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A quarterly journal of Maritime Meteorology

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THE MARINE OBSERVER

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

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Report of Work for 1980

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

1. Voluntary Observing Ships

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

(*a*) 456 Selected Ships, including trawlers, which are supplied with a full set of meteorological instruments on loan and which make observations in code every 6 hours and transmit them to the appropriate coastal radio station wherever their voyages take them.

(*b*) 22 Supplementary Ships, including trawlers, which make less-detailed observations than Selected Ships and are supplied on loan with only a barometer, air thermometer and screen. They use an abbreviated code for their messages.

(*c*) 49 Coasting ('Marid') vessels which make sea-surface temperature observations in UK coastal waters and transmit them in a special code by W/T or R/T. When in the North Sea, the coasting ships include in their messages wind, weather and visibility observations.

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

(*e*) 1 Trawler which makes non-instrumental observations only and transmits them by W/T or R/T, using an abbreviated code, to radio stations in the UK, Canada, Iceland, Norway or USSR depending on the area in which she is fishing.

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

As the oceans occupy three-quarters of the world's surface, the value of regular weather observations from oceanic areas is obvious, both for forecasting in this country and for climatological purposes. With the exception of HM ships, Ocean Weather Ships and research vessels, surface observations from the oceans are provided by the masters and officers of merchant ships and the organization for obtaining them has been the responsibility of the Marine Division since 1855. The vessels from which these observations are obtained form the Voluntary Observing Fleet (VOF) and the ships vary from passenger liners, general cargo ships and super-tankers to coastal traders and trawlers.

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

Europe	97	West Indies	12
Australasia	20	South America	10
Far East	27	Pacific coast of North America	7
Persian Gulf	28	Falkland Islands and Antarctic	2
South Africa	11	World-wide trading	194
West Africa	14	Near and distant-water fishing grounds	4
North Atlantic	52		

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

Despite the continued depressed state of the British shipping and fishing industries the strength of the VOF has been maintained during the year. This is largely due to the efforts of the 7 Port Meteorological Officers established at London, Liverpool, Southampton, Hull, Newcastle, Cardiff and Glasgow who recruit vessels into the VOF. Most of the older vessels of the British Merchant Navy have now been replaced by larger and faster ships which spend considerably less time in port and thus are at sea for a greater proportion of the year. As a result, the number of observations received continues to increase.

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

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

	1979	1980
Direct reception from:		
British ships	157	182
Foreign ships	106	97
Rigs, Platforms, Buoys	67	57
Total	330	336

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

	1979	1980
eastern North Atlantic	816	874
western North Atlantic	284	347
Mediterranean	73	87
North Sea	215	193
Arctic Ocean	88	54
North Pacific	779	845
All other waters	371	410
Total	2626	2810

Meteorological work in British merchant ships has always been carried out on a voluntary basis and the Port Meteorological Officers, who are all Master Mariners with considerable experience of meteorological observing at sea, are able to significantly contribute to the maintenance of a high standard of observations received from the VOF. It is gratifying to note that this standard has been maintained throughout the year.

The liaison between the Port Meteorological Officers and the various shipping companies continues to be to their mutual benefit and the installation of distant-reading meteorological equipment and automatic weather stations in a number of merchant ships under construction, in order to ease the work-load of observing officers, has continued with the whole-hearted support and co-operation of shipowners. On a small number of vessels trials have continued with the automatic radio transmission of ship's weather messages and, thus far, results indicate that the use of satellites is the most reliable and cost-effective method.

Acknowledgement must once again be made of the valuable services rendered by many foreign and Commonwealth Port Meteorological Officers for their services in the replacement of defective instruments and replenishment of stationery in UK

Selected Ships on protracted voyages. During the year a number of British observing ships has been sold or ended their sea-going careers in ports abroad and these foreign and Commonwealth Port Meteorological Officers have been of great assistance in the withdrawal of our instruments from these ships.

2. Ocean Weather Ship Activities

The United Kingdom continued to operate 2 Ocean Weather Ships on station 'Lima' situated at 57° 00'N, 20° 00'W under the North Atlantic Ocean Stations (NAOS) scheme. The ships, *Admiral FitzRoy* and *Admiral Beaufort*, continuously manned the station throughout the year with the exception of a 4-day period in early November when *Admiral FitzRoy* vacated the station to land an injured crew member.

The weather ships make hourly surface and 6-hourly upper-air observations as well as observations of sea temperature and salinity to considerable depths. In addition, rain-water samples are collected for analysis by the International Atomic Energy Agency, observations made of magnetic variation, sea-water samples collected on passage to and from station for monitoring radio-active content and sea and swell records obtained using the Tucker shipborne wave recorder. Also, aurora observations are made for the British Astronomical Association. During the first part of the year reports of floating pollutants were made for the Inter-Governmental Oceanographic Commission/World Meteorological Organization pilot project on marine pollution monitoring. On about half the voyages to and from station a plankton recorder was towed on behalf of the Institute for Marine Environmental Research.

3. Ship Routeing

A ship routeing service is provided to advise on North Atlantic and North Pacific passages and also to offer advice in regard to the movement of tows and salvage operations. Advice is also given to vessels on passage in other parts of the world on request.

For conventional vessels the object of the service is to select the best route for the ship to follow in order to reach her destination in the shortest possible time with the most economical fuel consumption commensurate with least damage to ship and cargo. To achieve this, data are extracted from the ship's deck logbook to determine the vessel's response to various sea-wave fields and a ship/wave performance curve is constructed. However, the service has now amassed a large amount of performance data for almost all types of vessels and it is frequently possible to assess wave-performance characteristics from basic ship size and type without recourse to the deck logbook. The ship routeing officers, who are all Master Mariners with long sea-going experience, are provided with wind and sea predictions up to 72 hours ahead at 12-hourly intervals by the forecasters in CFO and this information is used with the performance curve to determine the most favourable course for the vessel to follow. In this determination consideration is given to the loading state of the vessel, navigational hazards such as shoals, areas of fog and sea ice and also to sea-surface currents. The later stages of the voyage are also borne in mind. Communication with the vessel is usually by Telex prior to sailing and via pre-determined coastal radio stations whilst on passage.

Routeing advice to tows which do not have restrictive weather parameters is similar to that provided for conventional ships but allowance is made for the slower speed of the tow and for restricted manoeuvrability. For tows with limiting weather factors—which may be wave height or period, amount of heel or wind force—the routeing service advises when and where to seek shelter or when to resume passage.

During the year the number of routeings, including tows and salvage operations, increased by 58 per cent. It is significant that this year there has been no slack period in the services provided during the summer months as there has been in previous years. Seasonal contracts have been renewed with 2 shipping companies and, due to a high success rate and advertising, the service has continued to become more widely known in shipping circles throughout the world. Of special interest, during June and July, the service provided a weather watch and routeing for the movement of the first completed Thames Barrier gates from Middlesbrough to the Thames estuary. Also during September the service, which keeps a careful watch on the development and movement of tropical revolving storms, provided, at the request of the vessel's owners, current and wind drift patterns for survival craft to assist the search and rescue services following the tragic loss of the British cargo vessel *Derbyshire* in the North Pacific south of Japan.

4. Services for Marine Activities

Services to shipping via BBC Radio, the Post Office Coastal Radio Stations and our international radio-teleprinter and radio-facsimile broadcasts continued throughout the year. As from 1 January the late night Inshore Waters Forecast and station reports for English, Welsh and Scottish waters broadcast on BBC Radio 4 and BBC Radio Scotland were combined. Due to the impending automation of Sule Skerry lighthouse, weather reports from this station were discontinued in July and were replaced by reports from Sumburgh (Shetland Isles) in the Coastal Waters station reports. From 1 August a forecast for Northern Ireland Inshore Waters followed by reports from stations located around the northern Irish Sea was broadcast by Radio Ulster at 0945 GMT Mondays to Fridays in addition to the usual late night broadcasts. During the latter part of the year weather reports from Machrihanish for inclusion in the Inshore Waters Forecasts were temporarily replaced by reports from Prestwick. As a temporary service, the Post Office Coastal Radio Station at Cullercoats continued to broadcast weather forecasts and gale warnings for all North Sea shipping areas from Fair Isle to Plymouth in Radio Teletype.

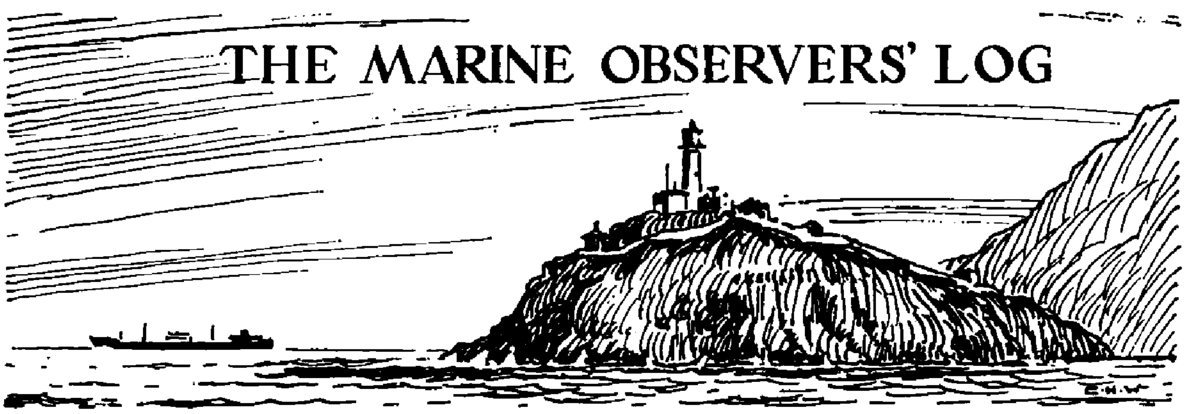
The Shipping and Inshore Waters Forecasts sent out on BBC Radio 4 are of direct benefit not only to the shipping and fishing industries but also to yachtsmen. Local radio stations, both BBC and independent, continued to broadcast forecasts for inshore waters and local weather information throughout the year.

5. Inquiries

During the year there has been a steady increase in the number of marine inquiries received. These have been principally from shipping interests, solicitors, universities and industrial firms and the subjects have been extremely varied ranging from the weather conditions prevailing at the time of marine casualties to a request for details of winds over the North Atlantic during a period in September which may have been a contributory cause of the rare sighting of a Sabine's Gull on the River Tweed at Melrose in Roxburghshire.

6. Awards to Voluntary Observers

As in previous years, Excellent Awards in the form of books were presented to the shipmasters, principal observing officers and radio officers who submitted the best meteorological logbooks during the year. Similar Awards were made to masters and officers on short sea trades for their work in making sea-temperature observations and to a skipper and radio officer of a trawler who made and transmitted valuable non-instrumental weather observations. The books selected for this year's awards were *The University Atlas*, *Cassell's English Dictionary* and *Bligh* by Gavin Kennedy. Four shipmasters were presented with long-service awards in the form of barographs in recognition of their valuable voluntary meteorological work over many years during their careers at sea.



April, May, June

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

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

LOCAL DEPRESSION

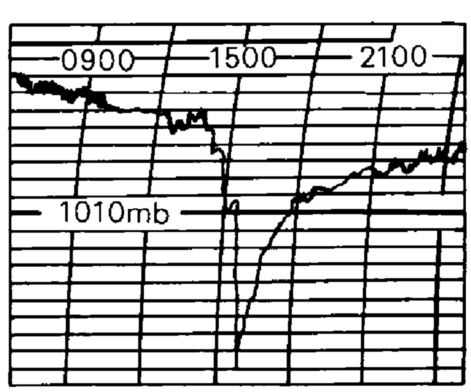
Western South Atlantic

m.v. *Donga*. Captain D. H. Clark. Cape Town to Montevideo. Observers, the Master, Mr M. Browning, Chief Officer, Mr M. Crammond, 2nd Officer, Mr G. J. Griffiths, 3rd Officer and Cadet P. Twelftree.

30 May 1980. At 0600 GMT when the vessel was some 660 n. mile east of Montevideo, the barometric pressure began to fall. There were, at the time, 4 oktas of cumulus, altostratus and cirrostratus cloud present, the wind was W, force 3, visibility good and a heavy south-westerly swell was present.

At 1100 the barometric pressure, having fallen 2½ mb since 0600, steadied somewhat, the wind had backed to become SE'ly, force 3, the sky was overcast with nimbostratus cloud and rain was falling. One hour later the rain had become moderate in intensity, the wind speed had increased to force 5 and the pressure had maintained its slow fall.

At 1330 the pressure began to fall sharply, see barograph trace, visibility was reduced in precipitation to half a nautical mile and lightning was observed.



By 1600 the pressure had become 1000·9 mb, a fall of 14 mb since 1330. At this time (1600) a severe squall was experienced during which the wind backed from SE to NE and increased from force 5 to force 10. After the squall the sky began to clear until a watery sun was visible and the pressure began to rise reaching 1010·5 mb by 1800. The rise was maintained until 0300 on the 31st when it steadied.

By 1700 the wind had become SE, force 4, the rain had eased and a general clearance had begun. By 1900 the wind had decreased further to become S, force 2, there was a slight sea and moderate swell and it was cloudy and clear.

Position of ship at 1200 on the 30th: 35° 05′S, 44° 36′W.

THUNDERSTORMS AND ST. ELMO'S FIRE

Western North Atlantic

s.s. *Jervis Bay*. Captain J. K. Blackburn. Rotterdam to Panama. Observers, the Master, Mr J. N. Kelleher, 2nd Officer, Mr R. D. Anderson and Mr H. Wren, 3rd Officers.

25–26 May 1980. At 1600 GMT on the 25th the wind was SE, force 5, air temp 26·0°C, wet bulb 23·2, sea temp 26·0, barometric pressure 1012·1 mb, conditions cloudless and fine, moderate sea and low swell.

By 1700 large amounts of medium and towering cumulus cloud were present and about 15 minutes later a heavy thunderstorm commenced. The storm continued for 20 minutes and was followed by occasional light showers with some lightning until 2300 when an extensive area of heavy thunderstorms was encountered. Over the 4 hours which followed the precipitation gradually decreased but frequent lightning flashes were observed. At about 0300 St. Elmo's fire was observed for the first time around the aerial tips.

By 0400 the lightning frequency had increased, a flash being observed once every 2–3 seconds. These were mainly cloud to cloud flashes with only occasional cloud to sea flashes.

At 0705 a distinct buzzing was heard in the direction of the starboard bridge-wing, a few minutes later St. Elmo's Fire was once again observed around the aerial tips.

At 0720 a lightning flash, followed almost immediately by a loud clap of thunder, occurred very close on the port side of the vessel. Very heavy rain, in which the visibility was reduced to 40 metres, commenced and was accompanied by lightning flashes so frequent that it was not possible to estimate the time intervals between each occurrence. This storm continued for about 15 minutes and was once again followed by only light showers and a resumption of St. Elmo's Fire, but frequent lightning flashes in which cloud to sea discharges were observed once per second.

By 0800 St. Elmo's Fire was no longer observed and the buzzing noise had ceased. By 1030 only occasional lightning flashes were observed; these had ceased by 1230 and breaks began to appear in the cloud cover.

Position of ship at 1600 on the 25th: 24° 51′N, 61° 07′W.

Position of ship at 1230 on the 26th: 20° 05′N, 66° 02′W.

SEVERE LOCAL STORM

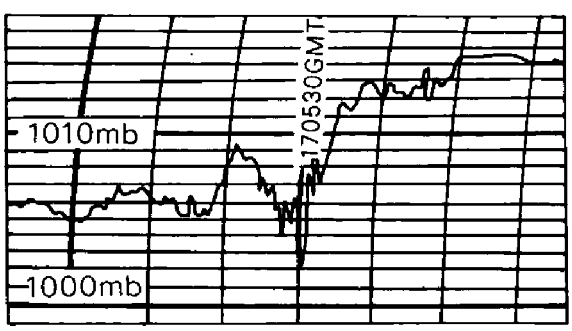
Gulf of Mexico

m.v. *Finnrose*. Captain J. Gizowski. Houston to New Orleans. Observers, the Master, Mr P. Dyson, Chief Officer and Mr N. lePine-Williams, 2nd Officer.

16–17 May 1980. Whilst on passage heavy showers with continuous lightning and occasional thunder were experienced. At 2100 GMT on the 16th the lightning increased in intensity, the rain became heavy and continuous reducing visibility, the wind was SSE, force 3–4. During the next 30 minutes the barometric pressure rose by 4 mb then fell by 5 mb over the 2 hours that followed; no appreciable change in the weather was observed during this time.

At 0000 on the 17th the vessel was approaching South Pass, Mississippi with the intention of embarking a pilot thence proceeding to the Gulf Outlet Canal.

At approximately 0030 the barogram showed a fluctuation of pressure of over 6 mb, see chart. The fluctuation was accompanied by a wind veer from SSE to NW and an increase in wind speed estimated to have reached 100 knots, (the estimated



speed was later confirmed by the pilot who came on board after the incident). The heavy rain and the spray resulting from the sharp increase in wind speed reduced the visibility to almost nil making the wind direction difficult to assess.

The scanner of the stand-by radar was completely arrested by the wind and, later, it was found that the gears had been stripped. The main radar scanner continued to rotate but the radar screen was a mass of clutter even after making all the adjustments possible.

In an effort to keep the vessel's head to wind, course was altered to a north-westerly heading. The wind veer was maintained until an easterly direction was reached.

The hurricane strength of the wind lasted for 10–15 minutes and was followed by a rapid decrease in force, which, in turn, was accompanied by a rapid improvement in the visibility.

At 0214, when the pilot came on board, the wind was E'ly, force 3–4 and the visibility more than 5 n. mile.

Approximate position of ship: 28° 50'N, 89° 10'W.

Note. From the observation of continuous rain and the severity of the wind it is thought likely that the *Finnrose* may have encountered a Severe Local Storm. These storms have a characteristic behaviour which is distinct from normal convective thunderstorms. They are self-sustaining systems and can last for periods of several hours, whereas a thunderstorm, once developed, generally lasts for about half an hour.

Normal convective storms travel with the mid-tropospheric winds but, most commonly, the Severe Local Storm travels more slowly. Very strong damaging winds, or tornadoes, are associated with these storms as well as hail or heavy rain and thunder.

On the 17th the synoptic situation would have been favourable for the development of Severe Local Storms. There was a large area of shallow low pressure extending from Kansas to Mexico together with a marked trough of cold air aloft. The air mass was deeply unstable. The surface air was well supplied with moisture from the south-south-easterly flow over the Gulf of Mexico and, finally, the winds aloft increased and veered with height.

The instability was amply illustrated by the many showers and thunderstorms that were reported on the 16th and 17th over the southern states bordering on the Gulf of Mexico. A further demonstration is given by the barograph trace; the fluctuations of pressure shown are often a feature associated with deeply unstable air.

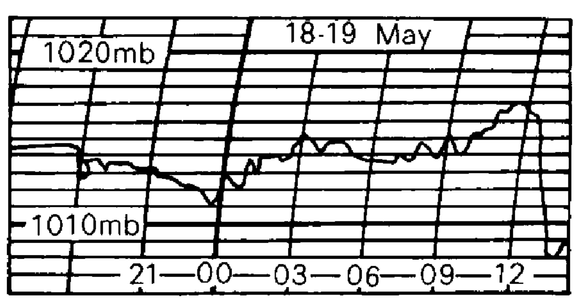
SEVERE ELECTRICAL STORM

Gulf of Mexico

m.v. *Scottish Lion.* Captain A. R. MacIntyre. At anchor, Galveston (Texas). Observers, Mr I. Ross, 2nd Officer, Mr R. P. Daniells, 3rd Officer and Cadet D. Price.

18–19 May 1980. The following observations were made when a severe electrical storm was encountered:

	GMT	
18 May	2330:	Wind NE'E, force 3, barometric pressure 1011·0 mb, dry bulb 25·0°C, wet bulb 24·8, heavy rain, sheet and forked lightning.
19 May		The lightning display continued throughout the night with maximum activity being reached at 0700. At one stage it extended across the whole of the sky from a central point to the north-west of the vessel.
	0900:	Wind ESE, force 4, barometric pressure 1014·8 mb, dry bulb 22·0, wet bulb 22·0.
	1300:	Wind veered from E, force 7 to ESE, force 7 as cold front passed through.



	1430:	Wind NNW, force 4, barometric pressure 1009·1 mb, dry bulb 23·1, wet bulb 20·9.

Position of ship: 29° 15'N, 94° 48'W.

Note. The system which gave rise to the large area of rain and storms and to the report by the *Finnrose* (above) moved away to the east during the 17th.

Late on the 18th, however, a broad band of showers, rain and thunderstorms associated with a slow-moving cold front moved south. This was responsible for the prolonged electrical display witnessed by the ship's company.

The fluctuations of pressure shown by the barograph trace demonstrate, again, deeply unstable air.

ST. ELMO'S FIRE AND BALL LIGHTNING

Arabian Sea

s.s. *Moreton Bay.* Captain B. V. Chipperfield. Suez to Fremantle. Observers, Mr D. R. Peel, 2nd Officer and Mr S. Knight.

1 May 1980. At 1955 GMT as the vessel was steaming on a course of 125°(T) on a clear night with a full moon, a bank of cumulonimbus cloud was observed ahead of the vessel. Shortly afterwards a crackle was heard on the bridge-wing and our skin began to tingle. At this time the rain was observed on the radar screen to be 10 n. mile distant; it extended in a north-easterly to south-westerly direction for a distance of 20 n. mile and was some 5 n. mile in depth.

As the vessel approached the rain the air became more heavily charged and minor electric shocks were experienced as we touched objects in the area of the bridge. A sound, similar to that one hears when standing underneath an electricity pylon, was heard in the starboard bridge-wing area. The topmost parts of the whip aerial and the main aerial were observed to glow with a blue flickering light. The hairs on our legs and arms were standing on end—a most uncomfortable feeling. Several lightning flashes were observed during this period but at no time was thunder heard.

At 2013, just before the rain reached the vessel, ball lightning, orange in colour, was observed off the port bow travelling horizontally on an almost reciprocal course to that of the vessel. It was observed for about 4 seconds and was estimated to be 1·5 n. mile distant from the vessel.

Very shortly afterwards rain began to fall and the air felt clearer.

Weather conditions at the time were: dry bulb 29·3°C, barometric pressure 1010·5 mb, light airs, rippled sea with low SSW swell.

Position of ship: 4° 15′N, 61° 55′E.

Note. Ball lightning is described in the *Meteorological Glossary* as being a rare form of lightning in which a persistent and moving luminous white or coloured sphere is seen. The explanation of this form of lightning is controversial as was formerly its existence.

Reports of the sphere dimensions vary from a few centimetres to about a metre, but are most commonly from 10 to 20 cm. Duration varies from a few seconds to several minutes. Many reported cases follow a brilliant lightning flash and may be physiological in nature (after-image); other reported cases have, however, occurred without a preceding flash. Sometimes more than one sphere is seen by an observer or a sphere is reported in the same locality by various observers. The speed of travel is generally about walking pace. Spheres have been reported to vanish harmlessly, to bounce from the ground or an obstruction or to pass into or out of rooms leaving, in some cases, sign of their passage, as for example, a hole in a window pane.

CETACEA

Mediterranean Sea

m.v. *Strathewe*. Captain J. M. Burn. Liverpool to Port Said. Observers, the Master and ship's company.

14 April 1980. At 1330 GMT a seaman working on the forecastle heard sounds which suggested that something was continually hitting the side of the vessel; upon investigation he discovered a whale impaled on the bulbous bow. It was wedged across the top of the bow, both its back and jaw-bone were broken.

Unsuccessful attempts were made to free the creature by turning the vessel to port then starboard. It was finally freed and sank when the engines were put astern.

The whale, believed to be a Sei and measuring approximately 18 metres in length, was thought to have been hit at about 0730 when a reduction in speed was noted.

Position of ship: 36° 45′N, 1° 53′ E.

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

'Quite obviously the whale was dead when it was finally eased off the bow. If the original impact had not killed it, it must surely have drowned by being pushed along in the bow wave for some 6 hours.

'There is more than one possibility why this sort of thing should happen. Firstly, it may have been asleep. The question of whether or not whales and dolphins actually go to sleep on the surface is open to debate. Captive dolphins which have been observed over 24 hours do seem to have quiet resting periods but become "awake" at the slightest noise. It is unlikely that large whales sleep deeply as in human terms, but it is known that some, such as the Sperm whale, also have these quiescent periods. Secondly, some individual animals encountered may be sick or diseased and, therefore, unable to take avoiding action. Thirdly, in this particular case, the animal may have been dead and floating on the surface before it was hit.'

Gulf of Siam

m.v. *Turquoise Bounty*. Captain B. G. Mavity. Bangkok to Singapore. Observers, the Master, Mr D. I. Vipond, Chief Officer and Mr F. W. Gray, Chief Engineer.

11 May 1980. At 0530 GMT whilst passing through the dredged channel in the Bangkok Bar a small group of dolphins was observed close to the vessel breaking the surface and blowing; there appeared to be 4 dolphins swimming in pairs. An unusual feature was that one of each of the pair was black and the other white.

The vessel is on a regular weekly service between Bangkok and Singapore and dolphin sightings in the Gulf of Siam and the South China Sea are frequent, however, those usually seen are greyish or have grey markings and are generally fairly small—about 1·5 metres in length. The black and white dolphins observed this morning were larger—probably a little more than 2 metres in length.

Position of ship: 12° 27′N, 100° 36′E.

Note 1. The *Turquoise Bounty* is a Singapore Selected Ship.

Note 2. Mr McBrearty comments:

'This does seem unusual doesn't it? There are white dolphins in the South China Sea including the Philippines and the northern parts of Indonesia. These are the Bornean white dolphins (*Sousa borneensis* = Indo-Pacific dolphin, *Sousa chinensis*). The skin of these animals is generally a creamy white colour with the tips of the dorsal fin and flukes a brownish cherry. They have dorsal fins which are long, low and only slightly concave on the rear margin. The beaks are quite distinctive and their over-all length less than 2·5 metres.

'The black dolphins which are mentioned are almost certainly a different species. The observers do not say whether or not the black and white dolphins had similar characteristics of beak, dorsal fin and flipper shape—this makes identification of the black dolphins difficult as there are probably 3 or 4 candidates which would fit a dark grey or black appearance and that sort of size.

'The other dolphins mentioned and which are generally fairly small and of various shades of grey are probably either the Irrawaddy dolphin (*Orcaella brevirostris*) or perhaps the Malayan dolphin (*Stenella* S. sp.).'

MARINE LIFE

North Atlantic Ocean

m.v. *King George*. Captain T. Young. Piombino (Italy) to Mobile (Alabama). Observers, the Master and ship's company.

21 May 1980. At 1200 GMT, whilst the vessel was hove-to awaiting orders a shark, as illustrated in the sketch, was caught at the third attempt by using liver with ox-blood compound as bait; on the 2 previous occasions it had taken the bait but had

avoided capture. As it was being brought out of the water it was heard to make 'growling' or 'barking' noises—these were thought to be attempts at breathing.

The upper part was blue/grey in colour with a mother-of-pearl tint, the lower part was pure white. It measured 3 metres in length and 25 centimetres in breadth.

Further inspection revealed that it had about 170 teeth, some of which were hollow and did not appear to be fully developed.

Position of ship: 28° 43′N, 56° 53′W.

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

'This was the blue shark *Carcharinus glaucus*. The specific name *glaucus*, from the Greek, refers to its dull bluish/grey colour as described by the observers; a better description than plain blue. The shark is cosmopolitan in its distribution and small individuals are not uncommon on British coasts.'

Bay of California

m.v. *Saxonia*. Captain C. R. Knight. Puerto Bolivar (Ecuador) to Wilmington (California). Observers, the Master, Mr I. K. Bourne, 3rd Officer and ship's company.

16–18 April 1980. Whilst the vessel was stopped and drifting in the Bay of California awaiting a berth at Wilmington, the Master and ship's company were treated to a remarkable display by marine life. At about 1400 GMT on the 16th a large number of squid surrounded the vessel. They were estimated to be between 15 and 25 centimetres long and floated on or just below the surface, propelling themselves by a rapid closing of an umbrella-like 'limb' at one end of their bodies; this operation enabled them to move at quite rapid speeds. They seemed to be feeding on small fish, about 5 centimetres in length and giving off an amber or blue/amber glow (possibly lantern-fish). The squid caught the fish by engulfing them in their tentacles. They stayed with the vessel throughout the night seemingly sampling everything dropped into the water for them; there was, however, no sign of them during the day.

On the 17th Pointer sharks were observed swimming around the vessel and at a discreet distance from us. They measured 1·5 to 2 metres in length and were accompanied by a number of Pilot fish. Also observed at this time were a number of tuna fish, varying in length from 30 to 60 centimetres, and fish with yellow tails varying in size from 25 centimetres to 1·5 metres. They were swimming in groups corresponding to their size, large numbers of smaller fish and smaller numbers of larger fish in separate groups.

Later in the day the ship's company observed the most spectacular event when approximately 250 yellow-tailed fish arrived and for a period of about 6 hours swam around the vessel, some displaying a remarkable turn of speed at times as they chased flying-fish across the surface of the water. As they broke the surface a vivid red/amber luminescence was observed for periods of 5 to 10 seconds.

Two turtles were also seen during the morning of the 16th and in early hours of the 17th. They were estimated to be 50 centimetres across the back, the shell was grey-brown in colour and they were accompanied by Pilot fish.

The water during the whole period of the observation was a clear azure blue and creatures in it were visible for a considerable depth.

Approximate position of ship: 22° 00′N, 108° 00′W.

Note. Dr Evans comments:

'A most interesting report. The Bay of California is a region of high phytoplankton production due to intense upwelling and, since "all flesh is grass", marine animal life is especially abundant there.'

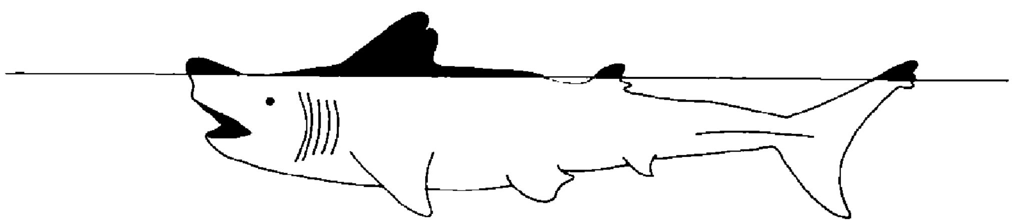
Western North Atlantic

m.v. *Devonbrook*. Captain G. Bowman. New Orleans to Egersund (Norway). Observers, Mr E. J. R. Williams, 3rd Officer and Mr R. Doheny.

7 June 1980. At 2255 GMT what were thought to be 2 whales were observed. The

(a)

(b)



(c)

first, see sketch (a), showing just a single jet-black fin approximately 60 centimetres high and the second, sketch (b), observed at fairly close range, appeared to be lying on its side. The fins were also jet-black. No 'spouts' were seen. The latter creature was estimated to be 8 metres long and the dorsal fin 75 centimetres high.

Position of ship: 40° 58′N, 53° 00′W.

Note. Mr McBrearty comments:

'I am not convinced that these are whales at all. When a whale surfaces it shows at least something of the head (it must in order to breathe). Sketch (a) shows only a fin; sketch (b) shows 2 dorsal fins, a tail fin and a snout; in neither case was any "blow" observed. If you draw the "missing" parts, sketch (c), a reasonable likeness of a basking shark, *Cetorhinus maximus*, could be shown.

'Basking sharks, colour grey to black, size up to 12 metres, are common in the North Atlantic. Sometimes 2 of these large fishes swim in tandem showing 2 enormous fins 15–18 metres apart, thought by some to be the origin of some "sea-serpent" stories.'

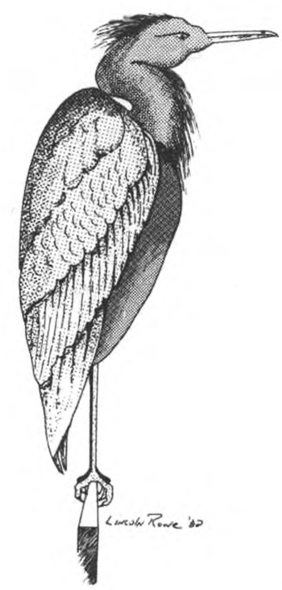
BIRDS

Western North Atlantic

m.v. *King Charles*. Captain I. M. Shearer. Norfolk (Va) to Piombino (Italy). Observers, the Master, ship's company and Mr L. Rowe of the Marine Society.

26 April 1980. When the vessel was 2 days out of Norfolk, a bird, see sketch, flew on board and remained with us for a day.

The creature stood about 50 centimetres in height with a wing-span of about 1 metre. The over-all colour was white with a tangerine/pink tuft on the crown of



the head and throat. The chest and back were tinted with a similar colour. The long straight bill was orange and the legs orange/yellow.

Position of ship: 36° 57′N, 67° 49′W.

Note. Captain G. S. Tuck of the Royal Naval Birdwatching Society, comments: 'This is the Great White Heron, *Ardea occidentalis*.'

Western North Atlantic

s.s. *Atlantic Causeway*. Captain E. L. Jackson. New York to Rotterdam. Observers, the Master, Mr S. G. Millar, 2nd Officer and Mr N. D. Cleave, 3rd Officer.

1 April 1980. At 1200 GMT 5 adult Northern Gannets, see sketch, were observed skimming the water in circles around the vessel; they remained with the vessel for about 4 hours before flying off in a northerly direction.

Each bird was approximately one metre in length; the bodies were mainly white with brown primaries and pale straw-yellow heads; the tails were wedge-shape.

They were first sighted as they approached the bridge-wing at close range travelling at a considerable speed. Most of the time they maintained a distance of about 2 metres above the water, sometimes only just missing the crests. Occasionally they headed off at some speed as if they had spotted food.

At 0900 on the 6th a single Northern Gannet was observed and it was thought it may have been sheltering on board the vessel or had been following us at some distance. Half an hour later the other 4 birds appeared—perhaps the lone Gannet observed earlier was checking us out before allowing the others to approach the vessel again—would this indicate a leader among them?

Position of ship at 1200 on the 1st: 40° 25′N, 70° 20′W.

Note. Captain Tuck confirms that these are Northern Gannets, *Sula bassana.*

Red Sea

s.s. *Liverpool Bay.* Captain W. A. Fitzgerald. Kobe to Suez. Observers, Mr I. W. Collister, Chief Officer and Mr P. P. van Bergen, 2nd Officer.

29 April 1980. The bird shown in the sketch was observed to fly on board and land on one of the containers. The wings were a deep rusty orange turning into a rich peacock-blue towards the tips. The tail which was also peacock-blue was of a

delta shape with 2 long feathers protruding from the end. The underside was pure white. Three dark-brown bands ran across the head which was itself slightly crested. A further band ran across the eyes and there was a 'collar' around the throat. The beak was slightly curved. The over-all length was estimated to be 30 centimetres.

Position of ship: 13° 10′N, 43° 10′E.

Note. Captain Tuck comments:

'This is the Bee-eater, *Merops apiaster.*'

Mediterranean Sea

s.s. *Pollenger.* Captain R. J. Pilley. Off Isla de Mallorca. Observer, the Master and ship's company.

1 May 1980. Whilst the vessel was off Mallorca awaiting orders the bird shown in the photograph opposite page 72 was one of a pair observed. It was discovered on the vessel's main deck apparently unable to fly and, in consequence, taken to the bridge where it was given raw fish, apple and water.

After a 2-day rest on the bridge the bird seemed to be showing no signs of improvement in its general condition and eventually died. It was thought to have sustained its injuries in a fight with another bird. A number of birds of many different species were observed flying around the vessel for almost 2 weeks with no apparent source of food. Maybe after this length of time the creatures had started to attack each other with food in mind.

Position of ship: 38° 11′N, 3° 32′E.

Note. Captain Tuck comments:

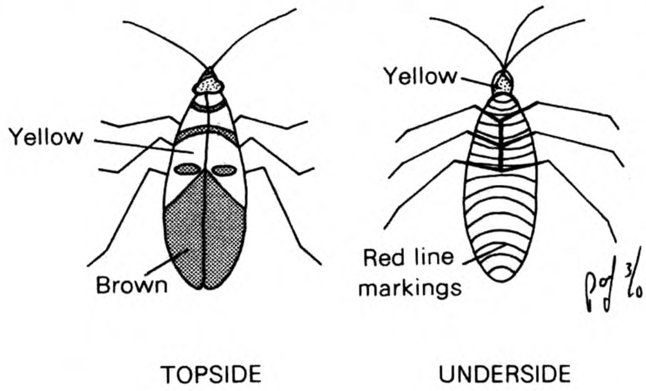
'This is considered to be the Night Heron, *Nycticorax nycticorax.*'

INSECTS

Eastern North Atlantic

s.s. *London Pride.* Captain E. G. Kemp. Rotterdam to Bonny (Nigeria). Observer, Mr P. N. Thompson, 3rd Officer.

24 April 1980. The insect illustrated in the sketch was found in the wheel-house.



It measured 3 centimetres in length overall and had distinctive red markings on its underside. It was thought to be a sap-sucking insect.

Position of ship: 7° 54′N, 15° 02′W.

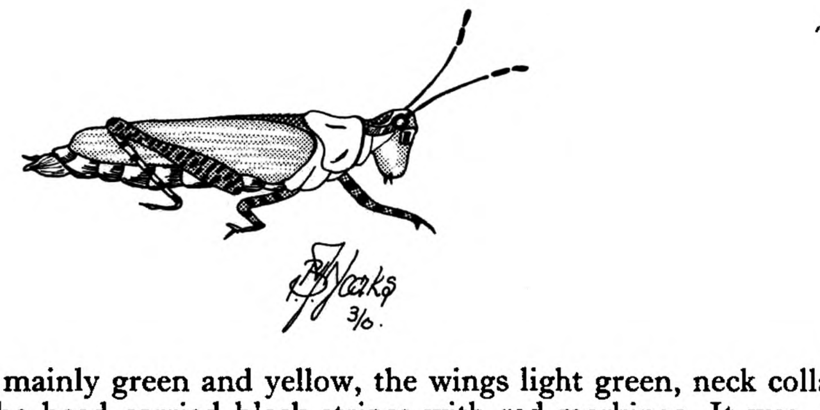
Note. Mr W. R. Dolling of the Department of Entomology, British Museum (Natural History), comments:

'This is the *Dysdercus fasciatus*, a pest of cotton. Several related species, including this one, are called "cotton stainers" because of the coloured stains imparted to damaged cotton balls by their saliva. This particular species is sometimes used in laboratory experiments and cultures of it are kept for this purpose.'

Eastern North Atlantic

m.v. *King Alfred.* Captain S. Hay. Kamsar (Guinea) to Rotterdam. Observers, Mr A. J. Blackler, Chief Officer, Mr B. T. Marks, 3rd Officer and Cadet T. P. Cull.

25 May 1980. The insect shown in the sketch was found on the bridge-wing.



The under-side was mainly green and yellow, the wings light green, neck collar yellow, eyes red and the head carried black stripes with red markings. It was $4\frac{1}{2}$ centimetres in length.

Position of ship: 18° 48′N, 18° 00′W.

Note. Mr D. R. Ragge of the Department of Entomology, British Museum (Natural History), comments:

'This is the *Zonocerus variegatus* (L.), a common African grasshopper.'

BIOLUMINESCENCE

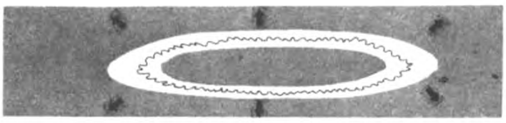
Laccadive Sea

m.v. *Clan Graham.* Captain T. R. Parsons. Dar-es-Salaam to Madras. Observer, Mr C. Williams, 2nd Officer.

9 May 1980. At 2010 GMT a number of patches of bright bioluminescence were observed some 150–300 metres ahead of the vessel; when first sighted they resembled patches of moonlit sea or breaking waves. No effect was noted when the radar was switched from the 24-n. mile to the $1\frac{1}{2}$-n. mile range or when the echo-sounder was turned on.

As the vessel passed close to one of the patches, within 60 metres, the following sequence of events was observed:

The patch was initially seen as a rapidly brightening green/white area measuring about 3 metres in diameter; it developed rapidly in size reaching an approximate diameter of 45 metres before beginning to fade. Within the centre was a jagged circle of very bright green/white luminescence, see sketch. The process of development took about 4 to 5 seconds after which time it began to fade and was finally lost in the glow from the accommodation lights. Only faint bioluminescence was observed in the bow wave and a water sample, when shaken, indicated little or no activity.



After a period of about 10 minutes a few more patches were observed but they failed to develop and soon faded. One such patch appeared close to the vessel on the starboard side but no effect was observed when the light from the Aldis lamp was directed on to it.

Weather conditions at the time were: dry bulb 29·4°C, sea temp 29·7, wind light NW'ly.

Position of ship: 5° 05'N, 79° 45'E.

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

'The observer is to be congratulated on the detail contained in this very interesting account. I cannot interpret it with any certainty but it is possible that the movement of shoals of fish might produce this effect with an initially compact group (causing the first observed patch) dispersing as the vessel approached. Initial agitation of the shoal prior to dispersal might produce the rapidly brightening effect. The very bright ring is harder to interpret on this basis unless it marks the centre of the dispersing population. Inevitably such interpretations must be highly speculative.'

Gulf of Panama

m.v. *Wild Cormorant.* Captain J. S. Laidlaw. Puerto Bolivar (Ecuador) to Balboa. Observer, Mr B. G. Fowler, 3rd Officer.

15 April 1980. Large circular patches of bioluminescence beneath the surface of the water with occasional small 'bubbles' reaching the surface and expanding were observed. The sub-surface patches were approximately 6 metres in diameter.

There was no reaction to any light stimulus or the echo-sounder when switched on.

Approximate position of ship: 7° 24'N, 80° 00'W.

Note. Dr Herring comments:

'This appears to be an example of upwelling luminescence but the permanently sub-surface nature of the major portion of the luminescence is unusual. It is possible that the appearance could have been caused by movements of a shoal of small fish close to the surface in water containing small luminous organisms such as dinoflagellates; the rising expanding "bubbles" might then have been caused by groups of animals breaking away from the main shoal, coming to the surface and spreading out there.'

South China Sea

s.s. *Tokyo Bay*. Captain A. A. Rundle. Hong Kong to Singapore. Observers, the Master and ship's company.

12 June 1980. At 1800 GMT the vessel passed through an area of bioluminescence extending for about 5 n. mile. The phenomenon consisted of patches, each about 30 centimetres in diameter, flashing at a rate of approximately 120 times per minute.

About half an hour later fast-moving bands of light converged on the vessel, firstly from either beam, then from astern. This phenomenon was observed for about 5 minutes.

Position of ship: 4° 54'N, 106° 42'E.

Note. Dr Herring comments:

'The fast-flashing rate of these patches could indicate worm aggregations, flashing patches of luminescence are known to be produced by mating aggregations of worms (related to the Palolo worm). The fast-moving bands of light were probably the spokes of "phosphorescent wheels" whose hubs were at such a distance that the phenomenon was not appreciable as "wheels".'

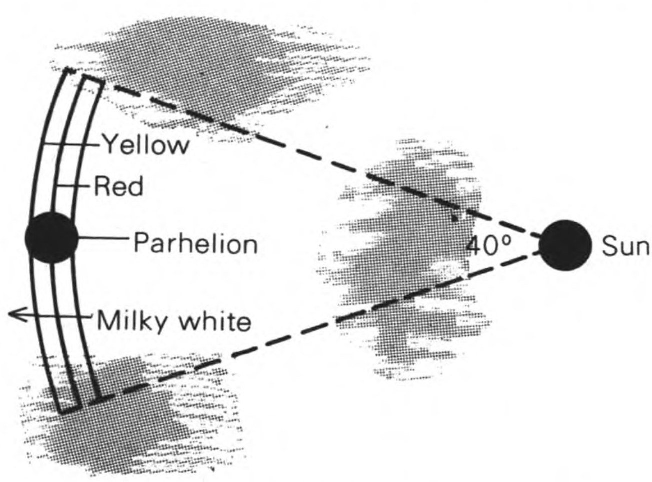
SOLAR HALO AND PARHELION

Mediterranean Sea

m.v. *King George*. Captain T. Young. Piombino (Italy) to Key West (Florida). Observers, Mr D. S. MacWilliam, Chief Officer, Mr P. L. White, 2nd Officer, Mr P. C. Campbell, 3rd Officer and Cadet D. Read.

11 May 1980. At 1200 GMT a halo of approximately 22° radius was observed around the sun, altitude 71° 29' on a bearing of 174°(T).

The inner ring, nearest to the sun, was coloured red changing outward to yellow then green then violet. A thin layer of cirrostratus cloud with some dense hooked cirrus was present. The phenomenon was observed for about 10 minutes.



At 1716 an arc of the halo was observed, the remainder being obscured by alto-cumulus cloud. The arc was less bright than the complete halo observed earlier but the red and yellow colours were still visible. Also on this occasion a parhelion was seen at the centre of the arc, see sketch. It appeared as a bright white light with a blue tint. The sun's altitude at this time was 21° 09′ on a bearing of 277°(T). The parhelion was observed for 7 minutes.

Position of ship at 1716: 36° 12′N, 4° 19′W.

Note. A parhelion (plural parhelia) is defined in the *Meteorological Glossary* as being an image of the sun, coloured or white, it is also termed 'mock sun'.

The parhelia seen most frequently are at the same elevation as and on both sides of the sun and are coloured with red nearest the sun. When the sun is near the horizon the angular distance of the sun from the parhelia is equal to the radius of the ordinary halo, i.e. 22°. When the sun is higher the distance is greater so that if halo and parhelion are both seen, the parhelion is outside the halo; for a solar elevation of 55° the angular difference is about 14°.

Parhelia are caused by the refraction of sunlight within hexagonal ice crystals whose axes are vertical. Oblique rays (sun above the horizon) do not lie in a plane perpendicular to the axes of such crystals and emerge at an angle greater than that corresponding to minimum deviation.

GREEN FLASH

Western North Atlantic

m.v. *Jamaica Producer*. Captain E. Foxworthy. Port Antonio (Jamaica) to Newport (S. Wales). Observer, Mr C. D. Spencer-Payne, 3rd Officer.

5 April 1980. At 2230 GMT a green flash was observed as the sun was setting.

On previous occasions such flashes had been observed to be either accompanied or replaced by an intense blue (topaz) flash, this phenomenon was not observed in this instance, neither was the intensity of the flash so great as seen before.

Weather conditions were: dry bulb 23·0° C, wet bulb 20·9, one okta of small cumulus cloud, slight south-easterly breeze and excellent visibility.

Position of ship: 25° 30′N, 64° 40′W.

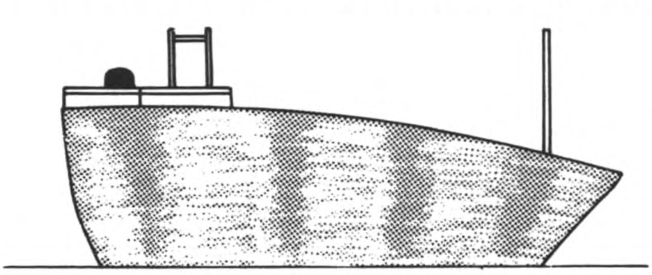
Note. The explanation of the green flash is the greater refraction of the short waves (violet, blue, green) than of the long waves (red) of white sunlight, coupled with the greater degree of Rayleigh Scattering (scattering of electromagnetic radiation effected by spherical particles of radius less than about one-tenth the wavelength of the incident radiation) experienced by the violet and blue rays. In a hazy atmosphere such differential scattering may not be appreciable and the flash may then appear blue or violet. It is interesting to note that Mr Spencer-Payne comments that a blue flash was not observed in this instance. Since the visibility was described as being excellent, the lack of haze may account for this.

ABNORMAL REFRACTION

Skagerrak

m.v. *British Poplar*. Captain G. K. Waite. Gothenburg to Grangemouth. Observer, Mr N. Howard, 3rd Officer.

17 May 1980. At 0345 GMT several vessels, when observed at distances greater than 6 n. mile, appeared distorted in the manner shown in the sketch. As the distance between us and the vessels decreased, so the distortion was apparently reduced.

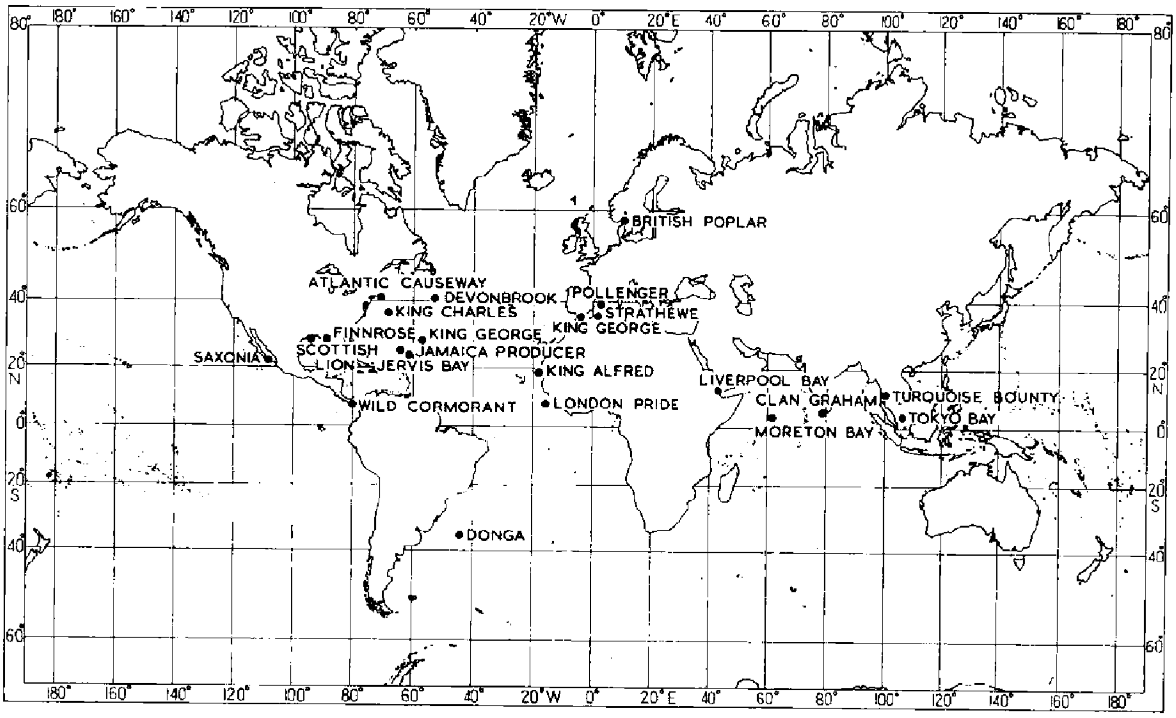


The decks at the bows of the observed vessels seemed to be curved so that they appeared trimmed by the head. At the sterns the hulls were extended and the accommodation decks greatly reduced.

The vessels observed varied in size from coasters to the 58 000 ton bulk carrier *Marion*.

Weather conditions at the time of the observation were: dry bulb 13·0°C, wet bulb 12·3, dew-point 12·0, barometric pressure 1024·2 mb, steady, wind NW, force 2, visibility 20 n. mile. There was a yellowish haze all around and just above the horizon.

Position of ship: 57° 47′N, 10° 15′E.



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

551.46.085:551.46.086:627.92:681.3

The Faeroese Wave and Current Measuring Project

By E. Davidsen and B. Hansen

(A paper presented at the 5th International Conference on Port and Ocean Engineering under Arctic Conditions (POAC) held at the Norwegian Institute of Technology in Trondheim during August 1979)

Abstract

The Faeroese wave and current measuring system was designed primarily to give local fishermen better information on wave conditions and tidal streams. It consists of 4 permanent offshore moorings with a wave recorder and a current meter on each. In addition, wave recorders at planned harbour construction sites are included in the system. The wave data enter a central computer and wave reports to be broadcast are printed on a real-time basis. Wave characteristics and spectra are stored on magnetic tape. Current and sea temperature are recorded internally in the current meter. Current data are primarily to be used for construction of tidal stream tables. The system has proved satisfactory although problems still remain with respect to the mooring system and radio interference on wave records.

Introduction

The Faeroese wave and current measuring system was established after a request by the Local Fishermens' Association to the Government for more reliable reports especially on the wave situation. The project was put under the authority of the Faeroese Coastguard while the authors were asked to design the system and to co-ordinate its implementation.

For economical reasons and due to their proven reliability in these waters, Datawell Waverider buoys were chosen as wave recorders, but real-time wave reports were essential and, therefore, the system was augmented by a computer and a set of electronic modules designed for the occasion so that the only non-automatic phase of the operation is to read the report to be broadcast from the computer print-out and telex it to the radio station. This could also have been made automatic, and may well be in the future, but it was felt that at least during the development phase every report ought to pass through at least one experienced human mind. In the resulting system the age of the reports, when received by the fishermen over the radio, is from 1 to 3 hours during daytime.

The current measurements did not need to be real-time as the dominant current is tidal and, therefore, deterministic. The measurements are to provide the necessary observational material on which to base future tidal stream tables. For this reason self-recording current meters with internal data storage were chosen.

It was recognized at an early stage that, in addition to the fishermen, many other users might find the data sampled by the system useful. Due to the location of the recorders in an interesting and in many ways extreme oceanic region, the data have a high scientific value. The wave-data are of interest to harbour engineers and indeed the system was augmented by including wave recorders placed by the engineering authorities at future harbour construction sites. Data from the current meters (current and temperature) are important for the fishery biologists. Finally, future exploitation of alternative energy resources in the sea requires a thorough knowledge of both mean and extreme conditions. Every attempt was, therefore, made to ensure that all potentially useful data were stored in such a fashion that they could be easily available when needed.

The system was first put into full-scale operation in the beginning of 1978. A major revision was made during the summer and autumn of 1978 and, although small alterations are still being made, the system is now past its development stage.

This paper describes the system as it was in spring 1979 and how it has worked from late September 1978 until now (August 1979).

The present system consists of 4 off-shore moorings, Figure 1, with a Waverider buoy and a current meter on each plus 2 Waverider buoys in in-shore regions.

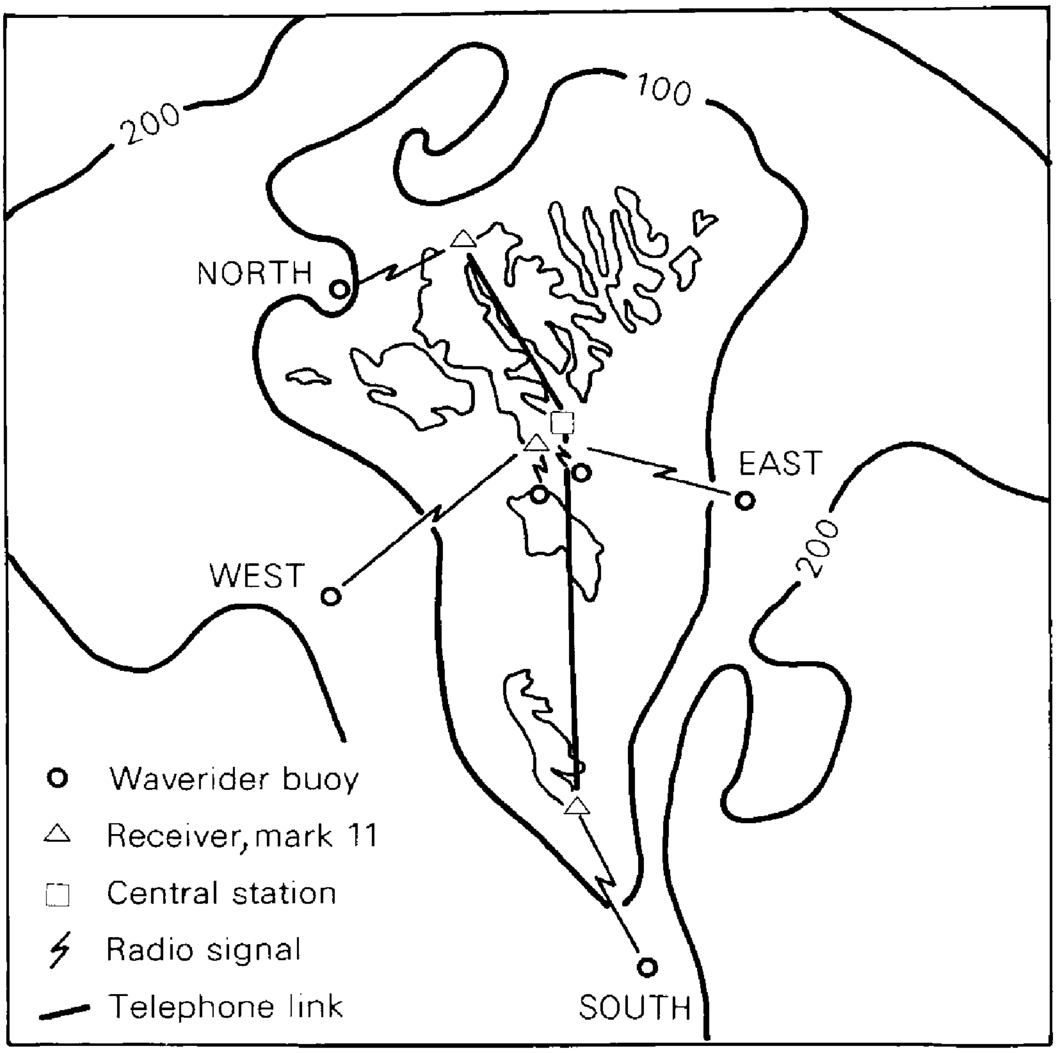


Figure 1. Layout of system

System design

Mooring system. The mooring, Figure 2, was inspired by that described by Houmb *et al.*[1]. At the beginning of the project the design current speed was unknown; a conservative value of 650 kg was, therefore, chosen for the anchor weight. Based on preliminary results of the current measurements, the design current speed has been set to 2 metres per second and the anchor weight reduced to 500 kg to simplify deployment and recovery.

Due to the strong current it has been necessary to use a 54-metre long rope between the rubber cord and the sub-surface float which is a glassfibre sphere in a net. The float is placed 30 metres under the sea surface and 2 small floats are attached to the rope in order to avoid entanglement and to make current meter recovery easier if the Waverider buoy should break adrift.

Wave measurements. The wave sensors of the system are the Waverider buoys (Datawell, Netherlands). These transmit a continuous VHF radio signal with an

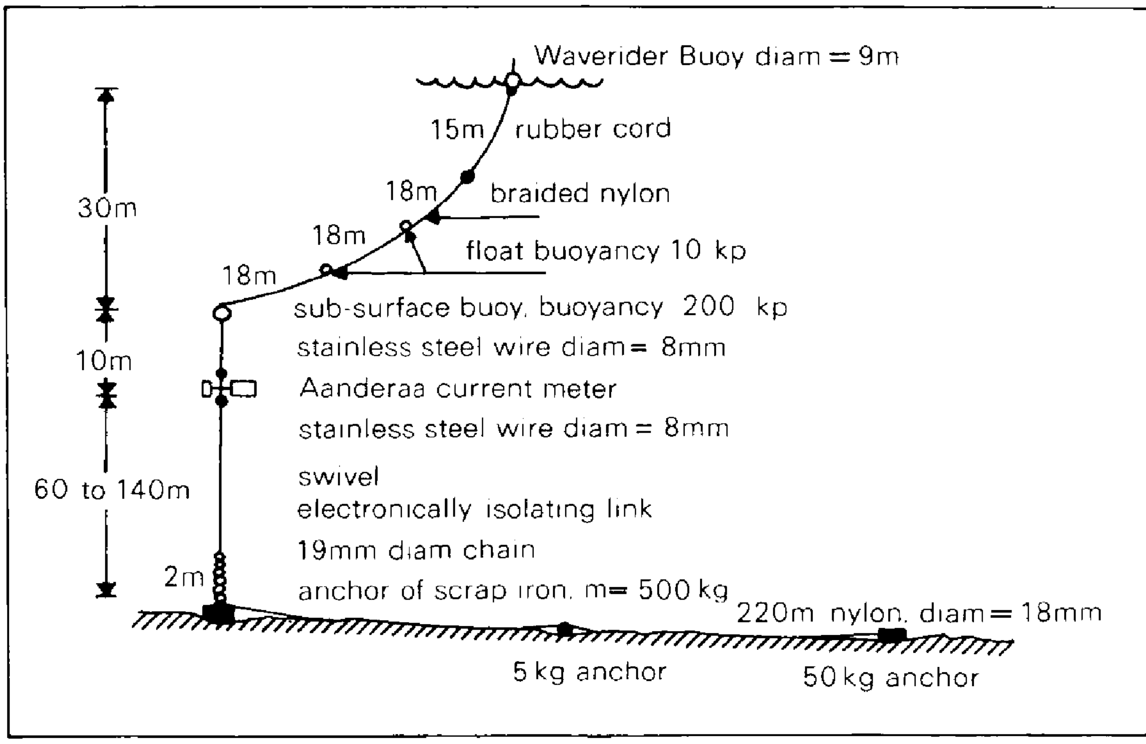


Figure 2. Mooring system

FM modulation, the frequency of which is a linear function of the instantaneous height of the buoy. The signals are received by a number of land-based Datawell receivers, Figure 1, which, among other outputs, produce a square wave signal of centre frequency 1036 Hz and with a 41·44 Hz increase in frequency for every metre elevation of the buoys above average. The square wave signals are fed through permanent telephone lines to a frequency counting module interfaced to the central computer in Thorshavn. The computer is a Hewlett Packard 9825 desktop calculator programmable in ROM-based hpl (a special HP high-level language). It has in this configuration 16 kilobytes of user-available memory, a 16 character internal printer, an internal tape cassette station for tapes of 250 kilobytes storage capacity and a real-time clock with battery back-up. After a power failure the wave system programme is automatically loaded and restarted. The Datawell receivers each have 6 channels so that 6 buoys may be serviced by the same receiver. In this system a switching module is connected between the receivers and the telephone lines which allows the central computer to select each one out of 4 of the channels of each receiver. The Datawell buoys and receivers as well as the computer are commercial products, which are well described elsewhere [2], [3] and [4], although the receivers have been slightly modified by the manufacturer for this system. The 2 modules have, however, been designed for this system and need a somewhat more detailed description as does the software.

The frequency counting module has 4 telephone line inputs and thus may service up to 4 receivers. The computer selects one of these by its 2 external control lines which are under programme control. The control logic of the module opens the gate to the counter for 0·48 seconds every counting cycle after which the contents of the counter are strobed into the computer and the counter reset for the next cycle. The module further acts as mediator for the channel-switching pulses to the receivers by lengthening the pulses to enable them to pass through the telephone lines.

The switching module has a cyclical 1 to 4 counter (2 bit) with the 4 states represented by its 2 output lines. These lines control the selection of receiving channel in that each state opens one of the 4 relays connected to the receiver. Moreover, each state selects one out of 4 fixed frequencies on to the code frequency line. The counter changes state after reception of a pulse from the computer through the telephone line. Each pulse also initiates a time-sequence in the control logic such that the output line from the module to the telephone line first transmits for approximately 25 seconds the code frequency representing the active channel before changing over to the signal from the receiver. Further, the test line stays on for another 25 seconds keeping the test-relay open and thus forcing the receiver to send its test signal instead of the signal from the buoy during this interval. The receivers have a DC output, which goes high, when the receiver is 'Unlock', that is no signal is received from the buoy. The unlock output from the receiver is used in the module to block the output to the telephone line. Thus the switching module enables the computer to select any one of 4 channels of each receiver without ambiguity, to identify unlock condition and to test the receiver at the start of each measuring cycle. The computer selects each of the buoys once every 3 hours and after identification and test of receiver, it reads the buoy for 18 minutes and 49 seconds. During each of these measuring cycles the buoy's height is read every 0·49 seconds. In total 2304 (9 times 256) values are read. After the first 256 values are read, data processing starts and continues while data are read under interrupt control. Data processing includes evaluation of several wave parameters, computation of the power spectrum and error checking, see Table 1.

Table 1. List of wave parameters stored at end of each measuring cycle

GROUP	PARAMETER	DEFINITION
Identification	Buoy location number	
—	Year, Month, Day, Hour, Minute	
—	Datafile number	
Error information... ...	Number of readings. Unlock	
—	Number of 'wrong' readings	Frequency >2000 Hz
—	Error code	see text
Wave parameters	Mean value	
—	rms-value	
—	Highest sea level	
—	Lowest sea level	
—	Highest single wave	Trough to crest
—	Deepest single wave	Crest to trough
—	Number of zero crossings	
Spectrum	64 spectral values	see text

The spectrum is computed using the Fast Fourier Transform (FFT) and is an average of 9 sample spectra, each based on 256 values. No 'windowing' is performed on the spectra. The error code is a number derived by bit-combination of the following 4 errors:

- bit 2: Mean value differs more than 5 cm from the 'correct' mean value for that buoy.
- bit 4: Largest difference between 2 consecutive readings is more than 4 times rms-value.
- bit 8: Largest single wave is more than 40 metres high.
- bit 16: At least one wave has half-period longer than 29 seconds.

At the end of each measurement cycle the parameters of Table 1 are stored on tape cassettes. When all the buoys have been read, the message to be broadcast is printed

Opposite page 72

Night Heron on board s.s. *Pollenger* (*see* page 63)

Opposite page 73

Presentation of barographs on 5 November 1980 at Bracknell. Left to right:
Captain A. Osborne (on behalf of Captain B. Hammond); Captain A. C. Davies (on behalf of Captain R. M. Michael); Mrs J. A. McKay; Sir John Mason; Captain J. K. Currie and Captain J. A. McKay (*see* page 85)

out and sent manually to the radio station by telex. In case any of the errors of Table 1 are indicated, the computer searches previously recorded results for that buoy for 12 hours back and prints the latest message. Once a day one whole-time series is stored for every buoy.

With 6 buoys the tape cassettes have a capacity for 5 days. At regular intervals the data are transferred to standard 9-track magnetic tape on an ALPHA LS1 mini-computer for storage and later analysis.

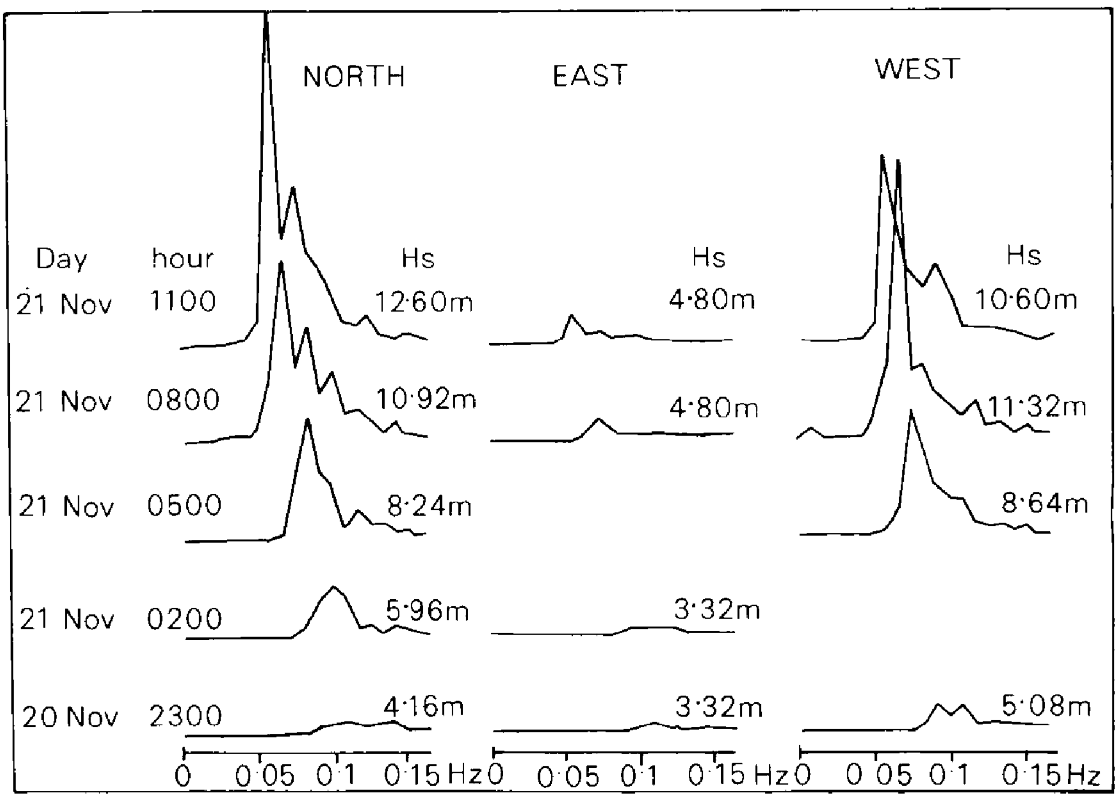
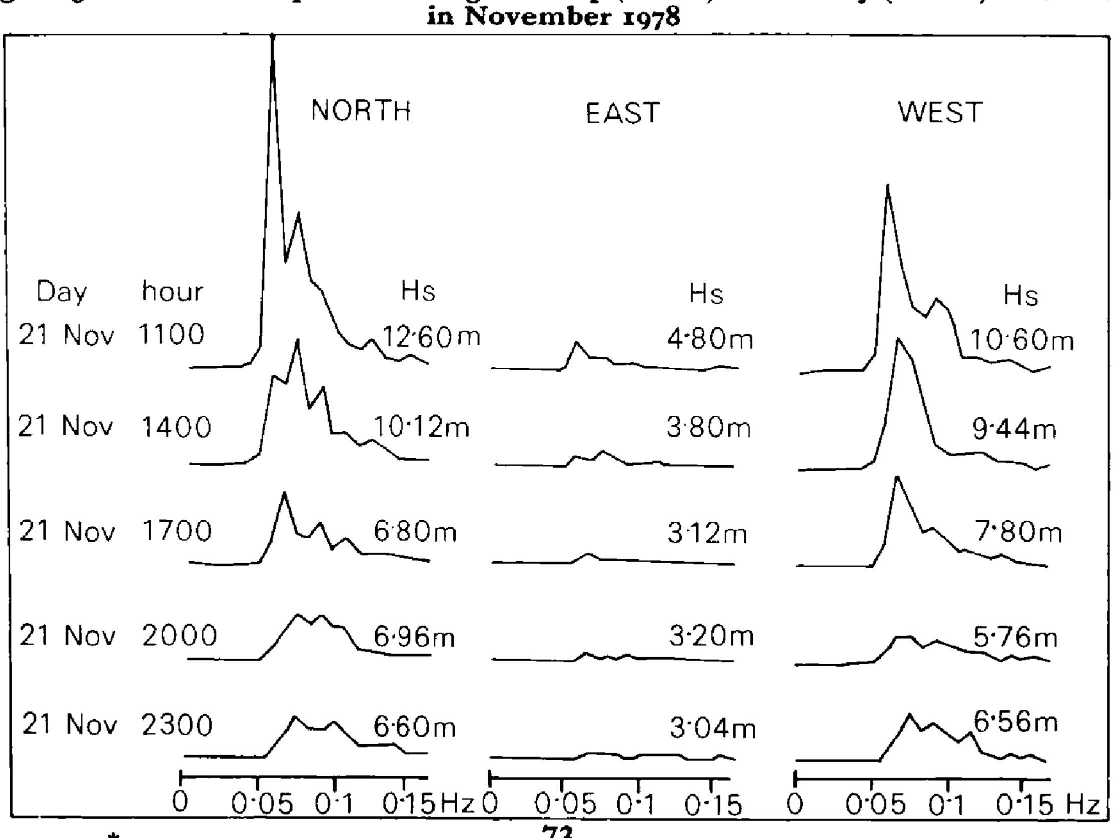


Figure 3. Evolution of spectra during build-up (above) and decay (below) of a storm in November 1978



To illustrate the wave data sampled by the system Figure 3 shows the evolution of the spectrum during 24 hours in a storm.

Current measurements. The current meter data are recorded inside the current meters (Aanderaa, Norway) on magnetic tape. Data are recorded at half-hourly intervals and every recording consists of current speed, current direction and sea temperature. Tapes are changed at regular intervals, at least twice a year. After retrieval the tapes are read directly into an ALPHA LS1 mini-computer, edited and calibrated. These data, as well as high- and low-passed series (diurnal filter) are stored on 9-track magnetic tape for later analysis. Examples of stored data are shown in Figure 4.

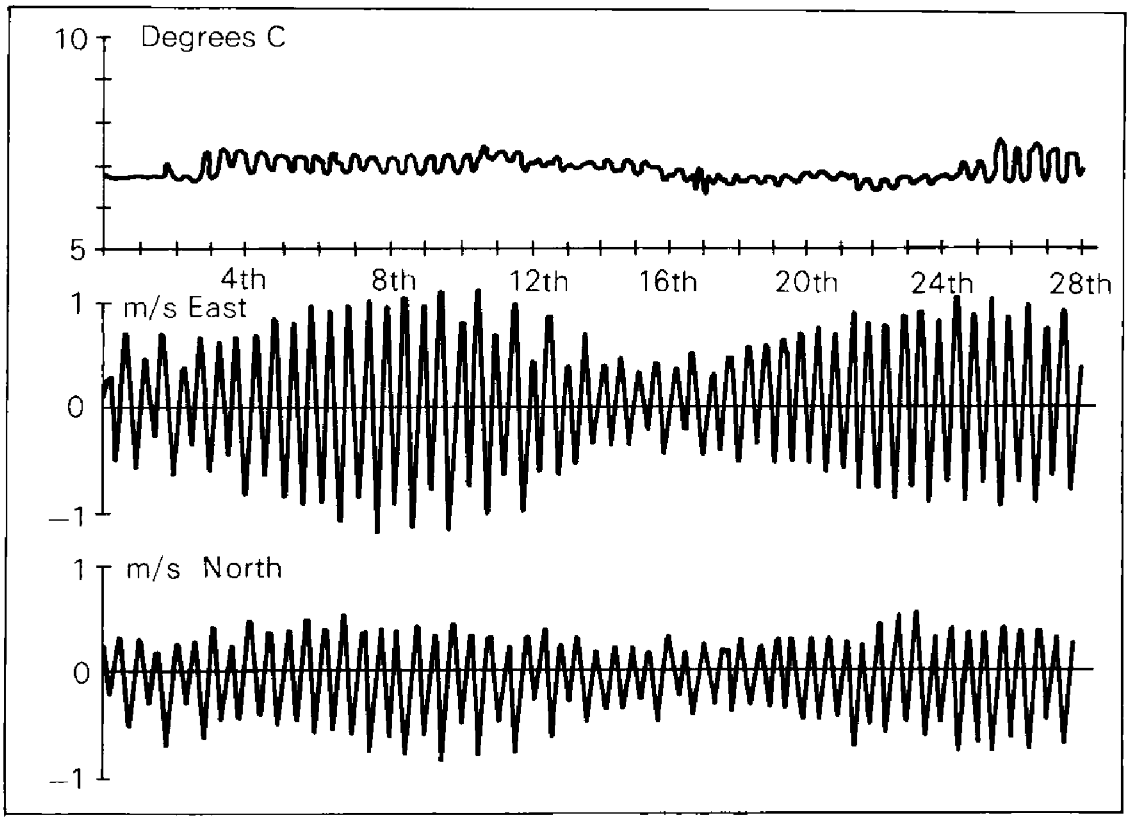


Figure 4. Sea temperature, East current component and North current component during February 1978 at position 'South' in Figure 1

System output

Radio reports. The radio report printed by the computer and broadcast consists of the 2 parameters, wave height H and wavelength L from each of the 4 offshore moorings.

Their definition is

$$H = 4 \text{ (rms-value)}$$
$$L = 1{\cdot}56\,(T_z)^2$$

T_z being the zero-crossing period. These wave characteristics are broadcast 3 times a day in connection with the weather forecast.

Data for coastal engineering. In the Faeroe Islands approximately 50 million Danish krone are spent each year for harbour construction and coastal engineering and, in almost all projects, the information on the wave climate is essential.

It is a well-known problem that design wave conditions have to be set based on wave recordings through only one winter season or, in rare cases, 2 years. In this system the offshore recorders are planned to be in operation continuously, thus steadily increasing the information on the offshore wave climate. The inshore recorders are positioned in direct relationship to specific projects and will be moved at more frequent intervals.

The analysis of the recordings is carried out in 2 stages. The general analysis is a general statistical analysis of wave height, spectral peak period and zero-crossing period. It is made on a routine basis.

The special analysis is carried out on recordings from storm periods and includes visual inspection of weather maps, visual inspection of spectrum, calculation of ratio between simultaneous rms-values inshore and offshore, estimation of the energy transfer function between buoys and investigation of the inter-action between current and wave conditions.

It is hoped that this kind of analysis can establish relations between offshore and inshore sites, such that half a year's inshore recording can give the wave climate at that site with a quality approaching that of the long-term recordings.

Tidal stream tables. The tables will, at least in the beginning, be based on harmonic analysis using the Least Squares Method, which has proved satisfactory in the area as shown by Hansen[5]. Corrections will be made for nodal modulation. The tables will list the times for slack water and for maximum tidal stream at each mooring position offshore, and, further, list speed and direction of the tidal stream at these times. It was planned that tables for 1980 be published in 1979.

System performance

Mooring system. There have been some problems with the mooring system. Two Waverider buoys have drifted ashore and been recovered after breakage of the nylon section of the moorings and one has been lost for the same reason. Experiments to develop a better design are in progress.

Wave recordings. The greatest problem with wave recordings has been radio interference from amateur radio transmitters, especially in Europe, notably Italy, but also from illegal transmitters in the Faeroes. Theoretically, European transmitters ought not to interfere as the carrier frequency is around 27·7 mHz, but, because of special circumstances caused by the high sunspot activity, this is a serious problem.

In November and December 1978 the interference was moderate, but in January it became worse and in February and March 1979 it was quite pronounced.

This is reflected in the percentage distributions of errors shown in Tables 2 and 3. Because of a lightning accident which destroyed one receiving antenna and damaged the receiver, the recordings at location South could not start until 20 February. It is seen in the tables that the most frequent error code is 2 for the offshore locations and 4 for the inshore locations. It is to be stressed, however, that most of the recordings labelled erroneous are perfectly valid and can be used in future analysis. This is the disadvantage of an automatic system which requires error criteria so restrictive as to pass no really erroneous results.

Current recordings. There has been one case of battery failure in the end of a measuring period, one case of entanglement from the bottom line and one case of rotor fall-off in a total of 10 deployments.

Table 2. Error percentage in November and December 1978

Location

Error Code	Offshore				Inshore	
	North	East	South	West	Skopun	Argir
2	5·1	2·7		8·5		0·8
4	1·6	1·8		3·7	17·4	7·8
6	0·9	0·4		2·8	2·1	0·8
8						
10						
12						
14						
16						
18	0·6	1·2		4·9	0·6	
20						
22		0·2		0·4		
24						
26						
28						
30						
	8·2	6·3		20·3	20·1	9·4

Table 3. Error percentage in January, February and March 1979

Location

Error Code	Offshore				Inshore	
	North	East	South*	West	Skopun	Argir
2	10·5	14·4	0·8	18·8	10·6	4·8
4	2·3	8·7	5·7	7·8	30·0	15·2
6	2·5	1·8	0·4	2·7	16·7	6·7
8						
10						
12						
14						
16						
18	2·7	0·7	1·2	10·3	11·2	0·3
20	0·2					
22	0·6	0·2		0·6		
24						
26						
28						
30						
	18·8	25·8	8·1	40·2	68·5	27·0

*From 20 February.

Conclusion

In operation the system has actually exceeded expectations. Problems certainly remain. The mooring system still needs development and the error rate is too high. This, however, is primarily due to the radio noise and it is hoped that it can be reduced either by changing the carrier frequency into another band or by increasing the number of receivers. Apart from these shortcomings, the system has worked very satisfactorily, especially as there has been no case of an obviously wrong measurement passing the error control of the computer. On the contrary the error criteria probably are too restrictive, hence increasing the error rate unnecessarily. They may, therefore, be relaxed somewhat, but as all data are stored regardless of error, the major concern is that the system be absolutely secure so that no false reports occur.

Acknowledgements

Mr Bjarti Thomsen has been engaged in the development and production of the electronic modules. We thank the Coastguard for their splendid co-operation and, certainly, the system would never have been so successful without the expertise of the crew of the m.v. *Tjaldur.*

Note 1. Since the fishermen are satisfied with the system, it is planned to add one more offshore wave recorder which will probably be located off the north-eastern corner of the Faeroe Islands. One more inshore recorder has already been included thus the system will probably soon contain 8 recorders.

The software also has been slightly modified after the paper was written in parallel with the experience gained; the use of high-level language in the central computer makes such alterations very easily implemented.

Note 2. Proceedings from POAC 79 may be obtained from:

The Norwegian Institute of Technology
7034 Trondheim—NTH
NORWAY.

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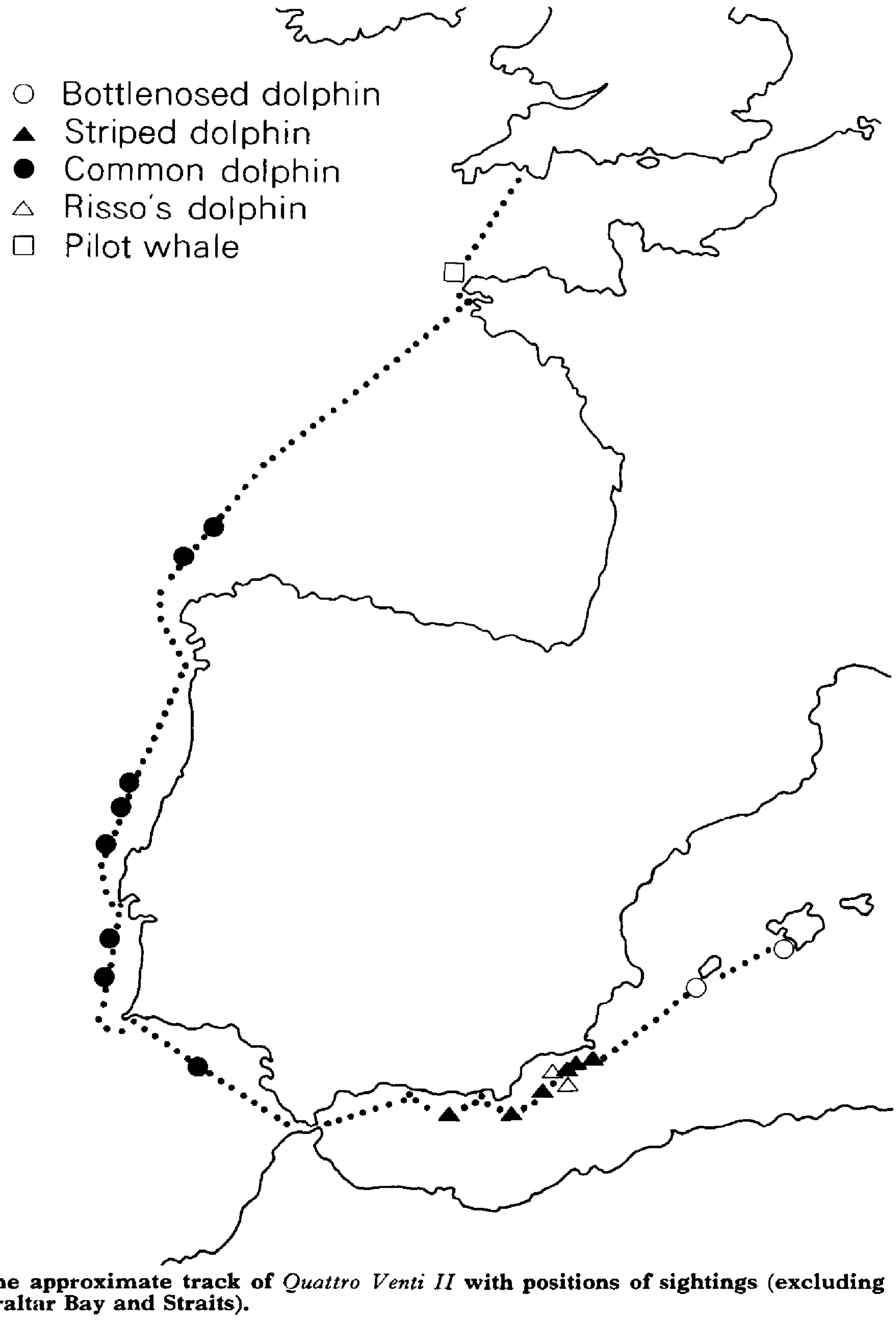
A Report on Cetaceans Observed on Passage from Palma to Plymouth

By D. A. McBrearty

(Department of Anatomy, University of Cambridge)

Introduction

Over the past decade there has been a steadily increasing interest in marine mammals, particularly whales and dolphins. Many books and scientific papers have been written about their general biology and numerous adaptations to a marine existence. The advent of the 'Dolphinarium' has enabled the public to see many of the smaller dolphins for the first time and this, in turn, raises questions on their conservation. The large whales have undoubtedly suffered depletion in stocks, the tuna/porpoise problem in the eastern Pacific may have had a long-term effect on local dolphin populations. Many people have produced possible answers to these problems, but a similar number would disagree with their findings. With the decline in commercial whaling and the real possibility of an eventual total ban on whaling, there is a need to know what the status is of each species. This is why continued observation of cetaceans is so important if we are to have any real information about what is happening to populations.



The approximate track of *Quattro Venti II* with positions of sightings (excluding Gibraltar Bay and Straits).

I have received much correspondence in the past few years from professional seamen and yachtsmen who say that whilst on passage they do not see as many whales and dolphins as in previous years. If this observation is correct, then it may be true only for the principal shipping routes—there is little way of knowing what is outside the normal shipping tracks. The information which comes from observers on merchant vessels is extremely useful, but there is a very real problem with identification. Depending upon individual views of classifications, there are perhaps 80–100 different species of cetaceans; most of these have a limited distribution pattern but others may be found world-wide. It is, therefore, essential to have a full description of an animal if one is to have any chance of identifying it. The principal points to note are over-all size, a description of the outline including the shape of the head, the position and shape of the dorsal fin and of the pectoral fins and flukes. An accurate description of the pigmentation pattern is essential. Finally, in the case of the larger whales, an indication of the type of 'blow' and of the diving characteristics (for example, does the dorsal fin appear at the same time as the 'blow' or later, and are the flukes raised when the animal sounds) is very useful indeed.

In April 1980 an offer was made to accompany the owner of a large private yacht on passage from Palma, Majorca to Plymouth; the object was to make observations on the different species of cetaceans which may be seen and to assess the degree of difficulty in making positive identifications—this latter point being most important when gathering data and planning any other larger, more-detailed survey. It was intended that the passage be made in 1- or 2-day short stages to enable time to be taken to deviate from the route and follow any interesting concentrations of animals.

The vessel from which these observations were made was the *Quattro Venti II*. This was a 25 metre, twin-screw motor yacht of 140 tons, Norwegian built by Romsdal in Hjelset in 1962. She was a well-equipped and seaworthy boat constructed along the lines of a traditional Norwegian fishing boat of $6\frac{1}{2}$ centimetres inside and outside Norge fir planking on 15 cm × 18 cm laminated fir frames. Extra equipment included radar, automatic pilot, stabilizers and 2 echo-sounders. An observation 'bucket' on the foremast about 9 metres above the water-line and giving a visible horizon of some 6·3 nautical miles was also available.

Results

A total of 13 full days and 2 half days were spent at sea in the main vessel; on 2 more half days the tender was used. Twenty-five schools of animals were sighted, see Figure 1. The number of animals varied in each school and 5 different species were represented as shown in Table 1.

Table 1. Animals observed on passage

Species	Number of Schools	Number in School Max	Number in School Min	Total Animals
Tursiops truncatus	2	7	5	12
Delphinus delphis	13	100	2	285
Stenella coeruleoalba	6	60	5	165
Grampus griseus	2	9	6	15
Globicephala melaena	2	18	4	22

Tursiops. The Bottlenosed dolphin (*Tursiops truncatus*) is an animal found world-wide in temperate and tropical waters. In over-all length adults may reach as much as 4 metres but are usually about 3 metres. A review of the species is much needed as obvious differences exist in certain geographical populations. At the moment only one species is recognized although others, such as *T. aduncus* from the Indian Ocean and *T. nuuanu* from the eastern Pacific may be found both in inshore and offshore waters. In the North Atlantic their diet consists of shoaling fish such as herring or mackerel, together with some squid.

Two schools of *Tursiops* were seen, both on the 100-metre depth contour and both were sighted in the early morning. The first school contained 5 dolphins: a large male of over 2·5 metres, 3 others at 2·25 metres and 1 juvenile at 1·5 metres. The second school was of 7 dolphins travelling in 3 distinct pairs with 1 juvenile of approximately 1 metre in length accompanying 1 pair. The length at birth of North Atlantic *Tursiops* (Florida) is 108–126 centimetres and birth takes place during the periods February to May and September to November (Harrison *et al.*, 1972). The largest animal with this group was over 3 metres in length. It was interesting to observe that whilst both schools approached the vessel readily and began bow-wave riding, the juvenile separated from their accompanying adults and did not approach nearer than 25 metres.

Delphinus. The common dolphin (*Delphinus delphis*) is another animal which is found throughout the world in all but the coldest oceans. Currently only one species is recognized but there is a great deal of regional variation in over-all length, beak length and in colour. There is some evidence that those dolphins on the Atlantic coast are morphologically different from those found in the Mediterranean (Gihr & Pilleri, 1972). The common dolphin of the southern hemisphere is also quite different (van Bree & Purves, 1972).

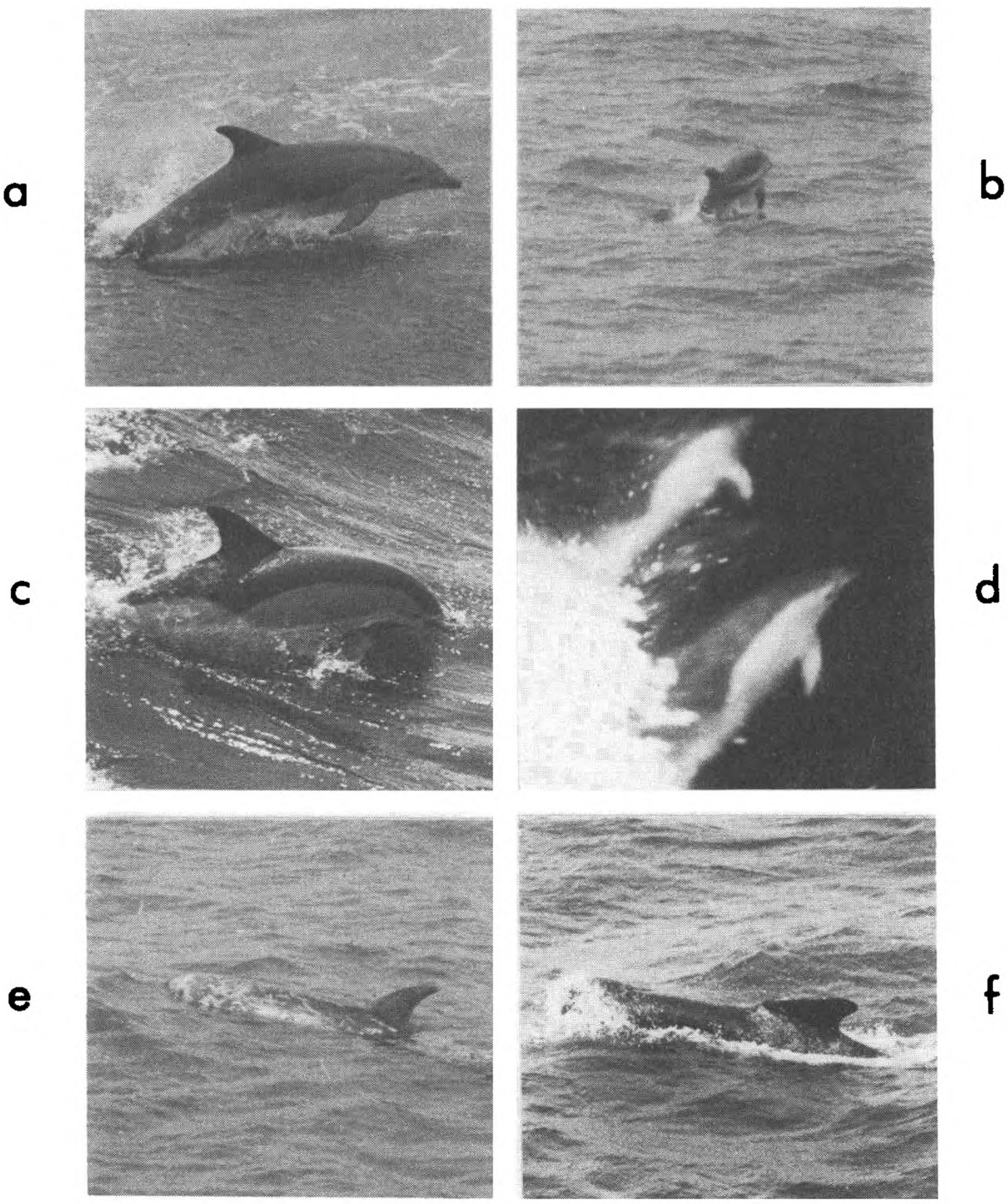
Over a period of 4 days several schools of *Delphinus* were seen in Gibraltar Bay, these were exclusively of the smaller Mediterranean variety. The flanks showed clearly the horizontal figure-of-eight crossover pattern. There was also a long beak, small heavily curved dorsal fin and small pointed pectoral flippers. The dorsal surface was a dark charcoal grey and the dorsal fin was a lighter grey in the centre. On the flanks the foremost 'lozenge' was white or a very light grey whilst the hind-most part was a much darker grey. The bridle mark from the beak to the anterior insertion of the pectoral flipper was not much in evidence, neither were other marks. Over-all length of these dolphins was approximately 1·5 to 1·7 metres.

In the Straits of Gibraltar, close to the Moroccan coast, more *Delphinus* were seen; these were larger with an average length of over 2 metres. Although their general configuration was similar, their colour pattern was quite different. Their most striking feature was a light orange patch or 'lozenge' between the insertion of the flipper and the pigment of the dorsal surface below and forward of the fin. The dorsal pigmented surface which had been a charcoal grey in the smaller animals, was a darker browny grey in these.

To the north-east of Cape Finisterre yet another apparently different *Delphinus* was seen. This variety was a similar size to the dolphins seen in the Straits of Gibraltar but they were pale yellow in colour where the others were orange. The pectoral flippers, which were greyish in the Straits dolphins, were pale yellow in these.

There was a similarity in school composition in all 3 types of dolphin in that the schools were composed of 8–20 individuals without any apparent pairing and in that no juveniles were seen. All animals in each group were of similar size and appearance, a difference was, however, noted in the behaviour pattern. Those dolphins observed in Gibraltar Bay displayed little interest in the vessel other than actively to avoid it. On the other hand, those *Delphinus* encountered in the Straits and also in the Atlantic came towards the vessel and engaged in the apparent sport of bow-wave riding.

Stenella coeruleoalba. The euphrosyne dolphin, or the blue white dolphin, is yet another species which, in various forms, is found world-wide in many seas. It is being seen more frequently in the western Mediterranean than is *Delphinus* and in certain areas it is believed to be replacing this dolphin as the common species (Collet, personal communication).

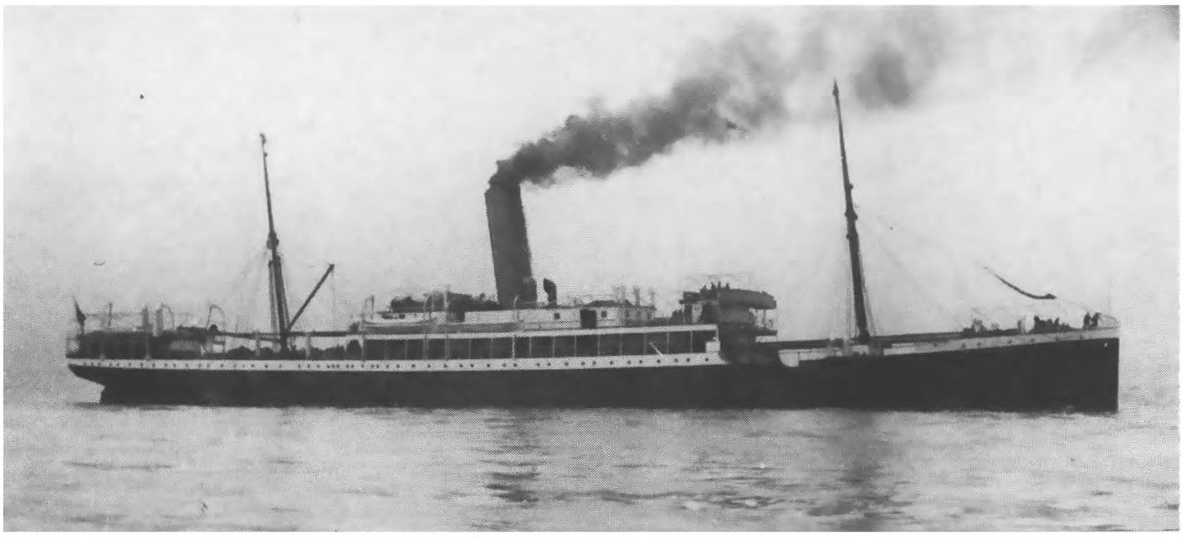


(a) Bottlenosed dolphin (*Tursiops truncatus*)
(b) Striped dolphin (*Stenella coeruleoalba*)
(c) Common dolphin (*Delphinus delphis*) showing horizontal figure-of-eight pattern on flanks
(d) From 8 mm colour film showing light-coloured *Delphinus*
(e) Risso's dolphin (*Grampus griseus*)
(f) Pilot whale (*Globicephala melaena*)

CETACEANS PHOTOGRAPHED ON PASSAGE PALMA TO PLYMOUTH

(*see* page 77)

Opposite page 81



Leopoldville

Fantee

Fourah Bay

Photo by W. Ralston Limited

VESSELS OF ELDER DEMPSTER LINES LIMITED (*see* page 82)

Six schools of these dolphins were seen, one with only 5 individuals, the others with approximately 20. The behaviour pattern was similar in that all approached the vessel from the west. With only one exception all schools changed course to engage in bow-wave riding for 5–10 minutes. All the *Stenella* which were identified were seen off the Mediterranean coast of Spain, none were seen in the Atlantic.

Grampus griseus. Risso's dolphin has a world-wide distribution pattern. It has been reported from northern and southern hemispheres in both tropical and temperate seas. They are numerous off the Hebrides during summer and are often seen in the western Mediterranean. Seasonal migrations have been suggested for the northern Atlantic, but there is still some doubt on this point (Mitchell, 1975).

These dolphins are readily identifiable at sea. They reach a length of at least 4 metres and have a robust build; the head is bulbous with a central crease which appears to divide the 'melon' into 2 hemispheres and there is no beak. The dorsal fin is tall and erect, as much as 40 centimetres high, and has a pronounced curve on the trailing edge. The over-all colour is a mottled grey with many light and dark scars over the surface. Dorsal fin, flippers and flukes are generally of a darker grey than the body, older animals become progressively whiter.

Two schools of Risso's dolphin, one of 6 animals, the other of 9, were seen in the Mediterranean. The dolphins showed no fear of the vessel and approached readily. In both schools the largest individual, presumably male, appeared to be leading the group. This animal also placed itself between the vessel and the rest of the school whilst making several circuits of the vessel prior to moving off. On each occasion the departure was accompanied by much splashing and tail slapping from this 'leader'.

Globicephala melaena. The long-finned Pilot whale (*Globicephala melaena*) is found on both sides of the North Atlantic, including the western Mediterranean. The short-finned, or tropical Pilot whale (*G. macrorhynchus*) is known to reach as far north as Madeira (Maul & Sergeant, 1977), but it is not known whether there is a crossover in the range of the 2 species.

Two small schools of Pilot whale were observed, one of 4 individuals and one of 18, including 2 juveniles. The smaller group were seen off the Britanny coast, the larger group were in the middle of the Straits of Gibraltar between the eastbound and westbound shipping lanes. Both schools were the same species, namely the North Atlantic or long-finned Pilot whale (*G. melaena*). The length of the adult animals in the Straits was 5·5 metres, that of the 2 juveniles accompanying them was 2·2 metres. Birth in the North Atlantic Pilot whale occurs in the autumn and the length at birth is 1·8 metres (Slijper, 1962). This would indicate that the accompanying juveniles were born between August and November 1979.

No other whale species were seen although many types, both large and small, do occur in the areas through which the vessel sailed.

Conclusions

Taking into account the sea area covered by these observations, the number of dolphins seen was more than I expected. The track we followed was approximately 2000 n. mile long but effectively only about 2 n. mile wide. The visual width varied considerably with the prevailing weather conditions, in particular with the state of the sea and position of the sun. Part of the voyage was, of necessity, completed at night; there were, therefore, areas along the track where no watch was kept.

Perhaps the most interesting of the observations were those made on *Delphinus*. There was a very obvious size and colour difference between those seen in Gibraltar Bay and those in the Straits; there was a difference again in the colour pattern of those off Finisterre. This poses the question 'how many of these presumably local populations are there and just how valid are they?'.

In good conditions, recognition of those animals which came close to the vessel was relatively easy, the significant characteristics of size, shape, colour pattern and dorsal fin being, at times, obvious up to a nautical mile distant.

Photography of animals at sea can, at times, be quite difficult and a large element of luck is required for the best results. As many animals often ride on the pressure wave at the bow of a vessel, the observer is presented either with a shot mostly from above or one head-on as they approach. Although the markings and colour pattern may be clearly seen, unless the animal jumps clear of the water, photographs can be disappointing, see photographs opposite page 80. It is, therefore, essential that an accurate description of the animal with size, shape and markings is provided if a positive identification of a species cannot be made at the time. It is possible to make a reasonable assumption of what one observer has seen, but one cannot identify unless all the physical characteristics are noted. If part of the information is missing, one is left with too many options to be certain of species.

One important consideration is observer fatigue; there is a limit to the amount of time which an observer can spend watching for a dorsal fin to break the surface. Although a total of 25 dolphin schools of various sizes were seen, there is no way of knowing how many, or indeed if any, were missed.

Acknowledgements

Grateful thanks are expressed to the owner of the *Quattro Venti II*, the Hon. Hugo Money-Coutts, whose generosity made this trip possible; to Professor R. J. Harrison F.R.S. for his comments on the manuscript; to Ms G. A. King and Mrs H. Baker for technical assistance and to the Cambridge Philosophical Society for a grant towards expenses.

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LONG ASSOCIATION WITH SHIPOWNERS— ELDER DEMPSTER LINES LIMITED

Following our usual annual practice of writing a short article about a Company with whom we have had long association, we continue this year with Elder Dempster Lines Limited, now absorbed into Ocean Transport and Trading Limited.

The formation of Elder Dempster, as we know it today, goes back to 1852; it was in that year that McGregor Laird, a man gifted with ideals and visions of the future, sowed the first seed to create, what was to become, the greatest shipping line ever to link the West Coast of Africa with the United Kingdom.

To further Laird's interest in the West African trade, the African Steamship Company was formed. It was incorporated by Royal Charter in 1852 and was based in Mincing Lane, London, the home of many well-known shipowners. At this time Laird commenced an operation with a vessel called *Forerunner*, followed closely by *Faith*, *Hope* and *Charity*. In looking at the history of Elder Dempster the name of their first vessel—*Forerunner*—was singularly appropriate being the first of some 467 vessels to be operated within the Elder Dempster fleet list.

With the formation of the African Steamship Company (Yellow Funnel Fleet), suitable agencies had to be found. McGregor Laird's brothers, William and Hamilton Laird, were appointed Liverpool agents and the firm was known as W. and H. Laird. Regrettably, Hamilton died and this resulted in the name of the Company being changed to Fletcher and Parr. Employed within this agency were 2 young Scots whose names were John Dempster and Alexander Elder; both of these men were inspired by the same enthusiasm which fired McGregor Laird for the West African trade. At this juncture the African Steamship's home port was transferred from London to Liverpool on a trial basis. The trial proved successful and, in 1856, Liverpool became the permanent home port.

Alexander Elder was appointed Superintendent Engineer of the African Steamship Company at Liverpool, a position he held until 1866 when he resigned to become a Surveyor with the Board of Trade. Towards the end of 1868 a number of Glasgow business men approached Dempster asking him to act for them as agent for a new shipping company they proposed to set up to trade with West Africa. Dempster agreed but, deciding he wanted an active partner, approached his old friend Elder who agreed to join him so giving up his position in the Board of Trade. It was as a result of this union that the firm, now known as Elder Dempster Limited, was to set out on the road to success. In partnership they acted as representatives for the newly formed British and African Steam Navigation Company (Black Funnel Fleet).

As previously mentioned the firm of Fletcher and Parr were acting as Liverpool agents for the African Steamship Company. It is now that Alfred Lewis Jones comes into the story.

Jones completed one round voyage to West Africa as cabin boy and obviously made some impression for, on his return, he was to join Fletcher and Parr where he served from 1860–75. In 1875 Jones decided to establish a business on his own and, in that year, set up a small shipping insurance brokerage office in Dale Street, Liverpool. He commenced by chartering small sailing vessels for the West African trade and later chartered a steamer. The business proved to be extremely successful.

The 2 main line companies to West Africa—African Steamship Company and British and African Steam Navigation Company—became quite alarmed at Jones' success and, fearing competition in their trades, Jones was induced to give up the charter of his first steamer, and, on 1 October 1879, was invited to become a junior partner with Elder Dempster and Company. This was indeed a significant day in the Company's history. Five years later Elder and Dempster both retired from the Company and soon afterwards Jones was left as the controlling partner. His brilliant brain, personality and abundance of energy led from one success to another.

We now come to the end of the 19th Century by which time Jones had acquired control of the African Steamship Company and, soon after, of the British and African Steam Navigation Company. Both Companies were now under the full control of Elder Dempster and Company although retaining individual identity.

The first association of the Meteorological Office with Elder Dempster and Company took place when s.s. *Leopoldville* was recruited as a voluntary weather reporting ship on 15 March 1904. She is described as being a steel steamship of 4152 g.r.t., length 375 feet, speed 13 knots, built by Sir Raylton Dixon and Company Limited of Middlesbrough. On this, her maiden voyage, she was commanded by Captain G. B. Sparrow. Captain Sparrow, assisted by Chief Officer E. Puxley, Second Officer Jones and Third Officer Peters, kept the meteorological logbook.

The first meteorological logbook was commenced on 24 April 1904 and completed on 13 August of the same year. It covered 2 round voyages between Southampton and West African ports which included Tenerife, Dakar, Sierra Leone, Sekondi, Cape Coast Castle, Banana, Sherwood Creek and Accra outward with second calls at the same ports for loading homeward. The meteorological instruments supplied in those days were a mercury barometer, wet- and dry-bulb thermometers, sea-temperature thermometers and a hydrometer for obtaining sea-water density. Observations were made 6 times daily at the end of each 4-hour watch.

Captain Sparrow's 2 voyages appear largely uneventful. From the 3 months and 20-day period covered by the logbook, 2 weeks were spent in Southampton between voyages and 5 weeks were spent at anchor in Banana Creek; thus the remainder of the voyages must have been carried out with minimum delays. Except for Banana, all other ports appear to have been cleared in less than 1 day.

The *Leopoldville* was transferred to the African Steamship Company in 1908 and renamed *Landana.* In 1910 she was sold to Spanish interests but her career ended prematurely in 1917 on a voyage from Barcelona towards Manila via the Cape when her back was broken by an explosion which occurred on 25 May 1917. With bow and stern pointing skywards she plunged beneath the waves within 5 minutes; only 24 of the 150 passengers and crew survived. The mine which caused the explosion was laid some weeks previously by the German raider *Wolf.*

The recruitment of *Leopoldville* as a weather observer in 1904 was followed by that of *Sekondi*, *Biafra*, *Degama*, *Nyanga* and many others over the years to follow. *Nyanga* was the first ship to be lost during the 1914–18 War—she met her fate when she unfortunately encountered the German armed merchant cruiser *Kaiser Wilhelm Der Grosse* off the Spanish Sahara coast.

Another interesting case was that of the *Appam.* She was attacked and captured by the German commerce raider *Moewe* in January 1916. The Germans put a prize crew on board and sailed for Newport News, USA, which at that time was a neutral country. The Company were most fortunate to regain the *Appam* at a later date for she proved to be a very useful asset until being withdrawn from service in 1931.

By 1914 the Company controlled 101 ships of which 29 were lost during hostilities.

During the years between the wars, Elder Dempster, along with other ship-owners world-wide, experienced the slump of the 1920s and 30s. This resulted in many of their ships being laid up for lengthy periods and the River Dart became the temporary home for many Elder Dempster ships.

This period passed and in the late 1930s Elder Dempster took delivery of a number of new ships amongst which were the handsome cargo/passenger liners *Seaforth*, *Sansu* and *Sangara.* At the commencement of World War II the fleet stood at 44 vessels of 218 000 gross tons. At the end of the conflict 25 ships had been sunk.

Post-war world trade boomed. Ships of all kinds were purchased and/or built. Mail/passenger ships and many cargo vessels came into service.

In 1968, Elder Dempster Lines and their subsidiary, the Guinea Gulf Line, together with P. Henderson and Company, were all absorbed into the Ocean Steamship Company which was, shortly afterwards, retitled Ocean Transport and Trading Limited.

The 3 photographs opposite page 81 show:

(1) s.s. *Leopoldville*, see details above.

(2) s.s. *Fantee*, 5663 gross tons, built 1919, speed 12 knots, sold in 1933 to Greek interests.

(3) m.v. *Fourah Bay*, 7704 gross tons, built 1961, speed 16 knots, sold in 1978 to Xoces Limited, Bermuda (Mexican National Line).

Since amalgamation with Ocean Transport and Trading, the Company has diversified in the marine and distribution fields.

The contribution which Elder Dempster Lines and their associate companies have made to the Meteorological Office over the past 77 years has been of incalculable value and our grateful thanks go to all serving Masters and Officers as well as to the many who have gone before.

We wish the Company success in all their business ventures in the future.

J.D.B.

PRESENTATION OF BAROGRAPHS

The presentation of Special Long-Service Awards to officers of the Voluntary Observing Fleet was introduced in 1948. Four of these awards are made annually to officers who have been selected in recognition of the quality and quantity of their meteorological observations over a number of years, thus having rendered considerable valuable service to the Meteorological Office.

As announced in the January edition of this journal the 4 Masters qualifying for the year ending December 1979 were: Captain R. M. Michael, P. & O. Strath Services; Captain B. Hammond, formerly of Panocean-Anco; Captain J. A. McKay, Manchester Liners and Captain J. K. Currie, Cayzer Irvine Shipping. Most regrettably only 2 of the 4 recipients were able to attend on this occasion—Captains McKay and Currie—but we were fortunate to welcome Captain A. C. Davies, Marine Manager of P. & O. Strath Services and Captain A. Osborne, Fleet Manager of Panocean-Anco who received the awards on behalf of Captains Michael and Hammond respectively. It was also our pleasure to welcome Mrs J. A. McKay who accompanied her husband in addition to Mr F. M. Marchant, General Manager of P. & O. Strath Services; Captain C. R. Kelso, Chief Marine Superintendent of Cayzer Irvine and Captain B. M. O'Connor, Marine Superintendent of Newgate Shipping Company, an associate of Cayzer Irvine.

The ceremony took place on 5 November 1980 at Meteorological Office Headquarters in Bracknell when the presentations of inscribed barographs were performed by Sir John Mason, F.R.S., Director-General of the Meteorological Office. Sir John, after expressing his appreciation of the lengthy period of outstanding service carried out by the recipients, emphasized the continuing importance of ships' observations both at present and in the foreseeable future and said that, in spite of meteorological satellites and data buoys, ships' observations were of fundamental importance. Sir John also remarked that, although ships now spent more time at sea than in earlier days, there were fewer ships to make observations, thus making each individual observation that much more valuable.

The Masters were able to peruse the first meteorological logbooks they had compiled, the earliest being as far back as 1949. This, as usual, provoked a discussion between them and the management side of their companies about the subsequent careers of their fellow officers whose names were, of course, also recorded in the logbooks. It was noted that several of these former shipmates had already received long-service awards from the Meteorological Office in recent years. A photograph taken at the presentation appears opposite page 73.

The guests were then entertained to luncheon by Sir John Mason and senior officers of the Meteorological Office. Afterwards they were shown around the Central Forecasting Office and the Telecommunications Centre.

J.D.B.

AURORA NOTES APRIL TO JUNE 1980

By R. J. Livesey

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

During the period auroral and magnetic activity remained relatively low in contrast to the corresponding periods in 1978 and 1979. From the autumn of 1979 onwards there has been a marked decline in reports of visual and radio aurorae as the following table shows:

	July–Sept.	Oct.–Dec.	Jan.–Mar.	Apr.–June
No. of nights visual aurorae reported	40	24	14	11
No. of nights radio aurorae reported	16	15	12	4
No. of nights having intense magnetic activity	11	3	6	10

It should be noted that the above figures are subjective and dependent upon the availability of observers with suitable observing conditions.

The period began with auroral forms observed between the 3rd and 7th of April followed by isolated reports on the 11th, 14th and 18th neglecting doubtful glows of an unconfirmed nature. Magnetic disturbance was noted between the 6th and the 12th with radio aurorae on the 9th and 10th.

During May there were reports of auroral forms on the 8th, 11th, 13th and 25th; reports of auroral forms with associated magnetic activity were made on the 5th to the 12th, the 25th, 29th and 31st. Radio aurora was observed on the 25th.

The very active aurora reported by the *Moreton Bay* on the 26th in the southern hemisphere correlated with a glow observed by the *Admiral FitzRoy* in the northern hemisphere and, of course, with the radio aurora and magnetic effects. The *Moreton Bay* was positioned north of the southern magnetic polar auroral zone, but in a good vantage point to see any activity that developed and expanded equatorwards.

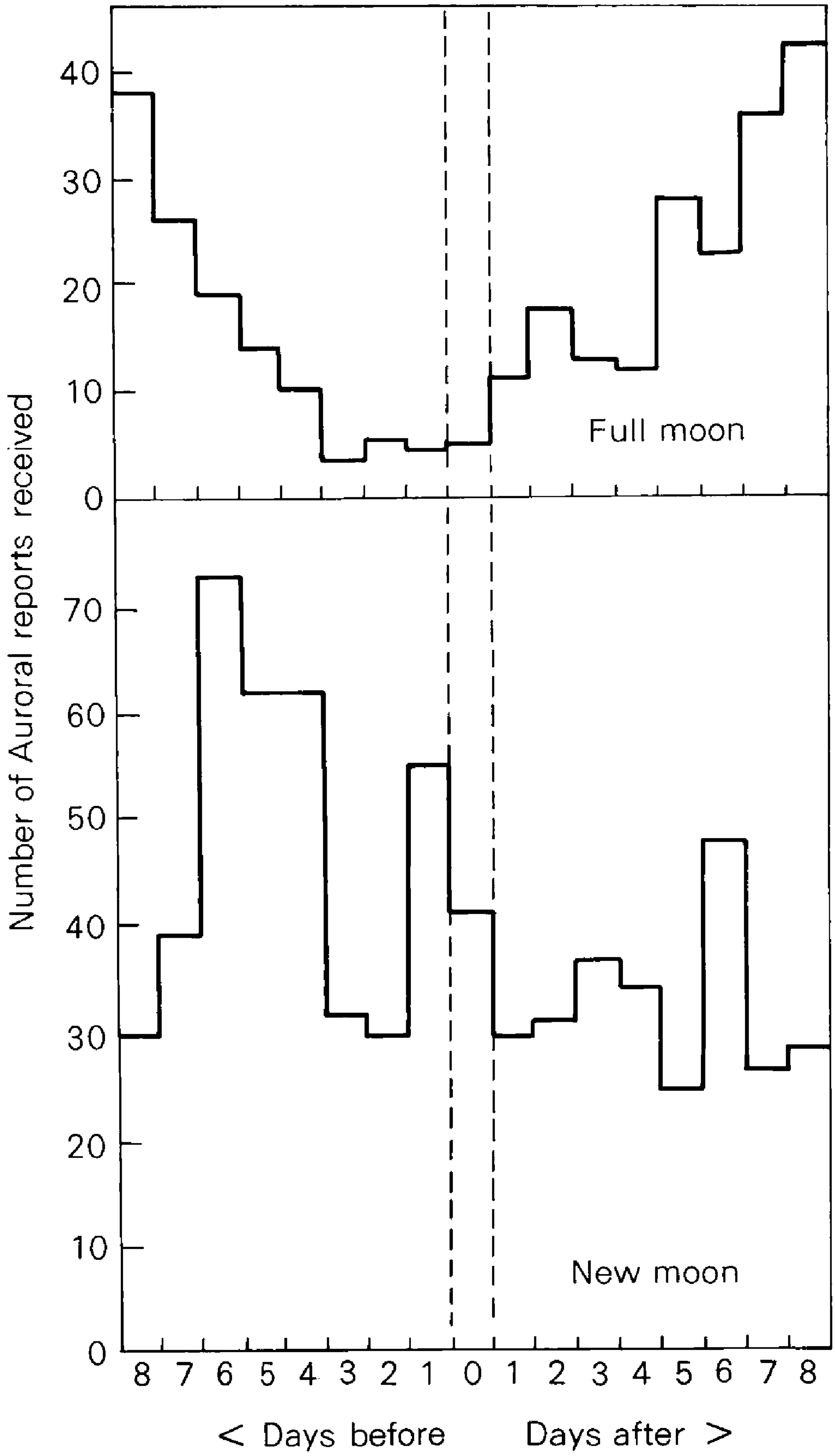
No visual aurorae were reported during June but radio effects were noted on the 11th whilst magnetic disturbances were recorded on the 6th to the 12th, the 24th and 26th.

The probability that visual aurora will be observed when it occurs relates not only to the observer's position but also to weather conditions and to the state of moonlight. The number of auroral reports received in terms of days before and after new and full moons from 13 January 1976 to 31 March 1980 are shown in the diagram. Notwithstanding the chance that a large number of reports were received in respect of particular events within the new moon period, moonlight had considerable effect on the observability of activity. As has been stated in previous Notes, interference filters are used by professional and skilled amateur observers in order to differentiate between auroral light and moonlight in these circumstances.

With regard to the effects of cloud, the nature of weather will vary with geographical position and no generalized comments may be readily applicable to a given position. It may be of interest to compare the mean annual frequency of visual aurorae present and visible were there no cloud cover, as derived from Fritz' original work[1], with the mean annual expectation of seeing aurorae, taking cloud cover into account as derived from Bates' chart[2] as indicated in the following table:

	Lerwick	Kirkwall	Inverness	Aberdeen	Glasgow	Newcastle
Actual auroral frequency (Fritz)	100	80	63	45	32	22
Observed auroral frequency (Bates)	30	20	15	10	7	5

The above figures would suggest that about 1 in 4 of auroral storms are observed. The actual frequencies, as demonstrated in previous Notes, vary from year to year



Sum of aurora reports received by the British Astronomical Association from 13 January 1976 to 31 March 1980 for days related to full and new moon.

in accordance with solar activity. The writer has found that, at Glasgow, only about 1 night in 5, on the average, is suitable for astronomical observing, but sometimes there are gaps in the cloud cover, unsuitable for telescopic work, sufficient to check whether or not auroral light is present.

It may be of interest to mariners that a fine series of auroral observations were made by Danish light-vessel crews between geographic latitudes 54° and 57° for the years 1897 to 1937[3]. Aurorae were most frequently seen in October and March. Hardly any were seen in June and July, whilst during the period November to February they were at approximately half the frequency of those seen at the equinoxes. Whereas the pattern of distribution varies from location to location throughout the world, the tendency to aurorae being more likely to be seen at the equinoxes is found, for example, in the long-standing records from Norway, Alaska and Scotland.

REFERENCES

[1] Fritz, H., *Das Polarlicht*, F. A. Brockhaus, Leipzig, 1881.
[2] Bates, D. R., *Physics of the Upper Atmosphere*, (Ed. Ratcliffe) Academic Press, London, 1960.
[3] Egeda, J., *Observations of Aurorae from Danish Light-Vessels during the years 1897–1972*. The Danish Meteorological Institute, Copenhagen, 1937.

Date 1980	Ship	Geographic Position		Time (GMT)	Forms
7 April	*Challenger*	54° 00'N	16° 36'W	0000	RdB
12	*Admiral Beaufort*	57° 09'N	19° 58'W	0100–0200	hA
12/13	*Admiral Beaufort*	57° 13'N	19° 49'W	2348–0250	N
15	*Challenger*	54° 40'N	11° 12'W	0000	RdB
14 May	*Admiral FitzRoy*	56° 54'N	20° 17'W	0220	N
16	*Admiral FitzRoy*	57° 19'N	20° 03'W	0330	N
26	*Admiral FitzRoy*	56° 50'N	19° 28'W	0245–0310	
26	*Moreton Bay*	39° 14'S	146° 10'E	1400–1420	qP, aP, acR
31	*Admiral FitzRoy*	56° 44'N	19° 08'W	0100–0200	N

KEY: A = arc, a = active, B = band, c = coronal, h = homogeneous, N = unspecified form, P = patch, q = quiet, R = Ray, Rd = rayed.

Marine Aurora Observations April to June 1980

ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM SEPTEMBER TO NOVEMBER 1980

The charts on pages 90 to 92 display the actual and normal ice edges (4/10 cover), sea-surface and air temperatures and surface-pressure anomalies (departures from the mean) so that the abnormality of any month may be readily observed. (The wind anomaly bears the same relationship to lines of equal pressure anomaly as wind does to isobars. Buys Ballot's law can therefore be applied to determine the direction of the wind anomaly). Southern and eastern iceberg limits will be displayed during the iceberg season (roughly February to July). In any month when sightings have been abnormally frequent (or infrequent) this will be discussed briefly in the text.

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

September

There was an anomaly for cold north-westerly winds over the Canadian Arctic Archipelago where ice re-formed earlier than usual, extending eastwards and southwards; by the end of the month thin new ice covered Lancaster Sound and had extended along the northern shores of Foxe Basin. In other parts of the Arctic anomalies of pressure and temperature were rather small and there was little change in the pattern of ice anomaly from that at the end of August, a notable feature being the persistence of an unusually wide lead off the east coast of Greenland; a substantial excess of ice in the Kara Sea also persisted.

OCTOBER

The rapid spread of ice eastwards and southwards in the Canadian Arctic continued despite somewhat higher temperatures than normal during October. By the end of the month ice had formed around all coasts of Baffin Island and in the northern part of Hudson Bay. East of Greenland, where northerly winds had given lower temperatures than normal, the notable lead of earlier months froze over and pack ice drifted farther south along the coast than is usual by the end of October. Over the Kara Sea there was some check in the formation of ice when temperatures were somewhat higher than normal in association with south-westerly winds.

NOVEMBER

There was a strong anomaly for high pressure between Iceland and the North Pole. As a consequence north-easterly winds with low temperatures were common over the Barents and Kara Seas and northern Europe. Ice developed more rapidly than normal in these seas and also in the Baltic. East of Greenland the ice edge lay close to its normal position for the time of year. Off north-east Canada the spread of ice continued rapidly despite a second month with temperatures near or above average.

REFERENCES

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

Baltic Ice Summary: September–November 1980

No ice was reported at the following stations during November: Emden, Bremerhaven, Hamburg, Flensburg, Kiel, Lübeck, Rostock, Stralsund, Stettin, Gdansk, Copenhagen, Aarhus, Oslo, Kristiansandfjord, Tallin, Riga, Ventspils, Klaipeda, Turku, Mariehamn, Norskar, Bredskar, Sundsvall, Oxelsud, Visby, Kalmar, Göteburg, Stockholm, Turku.
No ice was reported at any of the stations during September and October.

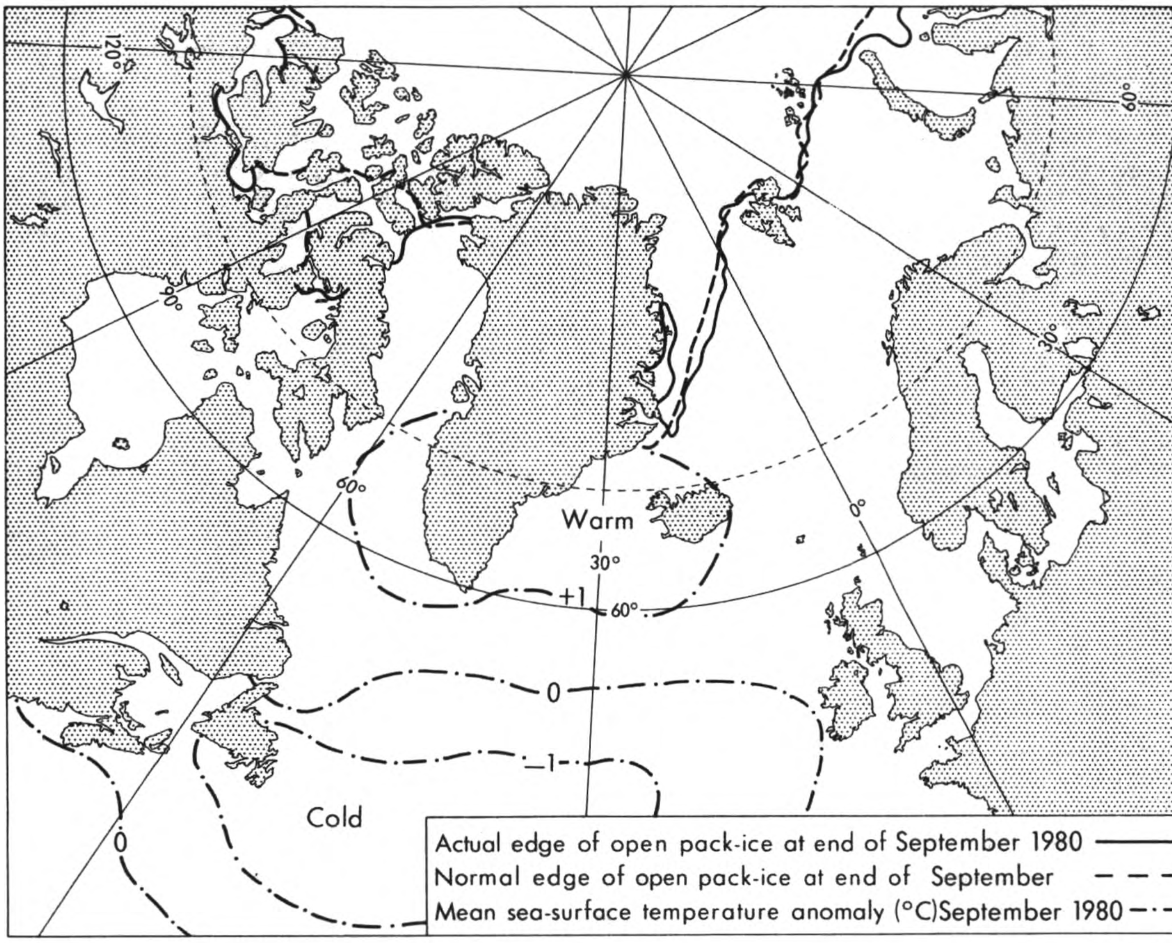
NOVEMBER

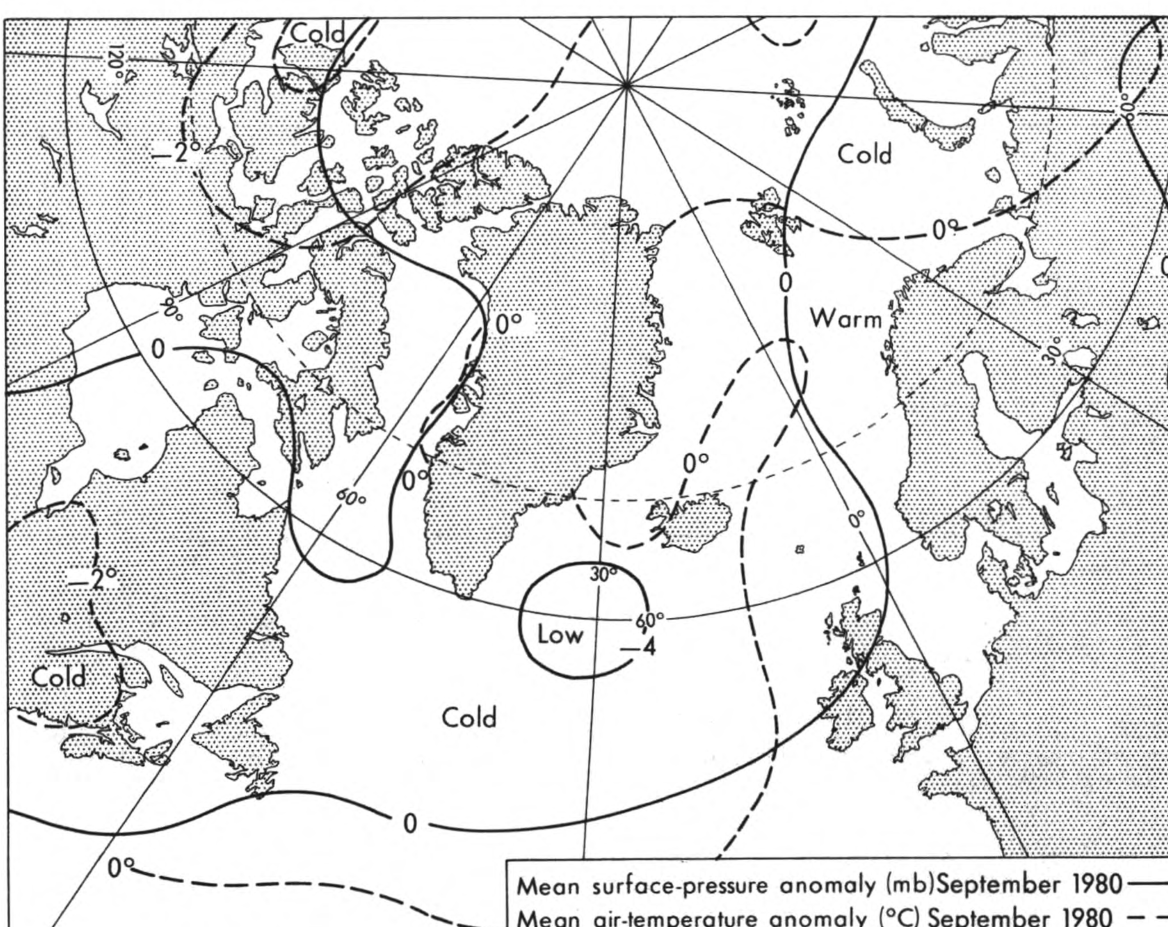
Station	Length of Season		Ice Days			Navigation Conditions			Accumulated Degree Days
	A	B	C	D	E	F	G	H	I
Leningrad	26	30	5	0	1	5	0	0	98
Pyarnu	30	30	1	0	0	1	0	0	45
Viborg	14	30	17	2	1	15	0	0	—
Helsinki	28	28	1	0	0	0	0	0	108
Mantylouto	30	30	1	0	0	1	0	0	—
Vaasa	24	30	7	6	1	6	0	0	167
Oulu	24	30	7	7	0	0	0	7	312
Roytta	24	30	7	0	0	2	0	0	—
Lulea	17	30	13	13	0	13	0	0	348
Skelleftea	28	30	3	3	0	3	0	0	—
Sandarne	29	30	2	0	0	2	0	0	—

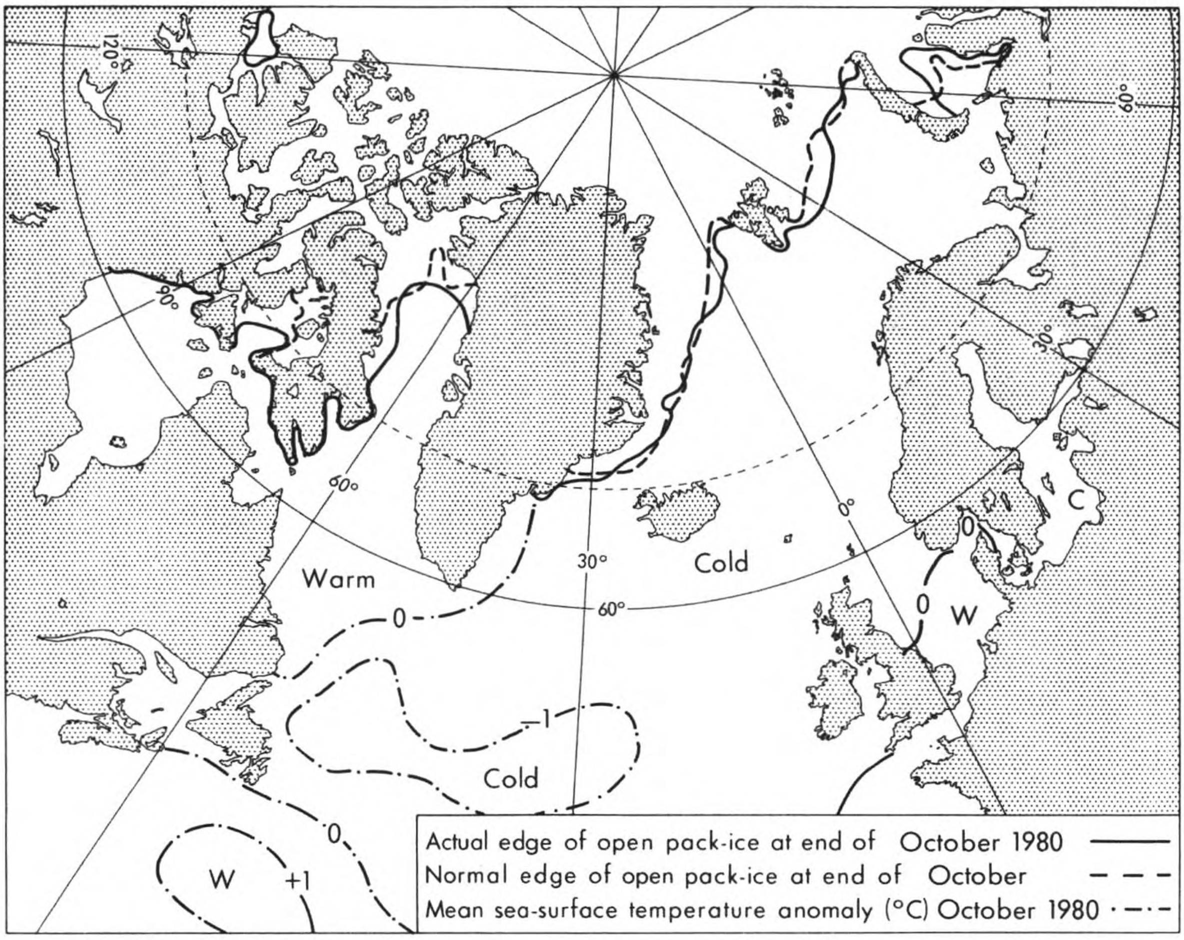
CODE:

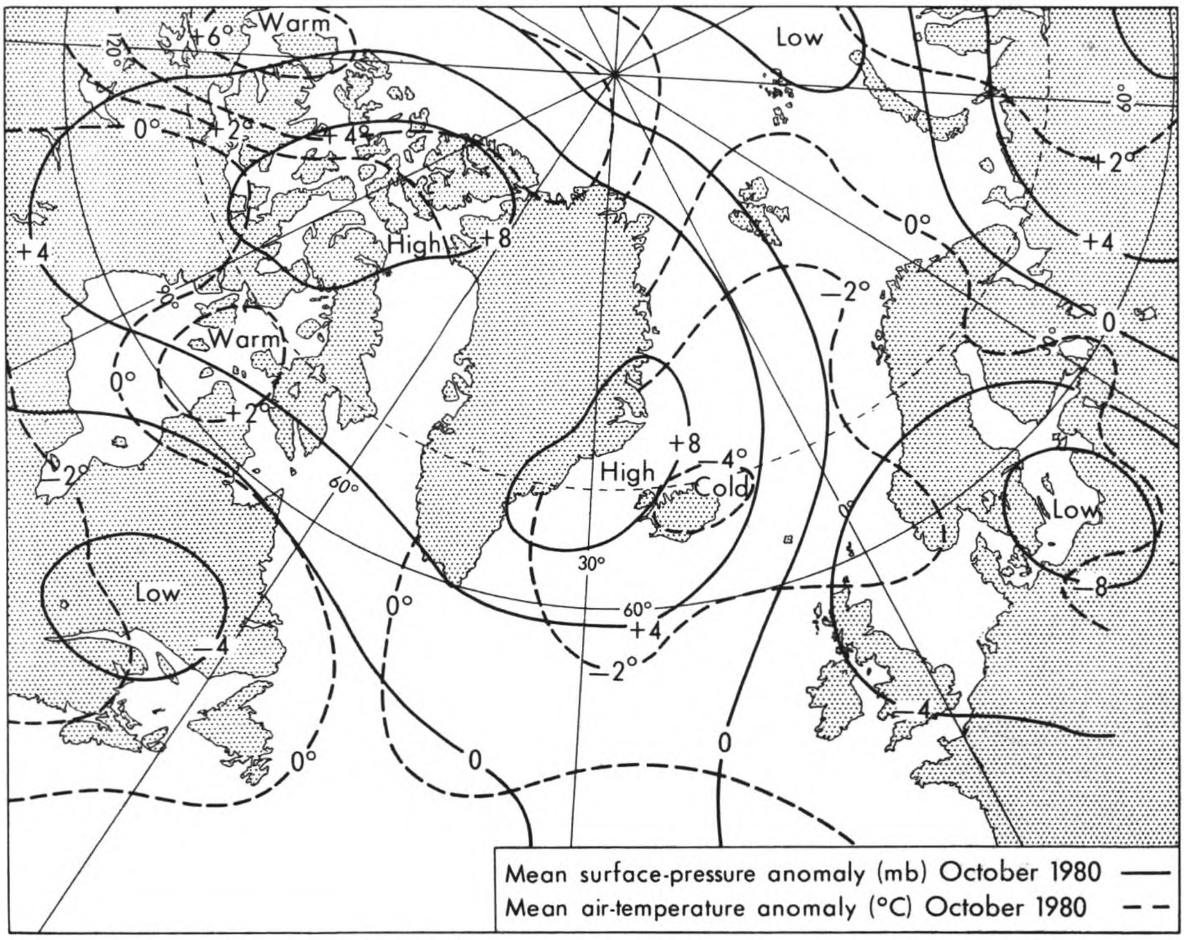
A First day ice reported.
B Last day ice reported.
C No. of days that ice was reported.
D No. of days continuous land-fast ice.
E No. of days of pack-ice.
F No. of days dangerous to navigation but assistance not required.
G No. of days assistance required.
H No. of days closed to navigation.
I Accumulated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

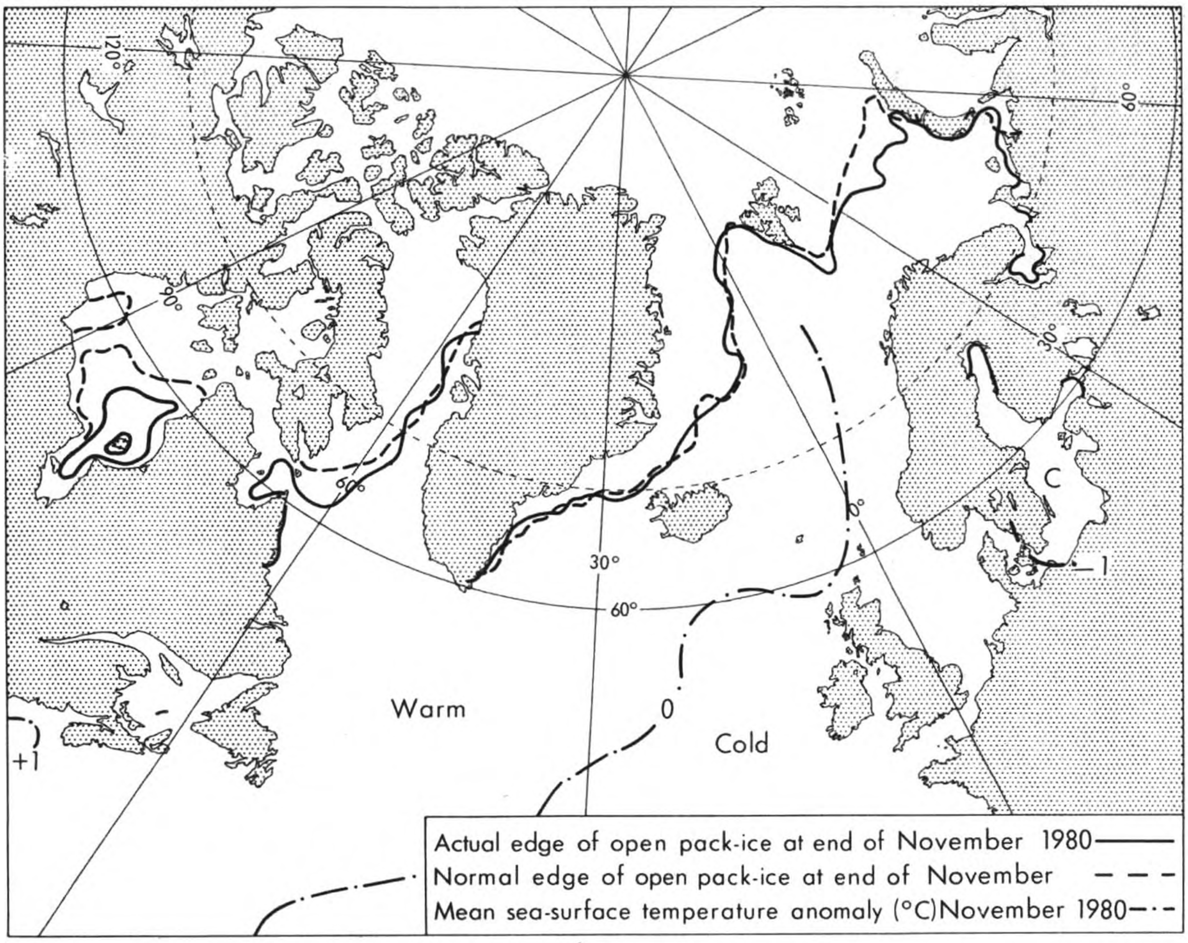
* These figures give a rough measure of the first probability of the formation of sea ice and later the progress of the growth and its thickness. They are derived from daily averages of temperature (00 + 06 + 12 + 18 GMT) and are the sum of the number of the degrees Celsius below zero experienced each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

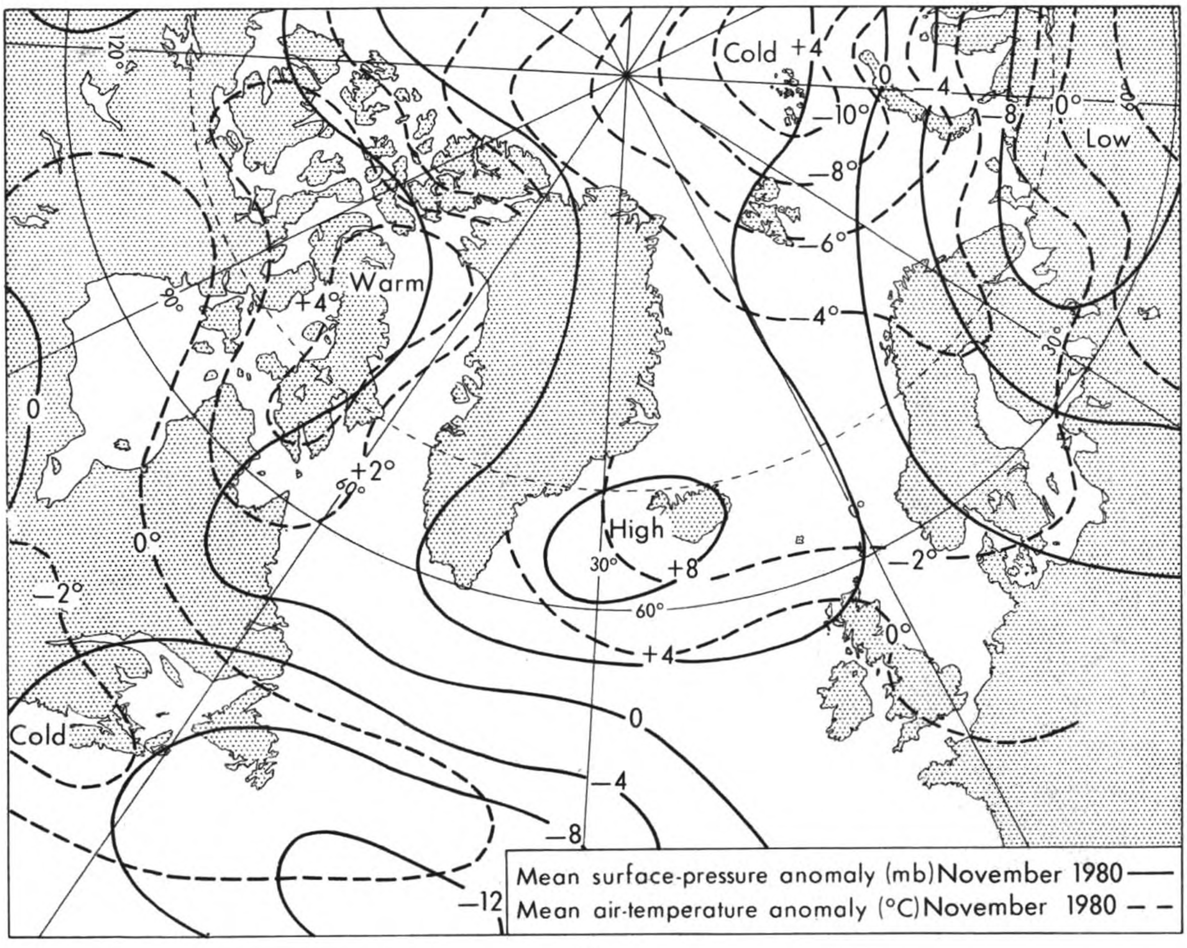

Warm
Cold
+1
0
-1
Actual edge of open pack-ice at end of September 1980
Normal edge of open pack-ice at end of September
Mean sea-surface temperature anomaly (°C)September 1980


Cold
Warm
Low
-4
-2°
0°
0
Mean surface-pressure anomaly (mb)September 1980
Mean air-temperature anomaly (°C) September 1980


Warm
Cold
Cold
W
+1
0
-1
C
W
30°
60°
Actual edge of open pack-ice at end of October 1980
Normal edge of open pack-ice at end of October
Mean sea-surface temperature anomaly (°C) October 1980


Warm
Warm
Low
Low
Low
High
High
Cold
+6°
+4
+8
+2
0°
-2°
-4°
-4
-8
+4
0
Mean surface-pressure anomaly (mb) October 1980
Mean air-temperature anomaly (°C) October 1980


120°
90°
60°
30°
60°
30°
C
—1
Warm
0
Cold
+1
Actual edge of open pack-ice at end of November 1980
Normal edge of open pack-ice at end of November
Mean sea-surface temperature anomaly (°C) November 1980


120°
Cold +4
0
—4
—8
0°
—10°
—8°
—6°
—4°
Low
Warm
+4°
90°
30°
0
+2°
60°
High
0°
30°
+8
—2°
—2°
60°
0°
+4
Cold
0
—4
—8
—12
Mean surface-pressure anomaly (mb) November 1980
Mean air-temperature anomaly (°C) November 1980

Book Reviews

Navigation Afloat—A Manual for the Seaman by Alton B. Moody. 222 mm × 145 mm, pp. 752, Hollis and Carter, 9 Bow Street, Covent Garden, London WC2E 7AL. Price £15·00.

Navigation Afloat is an attempt to summarize the knowledge of navigation required by the navigator, especially in the Merchant Navy. Whilst the traditional methods of coastal and astronomical navigation are included, the author gives special emphasis to navigation derived from the application of electronic aids.

The book sets out first to describe all the navigational terms used on both sides of the Atlantic, then goes on to discuss charts and their usage, describe gyro and magnetic compasses and chronometers, explain dead reckoning and pilotage, astro-navigation and almanacs, electronic aids including Omega and Loran together with satellite and inertial navigational aids and concludes with a section on the practice of navigation.

Captain Moody is obviously a man of many talents. After graduating from the US Naval Academy he received flight training in the US Army Corps. Thereafter he served in the US Mercantile Marine and gained both deck and engineroom certificates of competency. As author of more than 150 publications in navigation and other related fields, he is acknowledged to be one of the foremost experts in the USA. As the writing of this book was suggested by the Director of the Royal Institute of Navigation—the editor of *The Journal of Navigation*—who also wrote the Foreword, *Navigation Afloat* is a book not to be ignored. However, in no respect does it replace the well-known navigation manuals, particularly for those who are still learning their trade. Nevertheless, it does provide a fresh look at the whole subject of navigation at sea.

C.R.D.

Dictionary of Shipping and Shipbroking Terms by Peter R. Brodie. 250 mm × 170 mm, pp. 195, Lloyd's of London Press Ltd, Sheepen Place, Colchester, Essex CO3 3LP. Price £12·50.

This is a dictionary of English-French, French-English terms which will enable the reader to understand the terminology used in chartering and operating ships. It is primarily aimed at chartering brokers, port agents and ship operators but nevertheless covers a wide field of information vital to seafarers in general. Included are—ship types and their gear, ports together with their equipment and facilities, cargoes and their packaging, documentation including bills of lading, geographical and weather features. Towards the end of the book is a comprehensive list of abbreviations used in chartering and operating ships together with their meanings.

Brodie is a chartered shipbroker and a winner of the Baltic Exchange prize in the Fellowship examinations of the Institute of Chartered Shipbrokers. This book should prove of considerable value to senior officers trading regularly to French-speaking countries.

C.R.D.

Shipbroking and Chartering Practice by R. Ihre, L. Gorton and A. Sandevarn. 250 mm × 170 mm, pp. 204, *illus.* Lloyd's of London Press Ltd, Sheepen Place, Colchester, Essex CO3 3LP. Price £12·50.

The legal adviser and the marketing manager of a well-known Swedish shipping company have got together with a specialist in commercial and maritime law to produce a handbook on the practice of chartering and ship-broking.

It is intended as a text book for brokers, exporters, agents, shipowners and sea-staff. The authors have endeavoured to aim it at the international rather than solely the Swedish market and have made extensive revisions to the English version from the Swedish original.

Because it is intended as a basic text-book, it does not contain any detailed information on the interpretation of clauses or make reference to legal cases. The only types of contract of affreightment examined in detail are the voyage charter and the time charter but the authors hope to enlarge this part in future editions so as to include other types of contracts. With this in mind, the authors invite contributions from those in the field and criticism of the present text.

C.R.D.

Personalities

OBITUARY.—It is with deep regret that we record the death of Mr J. NICOLSON, Radio Officer, on board the *Historian* on 22 September 1980.

John Nicolson joined the Marconi International Marine Company in October 1939 and served throughout the war with a temporary Certificate. He was serving on board the *Pearlmoor* when she was sunk by enemy action but escaped without injury. With many others who held temporary Certificates, his services were terminated in 1945 but he obtained a 2nd Class Certificate in 1948 and was re-appointed to Marconi's sea staff. Since 1956 Mr Nicolson served almost exclusively on ships belonging to T. and J. Harrison until his untimely death.

We received the first meteorological logbook bearing Mr Nicolson's name from the *British Splendour* in 1955. Thereafter, he sent us a further 11 books of which 6 were classed as Excellent.

We extend our sincere condolences to his family.

RETIREMENT.—CAPTAIN F. C. TAYLOR retired on 31 July 1980 after serving 43 years at sea.

Frank Charles Taylor was educated at St James School in Grimsby and joined Runciman's Moor Line as Apprentice in July 1937, his first ship being the *Blythmoor*. On completing his apprenticeship he transferred to Anchor Line and throughout the war years served with various companies. After the war he served for a short period with Associated Humber Lines before joining the New Zealand Shipping Company in July 1948.

Captain Taylor obtained his Master's Certificate in July 1947 and was promoted to command of *Tekoa* in November 1956. In 1966 he commissioned the new *Tekoa* —the 3rd ship of that name. During the last 2 years of his career Captain Taylor commanded the *Wild Mallard* owned by P. & O. Strath Services.

Captain Taylor sent us his first meteorological logbook from the *Gloucester* in 1950. Since then we have received a further 43 logbooks bearing his name of which no less than 31 were classed as Excellent. He received Excellent Awards in 1958, 1960, 1967, 1968, 1969, 1970, 1972, 1974 and 1975. In 1979 he was presented with a long-service Award in the form of a barograph.

We wish him a long, healthy and happy retirement.

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