital School, Holbrook. He underwent pre-sea training at the School of Navigation, Warsash, Southampton, before joining N.Z.S/Federal Company's *Cornwall* in January 1953. He obtained his Master's Certificate in March 1962 and in July 1968 he transferred to Container Fleets, staying with the P. & O. Container company until he retired. His first command was *Botany Bay* in 1974.

Captain Thomson's first meteorological logbook came from the *Durham* in February 1956 and in his 25 years of carrying out voluntary weather observations, he provided a total of 51 logs, 33 of which were classed as Excellent. He received seven Excellent Awards, and in 1986 he was awarded a long-service barograph for his consistent efforts.

Captain Thomson's father spent the latter part of his varied seagoing career with Blue Star Line as relieving staff in the Royal Docks, London, until his death in 1974. We wish him health and happiness in retirement.

RETIREMENT — CAPTAIN G.J. TULLY has left the sea on appointment as Harbourmaster/Pilot at the port of Ramsgate, saying that this constitutes 'swallowing the anchor half way down'.

Geoffrey Tully was at sea with Bibby Bros, Bank Line and J. Marr & Son of Hull. His first log was received from Bibby Line's *Cheshire* in November 1960 and he went on to provide a total of 26 logs, eight of these being classed as 'Excellent'. He received Excellent Awards in 1963, 1984 and 1985.

Our grateful thanks to Captain Tully for keeping us in touch with his career progress, and we hope perhaps to have the benefit of his co-operation again one day in the future.

# Book Reviews

*Disasters at Sea* by Captain Richard A. Cahill. 160 mm × 240 mm, 272 pp., *illus.* Random Century Ltd, 20 Vauxhall Bridge Road, London SW1V 2SA. Price: £16.99.

The experienced seafarer and author of *Collisions and their Causes* and *Strandings and their Causes* has produced an original work which once again concentrates on the causes behind many spectacular sinkings, from the *Titanic* to the *Herald of Free Enterprise*. He brings out the interesting human factors which lead up to these momentous events and also looks in detail at the legal consequences and practical results of the impact of the disasters.

The book is divided into seven sections which include foundering, fire, explosion and collision, but, following a brief introduction, it begins with a chapter devoted to the most dramatic marine disaster of modern times, the loss of the *Titanic*. His story begins with some historical facts about the White Star Line, beginning some 17 years before the disaster itself. This attention to historical detail is the most redeeming factor of the book, all of which is very well written and documented. The sinking of the *Princess Victoria* in 1953, *European Gateway* in 1980 and *Flying Enterprise* in 1952 are some of the examples of Captain Cahill's graphic and carefully researched narratives. The loss of the sailing ship *Pamir* is sympathetically related, and incidents such as the *Lakonia* fire, the explosions on *Berge Istra*, *Berge Vanga* and *Betelgeuse* are not forgotten. Naturally the strandings include *Torrey Canyon*, *Amoco Cadiz* and *Exxon Valdez*, with expert summaries on the catastrophic decisions which led to these casualties.

Following his graduation from the United States Merchant Marine Academy, Captain Cahill spent forty years at sea and his experience is reflected in the minute way he dissects and discusses maritime disasters spanning three-quarters of a century. A technical annex and comprehensive index enable the reader to follow the subject matter with ease and attention, and it is a book to be recommended to anyone connected with or having an interest in the operation of seagoing craft, if only for the examples it highlights and attempts to pinpoint the follies that can be enacted by men at sea.

J.F.T.H.

*Fairplay World Shipping Directory 1990–1991.* 210 mm × 295 mm, 697 pp. Fairplay Information Systems Ltd (FISYS), P.O. Box 96, Coulsdon, Surrey CR5 2TE. Tel: 081-660 2811. Telex: 884595. Fax: 081-660 2824. Price: £45.00 for U.K. orders or £48.00/US$96.00 for overseas orders.

Launched in September 1990, this new directory is the result of major improvements made to its predecessor, the publisher's *World Shipping Yearbook* which has stood the test of time for 15 years. After extensive market research, Fairplay decided to produce an inexpensive but comprehensive maritime directory in A4 format instead of the smaller style previously published. Fairplay has succeeded in meeting these criteria admirably, with all sections of the directory revised and updated. All information has been garnered from the companies concerned and other sources, and the editor is anxious to be kept informed by readers of changes, thus continuing the relevance and value of information contained in the book. Such advice will be well employed, since FYSIS undoubtedly uses its considerable in-house databases to good effect.

The directory covers 15 sectors of the marine industry, from owners to Maritime Organisations, from P & I to Personnel index, and introducing new sections on Maritime Schools and Port Authorities, both having a useful part to play in such a directory. The directory is generally easy to use but, whilst advertisements are presumably necessary to subsidise production to a small extent, it still seems a mistake to intermingle these with introductory, contents and explanatory pages, which are thus time consuming to locate. Since each sector of the book is provided with black square indexing, there seems to be no reason why the introductory pages could not be similarly grouped together and so marked, making it simpler to find these pages. The remainder of the directory seems to live up to the publisher's claim that it is in user-friendly style.

J.F.T.H.

*On Course Together* by Canon Bill Down. 135 mm × 215 mm, 202 pp. The Canterbury Press Norwich, St Mary's Works, St Mary's Plain, Norwich, Norfolk NR3 3BH. Price: £8.95.

The retiring General Secretary of the Missions to Seamen describes his engaging book as a labour of love dedicated to Christians of all traditions, who joyfully and faithfully serve the Lord among the seafarers of the world. Bill Down's enthusiasm for and dedication to the maritime ministry becomes a tribute to the kindness, friendship and fellowship of those whose mission is to offer guidance and help to seafarers everywhere. His work is a full description of life at sea, past and present, together with an account of the early Christian ministry to seafarers, from 1800 to the present day. It includes an analysis of the shipping industry and world trade in the late 1980s, which in itself is of much interest. His own experiences as port chaplain in South Shields, Hull and Fremantle, and for brief spells in emergencies in Belfast and London, serve as good examples of his close involvement with those at sea.

Canon Down set out to paint a picture of seafaring in the past and now, aiming to put the maritime ministry of the Churches in perspective by sketching the main events and factors which have influenced its development in the last 200 years and analysing the shipping scene. All this he has achieved in a very imaginative way, from the beginnings of organised ministry to seafarers in the early nineteenth century, to a review of some of the 940 ports where 1300 'Missions' are now established. It is surprising how much history, information and good advice can be packed into a book of this sort, all written with a genuine humility which makes it all the more readable. It is a most enjoyable account of the Church's ministry at sea as well as being about the Christian ministry in general.

# Notices to Marine Observers

## COMMISSIONING OF AUSTRALIAN INMARSAT COAST EARTH STATIONS

INMARSAT Earth Stations have recently been commissioned in Perth, Western Australia. These stations service both the Indian and Pacific Oceans, and can relay traffic to and from ships possessing either INMARSAT Standard 'A' or INMARSAT Standard 'C' Ship Earth Stations (SES).

Ship weather observations may now be telexed using INMARSAT, at no cost to themselves, providing they use the INMARSAT Service Code 41+ (if they have a Standard 'A' SES), or telex number 71154707 (if they have a Standard 'C' SES). The report will then be relayed directly to the Bureau's message switching computer.

The Bureau is interested in receiving any ship weather reports from vessels operating south of the Equator, between longitude 60° E and 120° W.

When preparing the report for transmission, Radio Officers are asked to insert the surface synoptic code BBXX between the ship's name and call sign, and to append the Bureau's end of message terminator NNNN after the coded message, e.g:

M/v ANYSHIP
BBXX GBOB 1700499397 7262910145 5202071528 875/122253 =
NNNN

Use of this format will ensure that the report is automatically processed by the Bureau's computer and relayed onto its domestic and international communications circuits without delay.

In order to keep INMARSAT costs down, it is requested that reports be prepared 'off line', and that the telex call is closed down immediately after the message has been transmitted.

The Bureau will also be broadcasting High Seas forecasts and warnings via the INMARSAT Standard 'C' Enhanced Group Calling facility, which will be automatically intercepted by any vessel possessing a Standard 'C' SES, and which is operating within the area of broadcast coverage.

## *MARID* REPORTING VESSELS

Further to the notice in the January 1990 number, many MARID vessels providing the important coastal sea temperature reports from North Sea and Near Continental waters, are still omitting to prefix reports with their call signs. Without this prefix their data transmitted via Portishead are usually lost. Examples of the coded formats follow:

When in the North Sea
D....D MARID $GGL_aL_aL_a$ $L_oL_oL_oT_sT_s$ Nddff VVwwW

When outside the North Sea
D....D MARID $GGL_aL_aL_a$ $L_oL_oL_oT_sT_s$

D....D represents the ship's call sign. All ships recruited to this discipline are earnestly asked to send in MARID reports whenever practicable.

## BASKING SHARK WATCH (See page 83.)

**Please fill in this form as best you can. Do not worry if you cannot answer all the questions. Any information at all will be useful. Please complete in black ink.**

Name: ........................................ Telephone: ........................................

Address: ..........................................................................................................

..........................................................................................................................

Date and time of observation: ............................ UTC: ............................

Number of sharks: ........... How long were they in the area?: ...........................

Did any have buoys attached?: ..... How many of them?: ..... Buoy colour? ...........

Letters/numbers on buoys (if visible): ........................................................

Observed from (delete as applicable): Sea/Land Vessel type: m.v./yacht/inflatable.

Location: ..........................................................................................................

Grid reference: .................................... Lat: ............... Long: ..............

Approximate size of sharks (Please put numbers to each size):

2 m or less .... 2–4 m .... 4–6 m .... 6–8 m .... over 8 m .... other estimate ..............

If there was more than one shark, were they all behaving in the same way? ..............

..........................................................................................................................

What were the sharks doing?: Leaping ........ Feeding ........ Swimming .......

Approximately how fast were they moving?: ............ In which direction: ...........

Weather conditions: ................................................ Temps: ..................

Any other large marine creatures in the area?: ..................................................

Other comments: ............................................................................................

..........................................................................................................................

Where did you hear about this survey?: ........................................................

Do you want more forms? Yes/No

THANK YOU FOR HELPING.

Return form to:

The Marine Conservation Society,
9 Gloucester Road,
Ross-on-Wye,
Herefordshire HR9 5BU.

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