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The Marine Observer

A quarterly journal of Maritime Meteorology

Volume 63 No. 319
January 1993

THE MARINE OBSERVER

A Quarterly Journal of Maritime Meteorology
prepared by the Marine Divison of the
Meteorological Office

Vol. 63

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VOL. 63 **No. 319** **JANUARY 1993**

CONTENTS

COVER PHOTOGRAPH: The *Speciality* approaching a fog-bank off the mouth of the river Humber on 28 January, 1992, photographed by the Master, Captain A.J. Richards.

LONDON: HMSO

Editorial

Having eagerly followed the preparations for 'The Toughest Yacht Race in History' from the start of the British Steel Challenge at Southampton last September, as we go to press we hear that all ten yachts are still competing hard for the lead on the 5,000 mile first leg of this unique championship between Southampton and Rio. Much more interest centres on the fate of the yachts in the interval up to the time of publication, since the moment when they set off for Hobart and encounter the perils and turbulent seas around Cape Horn and beyond.

During the lead-up to the start of this fascinating battle, the Marine Division was privileged to be visited by several of the Crew Volunteers taking part. Whilst the Marine Superintendent and his staff at Bracknell and Southampton felt that any constructive help and advice they could offer was minimal, in the face of requests for information on such aspects as climatology for the east coast of South America and Magellan, there is admiration for the courage and determination of the participants in this 'Toughest Yacht Race in History'.

It was particularly gratifying that one of the two Master Mariner skippers volunteered to do some formal weather observing when the crew had settled to a routine, and teething troubles were overcome. Adrian Donovan, 33, from Plymouth, England, is Skipper of *Heath Insured.* He served his time with BP Tankers, when he sent in his first observations in 1981, and as late as 1988 he was providing data from coastal tanker *Shell Explorer.* His 'Principal Observer', Arthur Haynes from Roehampton, London, started sending observations from the yacht on the third week at sea, using an abridged set of Met. Office instruments. This does not give any advantage over the other yachts, but the records will be of special use, coming from a slower vessel having close encounters with the weather, and sometimes from data-sparse areas. John Chittenden, 52, of London, Skipper of *Nuclear Electric*, is the other Master Mariner in the Challenge.

Each of the ten yachts is equipped with a *Yachting Monthly* Ocean Vigil Book, containing reference material and reporting cards, to record sightings of marine wildlife, as well as signs of pollution. Data from these logs will be processed by the Marine Conservation Society, which is still anxious to receive reports of sightings of basking sharks. The Society may not have been too pleased to read the report from *British Steel II* that the yacht had rammed an unsuspecting basking shark in the early stages of the first leg, and 'the shark went off in a great sulk'.

At least the Challengers will miss all that the British autumn and winter can throw at them; judging by the portents already seen at the autumnal equinox, they may feel they are well out of it. High rainfall anomaly in August and September, accompanied by flooding in southern England and France, has given rise to further fears of an increase in sea levels around the U.K. coasts. But considering the cyclic nature of climatic extremes, it may not be sufficient to attribute such rare events to signs of climate change as a result of man-made global warming. That is not to say that every effort should not be spared to continue research into the effects of pollutants which cause the greenhouse effect, of greater significance, it seems, than depletion of the Ozone Layer. Nevertheless, it is important to approach these issues, given so much uncertainty in their future reality, with level head and rational statements: little is gained by making alarmist predictions which do not appear to match current scientific thinking.

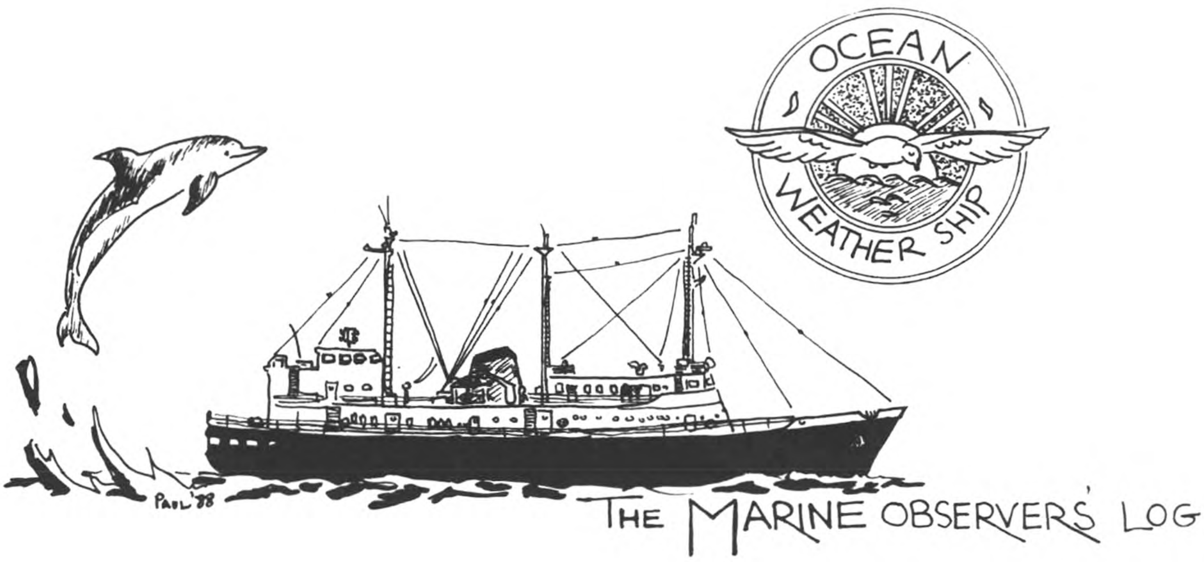
A report commissioned by Friends of the Earth from the University of East Anglia last August is a case in point. The UEA analysis indicates rising sea levels and flood risks into the next century, with increases of between 24 and 48 cm by 2030, and up to 140 cm higher by the year 2100. It is difficult to rationalise predictions that at least nine U.K. ports could experience flooding once in every three to five years by 2030, with reports published in the 1991 reprint of *Climate Change — The IPCC Scientific Assessment*. Nobody on earth is going to be in a position to verify other predictions that these ports face the threat of annual flooding by the end of the twenty-first century. These figures appear contradictory when placed against the published findings of several hundred working scientists from 25 countries, in respect of such elements as global mean temperatures, precipitation, extent of sea ice, movement of mountain glaciers and snow cover, all of which may be likely to contribute to sea-level changes.

Measurement problems over the last century make trends of these parameters difficult to determine with any accuracy, but in all these there is evidence that relatively fast regional climate changes can occur. These changes, though poorly understood, may persist for up to several decades but are often a function of season and can be of considerable practical importance. Oceanic thermal expansion resulting from gradual global temperature increase is expected to cause a rate of sea-level rise of somewhere between three and six times faster than seen on average for the last 100 years. However, the most stark projections shown by eleven separate scientific assessments indicate a largest 'best estimate' of a 30 cm rise by the year 2025 and a 100 cm rise by 2100. The estimated contribution of thermal expansion and ice change over the previous 100 years is 22 cm. However, these predictions have to be taken in the light of statements that climate statistics must become more reliable and precise, with present shortcomings including uncertainty over the sensitivity of the global average temperature and mean sea-level, timing and natural variations. Substantial improvements are clearly still needed, and it is readily acknowledged that voluntary observers the world over are making a very positive contribution towards this need. Careful use of instruments and the experienced eye are highly valued by scientists who have the benefit of ships' observations. However, regular inaccuracies do still occur: for instance, dew-point errors from a few up to too many do occur in most ships' logs. Observers may not appreciate the need for such care, or perhaps find the dew-point tables difficult to read; but the computer analysis which nowadays detects these errors is compatible with the tables issued to ships, given a tolerance of $\pm$ 1 °C.

Continued depletion of our fleet of observing ships, such as the Ben Line's withdrawal from ship operating in recent months, means that we are ever seeking volunteers to assist with this ongoing work, and look to the existing recruits to keep the observations rolling in. Also, we do not seem to hear of as many retirements of Masters and Radio Officers as we used to. However, we are still anxious to give their careers an airing in your journal, as a thank-you for their long-term efforts, and would like to hear of anyone involved with the voluntary observing who is retiring.

This first edition of *The Marine Observer* for 1993 is the first to be prepared with the assistance of the new Apple Macintosh PCWs installed in our Graphics Office and we hope the layout and style continues to be to the liking of our readers. Meanwhile we can do no more than offer customary sincere thanks and good wishes for success and fair sailing in 1993.

J.F.T.H.



January, February, March

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

AVOIDANCE OF SEVERE TROPICAL STORM

Coral Sea

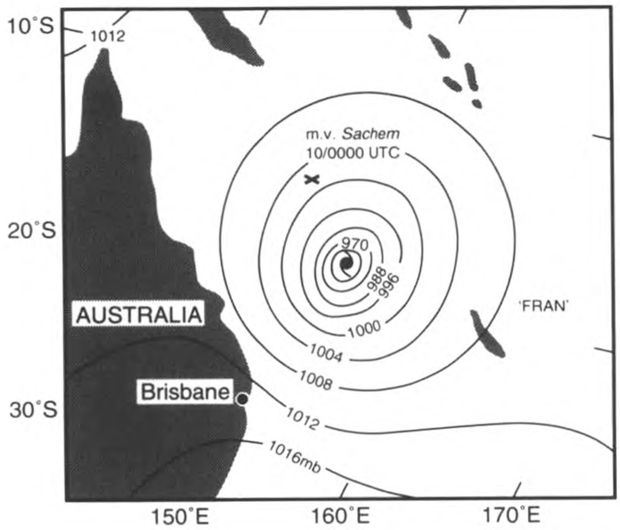
m.v. *Sachem*. Captain D.A. Platt. Singapore to Noumea. Observers: the Master, Mr I. Appleby, 2nd Officer and ship's company.

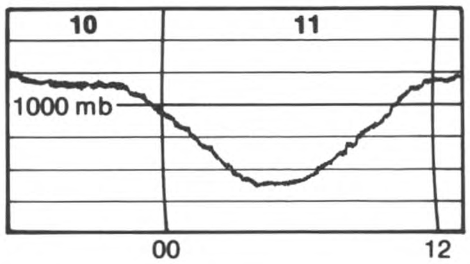
9–11 March 1992. Early warnings of the build-up and existence of severe tropical storm 'Fran' were received from WHR Brisbane at 0130 UTC on 9 March. The movement and probable path of the cyclone was plotted and compared to that of the ship's planned passage; at this time the ship was over 1,000 n.mile from Fran, but it was anticipated that the cyclone could cause concern. The winds were light and S'ly, and the pressure was reasonably steady at 1010 mb.

Twenty-four hours later the pressure was beginning to fall, passing through 1004 mb whilst the winds were still S'ly although increasing in strength. The analysis fax from Melbourne at 0000 on the 10th clearly showed the deepness of the storm with a central pressure of 950 mb but the observers still anticipated that Fran would keep moving west-south-west at 12–15 knots.

At 2120 on the 10th a warning was issued from Brisbane that Fran was now moving west-north-west at 12 knots which would put the ship on a direct path for the cyclone. By this time the ship's barometer was reading below 1000 mb and the winds had increased to gale force. The chart shows the prognosis for the cyclone for 0000 on the 11th.

At 0200 with Fran still moving west and winds at the ship increasing to force 9 the Master decided to alter course to due east so as to keep in excess of 200 n.mile from the storm. The ship's barometer was now reading below 998 mb (see barograph trace).





Over the following 12 hours the winds stayed at gale force but veered through W'ly to NW'ly as Fran passed to the south. By 1600 on the 11th it was considered safe for the ship to resume its original south-easterly course as Fran had passed a sufficient distance to the west and was beginning to fill.

Position of ship at 0000 UTC on the 10th: 15° 00′S, 154° 00′E.

SEVERE DEPRESSION

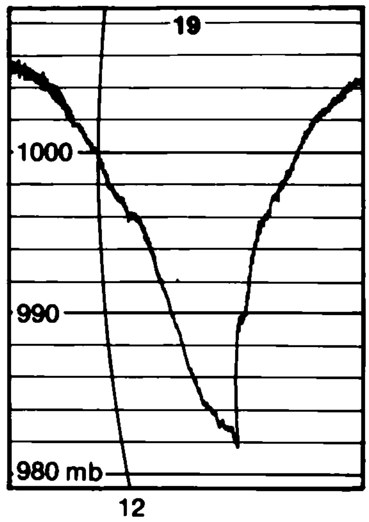
South Pacific Ocean

m.v. *Queensland Star.* Captain W.A. Wilson. Panama to Auckland. Observers: the Master, Mr W. Mazo, Chief Officer, Mr T. Ledesma, 2nd Officer and ship's company.

19 March 1992. At about 1300 UTC the pressure was noted to be falling rapidly; although the observers were aware that there was a disturbance in the area, it was supposed to pass well to the north of the vessel.

The following observations were then taken, the pressure changes being illustrated by the barograph trace.

Time	Pressure (mb)	Wind Dir'n	Wind Force	Remarks
1200	1012.7	N	6	
1300	1000.0	N	7	Pressure falling sharply.
1400	997.2	N	7/8	Wind and sea increasing.
1500	992.1	NNE	8	
1600	989.0	NE	8/9	
1700	984.0	SW	12	Sudden shift of wind direction.
1800	990.0	SW	10	
2000	996.0	SW	8	
2200	1004.7	SW	8	
2359	1006.1	SW	8	



The change in the wind noted at about 1700 was dramatic as the direction and force shifted from NE'ly, force 9 to SW'ly, force 12 in about two minutes, the air being filled with driving rain and spray. This lasted for about 10 minutes with the anemometer showing a speed of up to 90 knots before settling back to 70 knots. Shortly afterwards it ceased to function, the generator part having been destroyed. One point noted during the passage of the depression was that at no time was the ship's motion uncomfortable.

The observers believed that the depression was of tropical origin and it was later found to be heading for the Southern Ocean at a speed of 30 knots.

Position of ship at 1200 UTC: 34° 40'S, 175° 21'W.

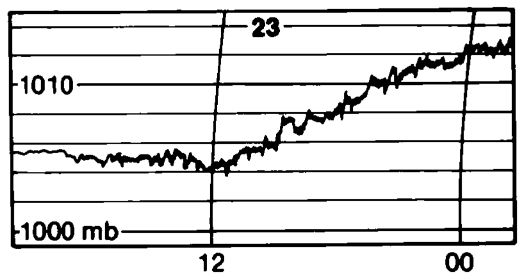
ERRATIC WINDS

Suez Canal

m.v. *Benavon*. Captain F.G. Anderson. Suez Bay to Port Said. Observers: the Master, Mr R.G.C. Noble, 2nd Officer and ship's company.

21–23 February 1992. The vessel arrived at the Suez outer anchorage at 2000 UTC on the 21st where the wind was found to be SSE'ly, force 7–8. Normally in this area the wind is N'ly and the high S'ly winds had the effect of closing Port Suez and hence the canal to shipping. The high wind continued into the 22nd with gusts of about 50 knots at times until 1300 when it dropped suddenly and became calm. This corresponded with a drop in visibility from 12 n.mile to 5 n.mile owing to haze caused by sand in suspension and/or air pollution. At 1330 the wind started to increase again but this time the direction was N'ly, and the speed was force 4 by 1400, increasing to NW'ly, force 6 by 1800.

Port Suez was now open once more and at 1815 the anchor was weighed and the ship proceeded to the canal. As Port Tewfik Signal Tower was passed the wind suddenly dropped and remained calm until the vessel reached Port Said at 0430 on the 23rd. At this point there was a sudden increase in the wind and within 30 seconds it was W'ly, force 5. As the vessel headed west into the Mediterranean the wind steadily increased until 1400 by which time it was WNW'ly, force 10. The barogram trace shows the pressure changes experienced during the period and the following observations were made.



Date and time (UTC)	Pressure (mb)	Wind Dir'n	Wind Force
21st 1800	1011.1	SSE	5
2200	1005.7	SSE	7/8
22nd 0200	1005.0	SSE	7
0600	1004.2	SSE	7/8
1000	1003.0	SSE	8
1400	1003.1	NW	4
1800	1008.5	NW	5/6
2200	1009.1	Calm	
23rd 0200	1008.1	Calm	
0600	1008.4	W	5
1000	1008.7	WNW	6
1400	1008.9	WNW	10
1800	1011.2	NW	10
2200	1014.6	NW	8

These conditions, accompanied by squally showers, some with hail or lightning (although no thunder was audible) continued until 2200 when the wind started to moderate.

Position of ship at 1200 UTC on the 23rd: 32° 12'N, 29° 54'E.

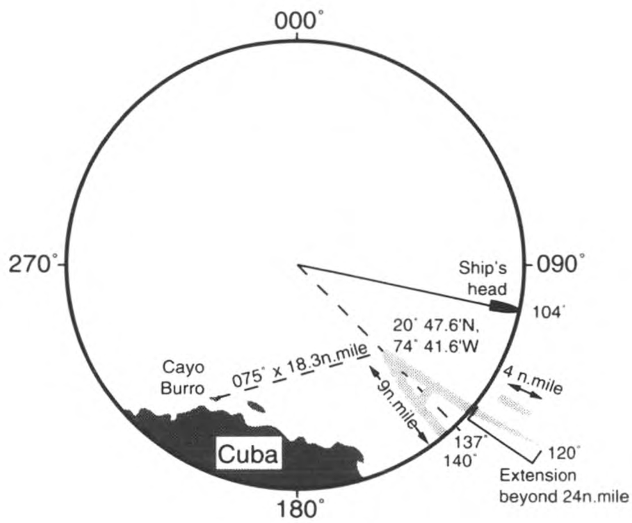
RADAR ECHOES

Caribbean Sea

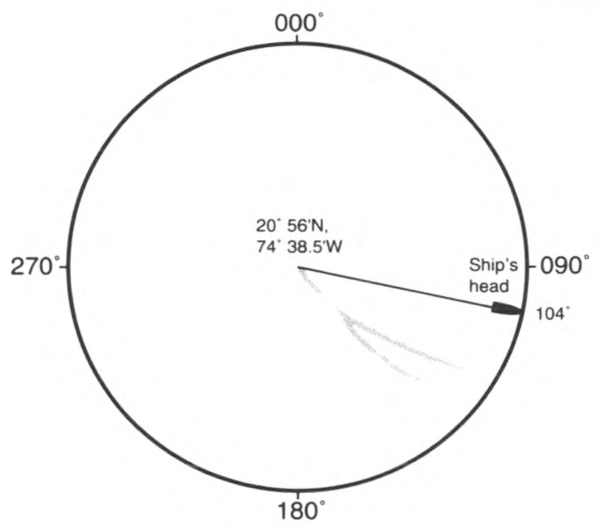
m.v. *Lincolnshire*. Captain D.G. Browne. Point Lisas to Tampa. Observers: the Master, Mr D.F. Morton, 2nd Officer, Mr D.I. MacKinnon, 3rd Officer, and Mr W.W. McKellar, Cargo Engineer.

12 March 1992. At 0340 UTC the radar echo as shown in the sketches was observed on the 24-n.mile range of the vessel's Decca radar (the echo had been seen earlier on the 48-n.mile range but was rather faint). It took the form of a long, slender 'V' shape with one 'arm' much longer than the other. The longer one measured 20 n.mile in length while the shorter side was about 9 n.mile long. Each arm of the 'V' was roughly 1 n.mile wide and there was also a bridge between them of the same width. The longer arm ran in the direction 120°/300° and the shorter one along 140°320°. The maximum width of the whole echo was 4.5 n.mile and, at a range of about 25 n.mile, just north of the longer side, was a 4-n.mile echo of similar direction and width.

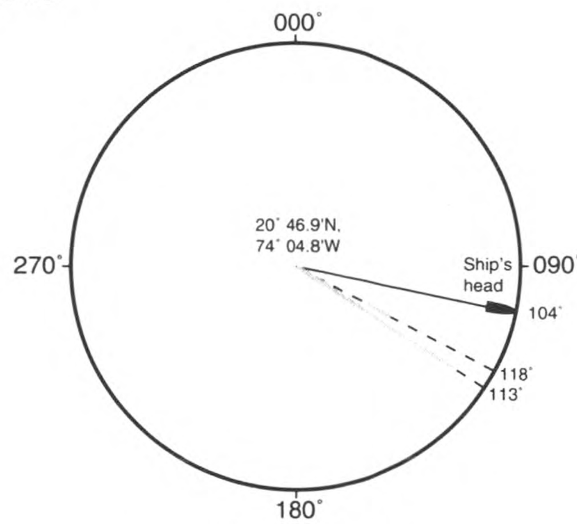
The position of the apex of the echo, using a bearing and distance off Cayo Burro at 0340, was plotted as 20° 47.6'N, 74° 41.6'W, bearing 137° × 12.9 n.mile from the vessel, and a series of radar observations and plots indicated that the echo



24-n.mile range
0420 UTC



24-n.mile range
0420 UTC



24-n.mile range
0624 UTC

was geographically fixed. However, the apex of the echo began to gradually curve towards the centre of the screen and by 0420 the 'V' shape was more slender and projecting from the centre spot of the radar. Although conditions were fine and clear nothing was seen on the bearing of the echo. The echo persisted for a few hours until 0624 while continually becoming dimmer, and ultimately took the form of a spoke 1 n.mile thick emanating from the centre spot accompanied by a spoke to the north of similar thickness but not emanating from the middle.

Weather conditions were: dry bulb 25.2 °C, sea 26.0°, pressure 1011.8 mb, wind ESE'ly, force 3. Fine and clear, visibility 15 n. mile.

Position of ship at 0340 UTC: 20° 57′N, 74° 51′W.

CURRENTS

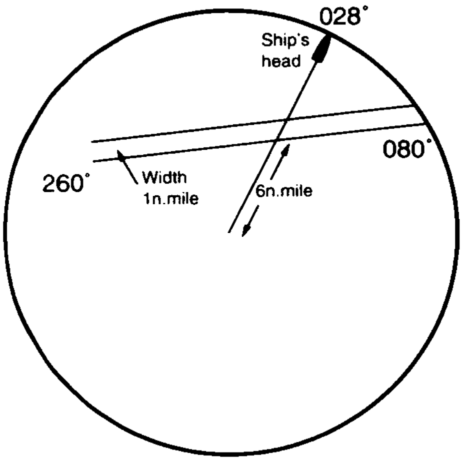
South Atlantic Ocean

m.v. *Mairangi Bay*. Captain B. Graham. Lyttelton to Zeebrugge. Observers: the Master and Mr M.P. Green, 2nd Officer.

8 January 1992. At 0516 UTC the vessel was north of the Falkland Islands in position 48° 51'S, 55° 13.5'W, steering 028° at a speed of 20.7 knots. A few minutes later at 0520 the vessel entered a fog-bank and the visibility was reduced

to less than 100 m. At 0530 two parallel lines were noticed on the radar display (see sketch) at a distance of approximately 6 n.mile on both the 3-cm and 10-cm radars, and were crossing the vessel's bow on a line orientated 080°/260°.

At 0554 the sea temperature began to rise and the entries in the table give an indication of the rate of increase. This coincided with the passage of the vessel through the nearer of the two lines on the radar screen.



12-n.mile range
0530 UTC

Time	Sea temperature (°C)	Time	Sea temperature (°C)
0554	9.6	0611	11.7
0556	9.8	0613	11.8
0558	10.0	0615	11.9
0600	10.5	0617	12.2
0601	10.7	0619	12.4
0602	11.0	0620	12.4
0603	11.2	0630	12.7
0605	11.6	0640	13.0
0607	11.8	0650	13.2
0609	11.7	0700	13.1

At 0635 the vessel's position was 48° 33.3'S, 54° 56'W and since the position at 0516 it had been set generally westwards (252° × 1.3 n.mile).

Weather conditions at 0600 were: air temperature 10.2 °C, wet bulb 10.2°, pressure 1011.2 mb, rising, wind NW'ly, force 1/2. Visibility approximately 100 m, sky not discernible.

Position of ship at 0600 UTC: 48° 43.4'S, 55° 04.3'W.

South Atlantic Ocean

m.v. *Atlantic Universal*. Captain S. Venner. San Antonio to Jeddah. Observer: Mr P.G. Rafferty, Chief Officer.

22–23 March 1992. The vessel was steering a rhumb line course 055° from the entrance of the Strait of Magellan to position 49° 00'S, 60° 00'W which would take it a distance off the Falkland Islands of about 60 n.mile. The current chart for the South Atlantic for March indicated a current running north-easterly with a weaker current running approximately south. Throughout the rhumb line course a southerly set was experienced and the vessel was set to the south, the predicted northerly current not being experienced at all.

From 49° 00'S, 60° 00'W the course was altered to 067° in order to gain the expected benefit of the Falkland Current. This proved to have little or no effect and initially the vessel was being adversely affected as the current appeared to run in a direction counter to that shown on the current chart.

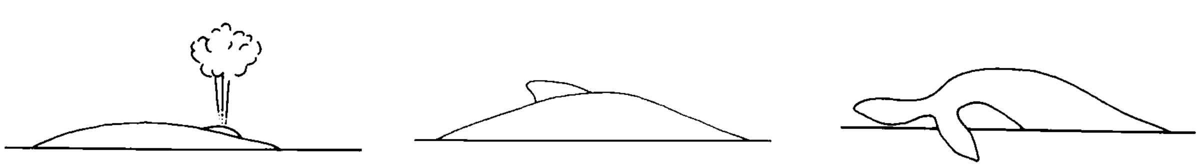
Position of ship: 52° 33'S, 68° 05'W.

CETACEA

Mona Passage

m.v. *Lincolnshire*. Captain C.O. Thomas. Point Lisas to Tampa. Observers: Mr D.G. Browne, Chief Officer, Mr D.F. Morton, 2nd Officer, Mr D.I. MacKinnon, 3rd Officer and Mr D. Hartigan, Cadet.

1 February 1992. At 1200 UTC whilst passing 5 n.mile off Mona Island a whale was observed surfacing off the port quarter, showing a good deal of its back as it did so; it then submerged and surfaced again but was seen no more. No spout or tail was observed but the fin was noted to be short and curved, rather like that of a Humpback whale. A spout approximately 3 m high was then observed on the port bow at a range of roughly 200 m and a whale slowly surfaced and dived in the sequence shown in the sketches. When it did so it appeared to have a short 'stub' at its blowhole and also displayed a small curved fin. Another whale was seen alongside this one and they both surfaced and dived six times before disappearing from sight. The tail was the final phase of the dive, being flipped up before slowly re-entering the water without a splash. This portion of the dive lasted for about 5 seconds.



Surfacing — Commencing dive — Diving

The whales were dark grey in colour on top and also showed a lighter underside which was clearly visible as they passed close by, heading in a direction of about 230°. At 1600 a pair of Humpback whales was observed playfully rising above the surface and splashing back down. This jumping was repeated on numerous occasions and created much spray as the whales landed in the water, making them conspicuous from a substantial range. On observation through binoculars they surfaced and dived occasionally but seemed to prefer jumping clear of the water. As they did so they twisted in the air, turning through 180° at times, and exhibited light undersides and long slender flippers. When jumping clear, their slender snouts were clearly visible, especially when their jaws were open. They also appeared to have a 'lumpy' appearance all over their bellies and on the undersides of their flippers.

They did not appear to be heading in any particular direction but continued to jump from all kinds of angles and occasionally lazed on the surface. After about six minutes they disappeared from sight.

Position of ship: 18° 14'N, 67° 50'W.

TURTLE

Southern Indian Ocean

m.v. *Equinox*. Captain R.M. Pitts. Tubarao to Fukuyama. Observers: Mr S. Sowerby, 2nd Officer and members of ship's company.

2 February 1992. At 1145 UTC four objects which together resembled a table floating upside-down, were sighted about 450 m ahead of the vessel on the starboard side. On closer inspection through binoculars it was found that the objects were the flippers of a basking turtle. The flippers were about 0.5 m in length while the body was roughly 1.5 m long and 1.0 m wide; the turtle was brown in colour.

When about half-way down the ship's length, the turtle appeared to turn over from having its undersides uppermost and revealed an oval shell with a large, heavy ridge where the head would be retracted. There was a long neck roughly the same length as the flippers and the head was triangular in shape. The turtle submerged before it was passed by the bridge area of the ship but briefly reappeared on the starboard quarter before submerging, not to be seen again.

Position of ship: 34° 33′S, 24° 45′E.

Editor's note: Reference to suitable volumes held in this office indicates that the turtle was probably a Leatherback turtle or Luth (*Dermochelys coriacea*). It is the only species in this family and can grow to a length of 2 m, having seven ridges running down the back and five on the underside.

BIRDS

North Atlantic Ocean

m.v. *OOCL Challenge*. Captain C.E.W. Sturcke. Montreal to Felixstowe. Observer: the Master, Mr D.R. Pritchard, and ship's company.

26–29 February 1992. At about 0500 UTC, shortly after daybreak, an owl was sighted on top of a 3-high tier of containers amidships. It had arrived during darkness and was positioned in the middle of a large patch of snow which still remained from the previous week's winter weather.

The face and breast of this large bird were pure white whilst its back and wings had black flashes on them. The wing-span was approximately 1.5 m. By 0900 on the morning of its arrival the patch of snow which the owl selected had melted and so the bird shifted sideways across two containers and repositioned itself in the centre of another patch where it remained for the rest of the day.

By daylight on the 27th all the snow had melted and the owl had positioned itself on top of a white container. Several times during the day it shifted position, and on one occasion did an inspection flight around the accommodation; after each movement it returned to the top of a white or a light-grey container. There was no evidence of the bird having eaten anything since its arrival.

The owl's behaviour on the next day was much the same as before, except that it apparently decided that red containers as well as white ones were alright to sit on, and also disappeared over the horizon for two hours during the afternoon. The ship was well into the English Channel by daybreak on the 29th and 'Snowy' had obviously been busy during the night as the tops of four containers were littered with blood, feathers and other carnivorous debris. During the morning and early afternoon Snowy remained in his same amidships position, only moving to take snacks from beneath him and devour them with an obvious savage enjoyment.

Later in the afternoon, as the ship approached the Dover Straits, the owl set off towards Folkestone and was not seen again.

Position of ship on the 26th: 46° 30′N, 32° 30′W.

Weddell Sea

R.R.S. *James Clark Ross*. Captain N.A. Beer. Geophysics cruise from the Falkland Islands. Observers: the Master, Mr R. Jackson, 3rd Officer and ship's company.

27 February 1992. At 2200 UTC whilst the vessel was stopped in the water, lying head to wind and using main engines, bow and stern thrusters to maintain station during the deployment of a sea-water sampling device near the seabed, a pod of 20 Minke whales approached close to the ship. The pod slowly closed around the vessel's bow and starboard side, coming to within 4.5 m of the hull and seemingly investigating the activity (the ship was emitting on 12 kHz and 10 kHz echo sounders at the time).

The pod then broke up and while some whales continued to swim just below the surface and close by, others meandered away to a position 180–275 m distant. All the mammals frequently broke the surface either to exhale, swim belly uppermost, breach or 'sail' along with just a flipper breaking the surface. Many of the group had white/grey undersides with darker grey colouring above, but several had a rusty-pink colouration along the belly and undersides; this was a continuous shading not a streaky or patchy pattern. Some whales breached head first with about half their entire length leaving the water before splashing downward and the pointed head shape, prominent rostrum and pale flipper patch were all plainly observed. Most of the ship's company witnessed the event, many from higher up the ship's structure which gave an ideal view. The whales remained close by for perhaps 10 minutes until the ship increased power and moved away.

Weather conditions were: dry bulb –0.5 °C, sea –0.6°, wind E'ly, force 2, fog. Numerous bergy bits, growlers and several larger bergs together with one-tenth open pack-ice.

Position of ship: 62° 32′S, 43° 23′W.

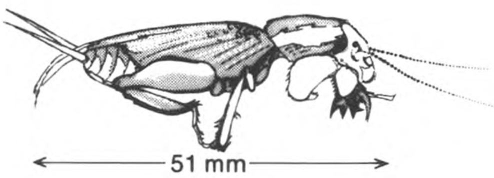
INSECTS

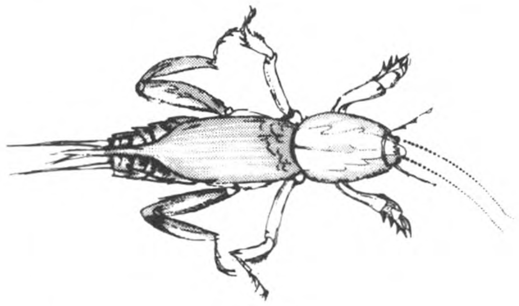
South Pacific Ocean

m.v. *Encounter Bay*. Captain B.W. Nuttall. Botany Bay to Wellington. Observers: Mr G.H. Smith, 3rd Officer, Mr C.R. Brooks, Radio Officer, Mr T.W. Al-Ozdi, Cadet and Mr V. Price, SM1.

8 February 1992. AT 2000 UTC whilst approaching the coast of New Zealand a beetle or grasshopper-type insect, see sketch, was found on the starboard bridge wing, apparently basking in the early morning sun. When approached it reared up on its back legs and started to move its front legs in a grasping motion. The front legs appeared to be developed into 'armour-plated' gripping devices as they had hooks and claws along the lower and front edges. The head was also armour-plated with four tube-like antennae protruding from the front of the head beside the jaws. Set above these were two feelers which were 23 mm long and the insect had powerful jaws.

The main body measured 51 mm and resembled a grasshopper having a soft unprotected belly and a set of wings lacking the normal casing of a beetle. Under the wings the body was soft and segmented. The rear legs were also armour-plated at the 'knee' joint and there were two 'tails' protruding from the rear, as found on an earwig. The head was shiny and black in colour, the forelegs were orange-brown while the body and wings were green-brown in colour.





A pencil was put near it and the insect bit it, making indentations, so human fingers were rapidly withdrawn. When annoyed with the pencil, the insect squirted a black/grey watery substance at the offending article, but opinions varied as to whether this was a defence system or a natural bodily function. The insect looked ferocious and was suspected to be carnivorous but owing to the lack of literature on board, identification was impossible so it was landed in Wellington for analysis.

Position of ship: 40° 02′S, 179° 14′E.

South Atlantic

R.R.S. *Bransfield.* Captain M.J. Cole. Montevideo to Stanley. Observers: Mr S.I. Wallace, 3rd Officer, Mr G. Morgan, 3rd Officer, Mr C. Littlehales, A.B. and Mr D. Walters, A.B.

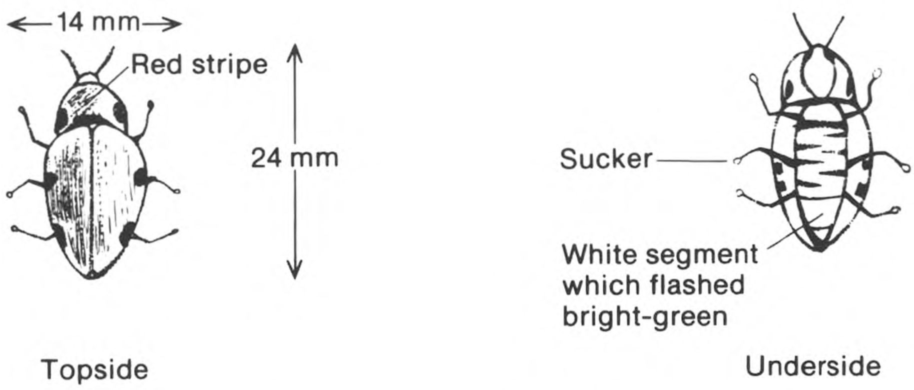
15 March 1992. At 0230 UTC a 'dragonfly' type insect was observed on the outside handle of the bridge wing door where it remained for about 15 minutes and was not disturbed by torch-light or when being measured.

It had a relatively large head, about 5 mm long, a short and stubby thorax measuring 10 mm in length which lead to a long tail/abdomen with short 'pincers' at the end; its length over all was 55 mm and its wing-span was 75 mm. There were six short thin legs and two pairs of thin transparent wings which remained spread at rest, the front pair being larger than the rear. The body colour was light-brown over all but the eyes were black.

One such insect was seen on the bridge although another one had earlier been removed from the chart table. Many were sighted, however, on deck and at various points on the vessel. At the time of the sighting the vessel was about 35 n.mile east of the Argentine coast and it was thought that the insects had been carried out on the W'ly winds.

Later, at 0500, a bright flashing light drew the attention of the bridge team to what was discovered to be an insect as shown in the sketch.

The flashing light was green in colour and was being emitted from the tail or abdomen of a beetle-like insect. The light 'flashed' intermittently every few seconds, though at times was not shown for several minutes. The beetle had wings which formed a shell over its main body, and six legs each of which had a sucker at the end allowing the insect to secure itself to the outside of the wheel-house



window. Measuring 24 mm long the beetle's top surface was pale-brown in colour with six black or dark-brown spots around the edge and a red stripe at the base of the head. Underneath, the wings were pale-grey or fawn and the dark spots also showed through from the top. The head was red and the body was brown-and-white with a red band near the top of the abdomen and a white section near the tail which flashed green.

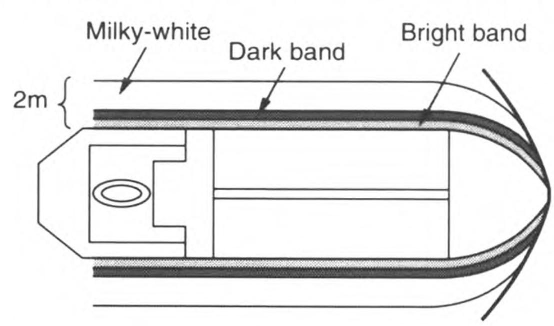
Only one insect was seen at first but as the watch progressed numerous flashing lights were sighted on the ship, in the air around the bridge and foremast, and also in the water. These sightings continued until daylight. Again, the wind was thought to have blown the insects out to sea.

Position of ship at 0230 UTC: 36° 45′S, 55° 54′W.

BIOLUMINESCENCE
Western Mediterranean

m.v. *British Trent.* Captain A.R. Wilkinson. Alexandria to Teeside. Observers: Mr M. Murphy, 3rd Officer and Mr A. Batte, A.B.

16 February 1992. At 0510 UTC a milky-white colour was noticed appearing on the bow wave and then progressing down the side of the vessel to give an outline of it which extended up to 2 m out, see sketch. The signal lamp was used to illuminate the sea and this produced an effect of small bright speckles which could be observed for up to 1 cable away from the vessel. A sample of water was obtained but once on deck there was no reaction to either the light or to being stirred.



At 0525 it was noted that the area of luminescence around the vessel had three distinct parts; the first band extended outwards for about 0.5 m and was extremely bright, the second appeared as a dark band between the outer and inner ones while the outside band was of a milky-white colour. Outside the 2-m band, the sea needed the stimulus of the signal lamp in order to show speckles. The total effect continued until one hour before sunrise.

The weather was fine and clear with a calm sea and no swell.

Position of ship: 36° 45′N, 00° 37′E.

Bass Strait

m.v. *Moreton Bay*. Captain D.S. Hughan. Melbourne to Sydney. Observer: the Master, Mr W.M. Axon, 3rd Officer and Mr R. Castle, SM1.

28 February 1992. Between 1000 UTC and 1200 whilst the vessel was rounding Wilson's Promontory, Victoria, and passing south of Rodondo Island it was noticed that the bow wave was glowing with bioluminescence. This originated in the disturbed water around the bow but did not extend the whole length of the ship, seeming to increase at the beams and appearing as broken bands in the wake. This bioluminescence seemed firstly to appear as the vessel rounded the promontory; the vessel was noticeably being set southward at this time and there was an obvious increase in the sea-water temperature to 23 °C from around 16° that it had been earlier.

The bioluminescence varied in intensity throughout the observation and at its maximum was seen as a distinct white/green glow which appeared to jump or scatter from the bow in flashes. Shining the Aldis lamp on the water had a limited effect on the intensity whereas switching the radar/echo sounder on and off showed a more noticeable increase. The luminescence had gradually diminished by 1300 and it was suggested that the phenomena had been caused by a warm northerly current which markedly increased the sea temperature by up to 5°; all temperatures were then carefully checked and a warm current was still held partly responsible for the event.

At the time of observation there was a moderate bow sea and moderate swell and the visibility was in excess of 18 n.mile.

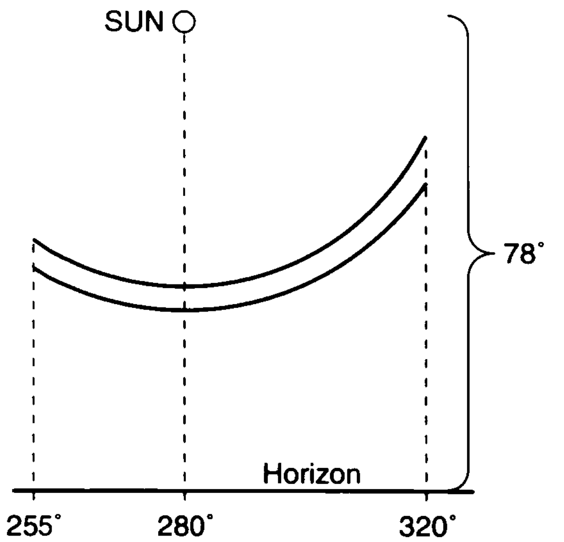
Position of ship: 39° 16′S, 146° 23′E.

HALO

Eastern South Pacific

m.v. *Andes*. Captain R.A. Whistler. Arica to Valparaiso. Observer: Mr J.N. Balkwill, 2nd Officer.

5 January 1992. At 1800 UTC while scanning the sky to determine cloud coverage and type for the synoptic observation, a partial solar halo was observed formed in cirrostratus, see sketch. What struck the observer as being unusual was that unlike the more common halo of 22° this one had a radius of about 46° 30′



(measured by sextant) and the colours appeared more metallic than those of a rainbow. The width of the halo was about 3° and the colours changed from pink, orange, yellow, green and turquoise from the inner to the outer edge. The arc appeared below the sun between 255° and 320°.

With only 2 oktas of cloud in small patches, the phenomenon might not have been as spectacular as a full halo; even so, in an otherwise blue sky on a fine day, the bright halo looked most out of place. The altitude of the sun was 78° bearing 280° and no other haloes were observed. The phenomenon lasted for a further 25 minutes when the cloud then became less developed.

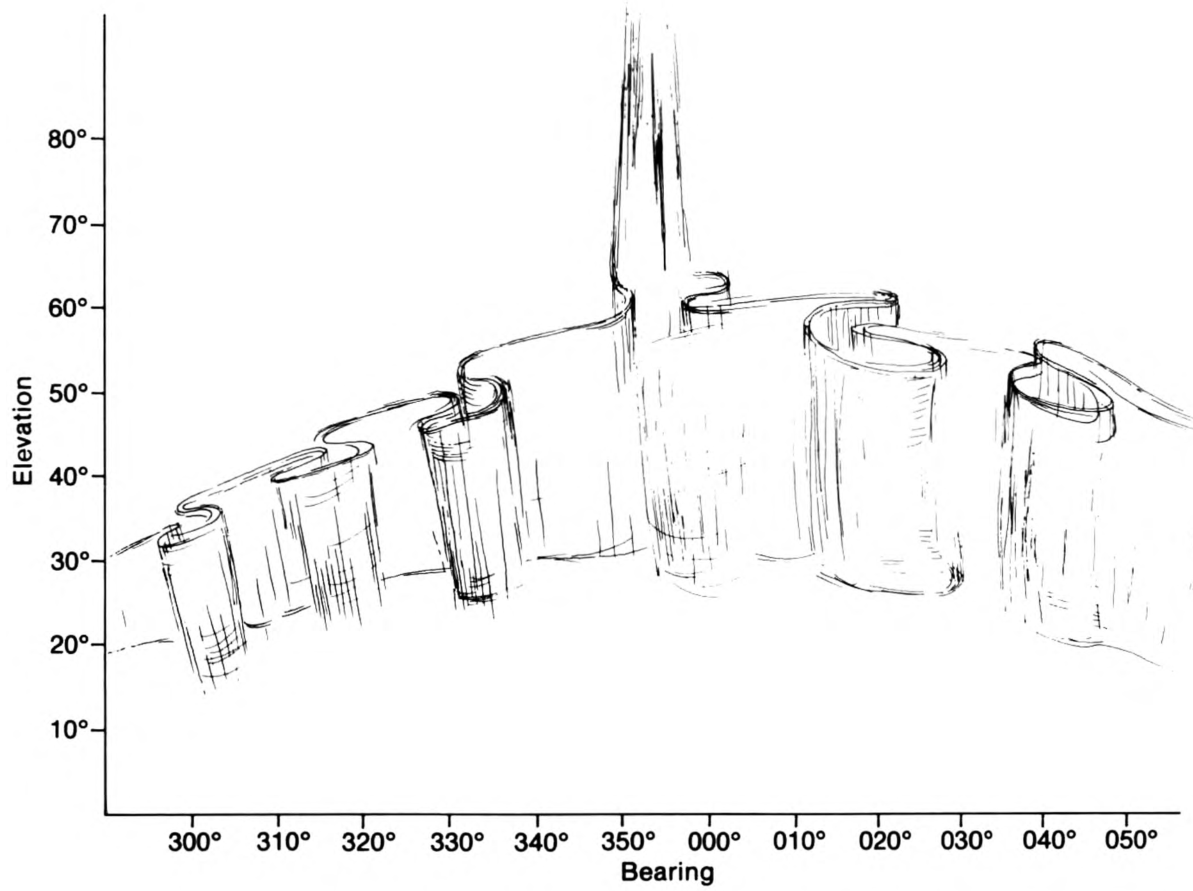
Position of ship: 27° 50′S, 76° 36′W.

AURORA BOREALIS

North Sea

m.v. *Seniority*. Captain L.C. Pink. Gdansk to Inverness. Observers: Mr I.A. Marson, 2nd Officer, Mr J. Harvey, Engineer Cadet and Mr M. Baker, Deckhand.

25 February 1992. Between 0145 UTC and 0330 an auroral display was observed, commencing with a homogeneous patch bearing 290° between elevations of 30° and 40°. During the next 45 minutes the patch developed into a rayed arc covering an arc of the horizon of 130° from 290° to 060°, see sketch.



The elevation over all was 20°–50°, the elevation of the highest part of the lower edge being approximately 30° whereas the upper limit of the display ranged from an elevation of 30° at its western end to 50° on a bearing of 000° to about 40° at its eastern end. The 'curtain in a breeze' effect was visible throughout the whole length. At intervals, irregular in both time and bearing but predominantly from the eastern half of the display, rays were seen to shoot higher into the sky to a maximum elevation of 70°.

The display was initially of weak brightness but developed to moderate brightness for the remainder of its duration except for the last 30 minutes when it homogenised and diminished more or less uniformly until at 0400 the sky was clear and dark once more. Stars were generally visible through the less bright folds in the 'curtain'.

There was some disagreement amongst the observers concerning the colour of the display. Of the three, two saw it as white/pale-grey whilst one saw it as green, and two reported a reddish tinge in the eastern part at times.

Position of ship: 57° 50'N, 00° 05'W.

RADIO RECEPTION

Indian Ocean

m.v. *Alcides*. Captain P. Callaghan. Ras Tannurah to Whangarei. Observers: Mr D.A. Hinks, Chief Officer, Mr P. Williams, 2nd Officer and Mr D.M. Hopkin, 2nd Officer.

5–6 January 1992. On the 5th at 0950 UTC Dampier port control was clearly heard on two occasions at a distance of at least 900 n.mile, but no reply was heard on trying to establish contact. The next day at 0150 a Malaysian vessel was heard calling Caernarvon Radio and the CRS reply was easily audible on VHF Channel 16. An 'all stations' call was then heard for a weather report on Channel 67, but this transmission was broken as the vessel rolled easily 3°. The distance from the CRS was approximately 540 n.mile and a radio check with Caernarvon Radio was attempted, but no reply was heard.

Later at 0814, Caernarvon Radio could be clearly heard on Channels 16 and 67. After the station operator had completed the weather information message and navigation warnings an attempt was made by the observers to contact the station on Channel 67. Unlike the previous attempts the coast station heard the call clearly and with good signal strength; the distance from the station at this time was about 480 n.mile. After a chat about the atmospheric conditions and an enquiry as to whether the ship carried a 'sky-scraper' for a VHF antenna, the observers wished their helpful colonial cousin 'G'day' and changed back to a Channel 16 listening watch.

The weather conditions during the two days are summarised in the table.

Date and time (UTC)	Temperature (°C) Air	Wet	Pressure (mb)	Wind Dir'n	Force
5th 0950	23.7	19.6	1015.1		
6th 0150	22.9	18.9	1017.2	SExE	4
0814	22.5	19.4	1014.7	SE	6

The height of the antenna was approximately 36 m.

Position of ship at 0950 UTC on the 5th: 21° 13'S, 100° 47'E.

ASSISTANCE TO YACHT IN DISTRESS

Eastern North Pacific

m.v. *Auckland Star*. Captain J.F. Rowe. Los Angeles to Valparaiso. Observers: the Master and ship's company.

10 January 1992. At 0120 UTC a MAYDAY call was received from the yacht *Monoped* of Los Angeles; it was in danger of sinking approximately 14 n.mile ahead of the vessel. Three people were on board, one with a wooden leg, and Auckland Star proceeded to give assistance. The following account details the rescue operation.

0150: Yacht *Touched* in VHF radio contact with this vessel and *Monoped*, and proceeding under power to assist.

0215: This vessel in position and stopped about one mile from *Monoped*, maintaining contact on VHF Channel 16. Skipper requests the vessel stands by until *Touched* arrives. Unidentified fishing vessel close by and moving towards *Monoped*. (This was later identified as a Mexican vessel *Isla de la Piedra* with no English persons on board.)

0220: This vessel makes contact via 6 MHz to SCG CAMSPAC San Francisco and acts as rescue co-ordination vessel between parties.

0240: VHF contact with *Monoped* lost although masthead light and dim lights on deck still visible; this vessel moves in to about 0.5 mile.

0250: Fishing vessel *Isla de la Piedra* alongside *Monoped*. No contact with either vessel. *Touched* still proceeding to area.

0325: *Touched* alongside *Monoped* and assessing situation to report back to this vessel.

0335: *Touched* reports that crew from fishing vessel have placed mobile pump on board *Monoped*, but only slow progress being made in reducing flooding; freeboard about 23 cm. All three crew members on *Monoped* safe and remaining on board; this information passed to USCG CAMSPAC who advise that USGC *Long Island* is *en route* with ETA of about four hours.

0350: *Touched* reports that slow progress maintained in lowering water level on *Monoped*; three crew remaining on board with assistance from fishing vessel crew.

0445: Pump unable to lower water level on *Monoped* any further. Flooding is from leaking gland and cabin area under water. Freeboard now 30–45 cm. *Touched* now intends to assist in removal of disabled person from *Monoped* to *Touched*. The remaining two crew members will then transfer to fishing vessel and attempt to tow *Monoped* to safety of Isla S. Benito (approximately 7 n.mile east).

0508: USCG cutter *Long Island* makes contact with this vessel on VHF Channel 16 and gives ETA of 2 hours 15 minutes.

0520: *Long Island* makes contact with *Touched* on VHF Channel 16 and gives ETA of 0700.

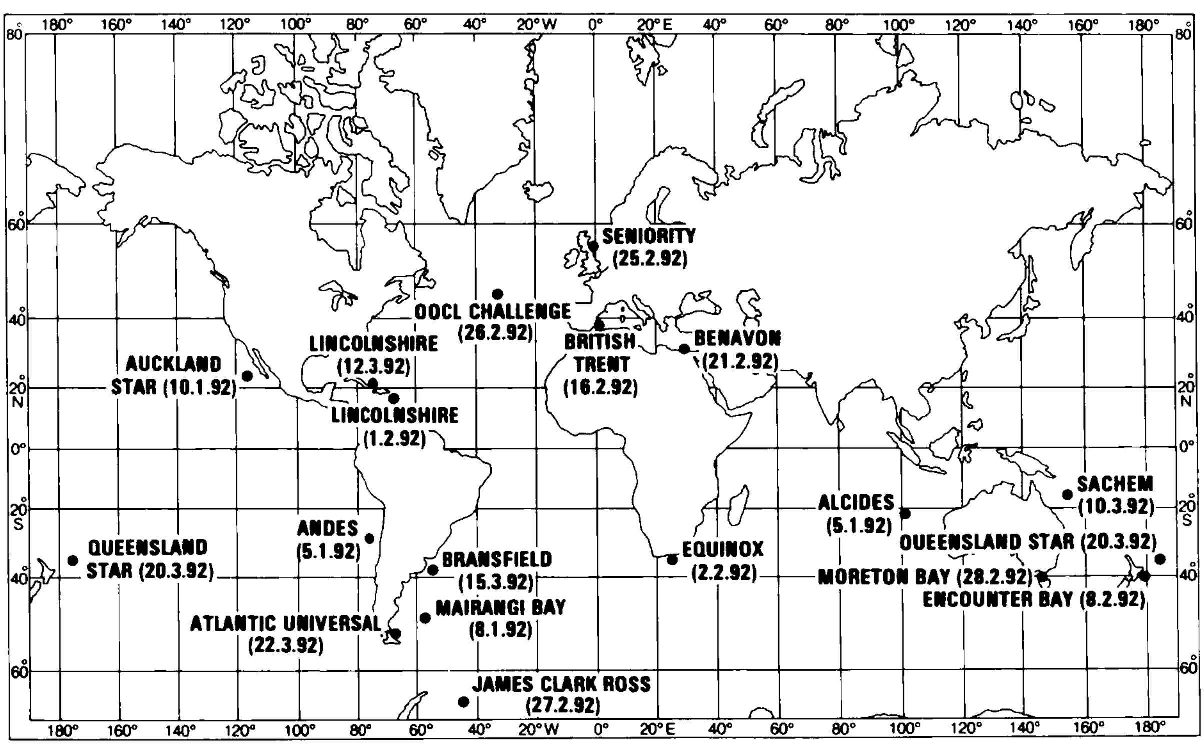
0550: *Touched* reports that disabled person now on board and remaining two crew preparing to transfer to *Isla de la Piedra*. Call monitored by *Long Island*. This vessel requests permission to leave area as soon as possible and USCG acknowledges but requests vessel remains.

0600: *Touched* reports that crew of *Monoped* safe on fishing vessel and situation ceases to be a distress. Request made to USCG to release this vessel to resume passage but told to stand by whilst *Long Island* confers with USCG CAMSPAC.

0635: *Long Island* reported to be 20 minutes from area. *Touched* reports that fishing vessel has *Monoped* under tow and all proceeding to shallower waters.

At 0644 *Auckland Star* was thanked by USCG CAMSPAC for the assistance and granted permission to resume passage.

Position of ship at 0240 UTC: approximately 23° 18′N, 115° 45′W.



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

Don't send these yet — I'm waiting for some artwork to send back to authors
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: a Bioluminescent Puzzle

P.J. Herring and M. Watson*

Seafarers encounter many unusual phenomena. The various forms of bioluminescence provide some of the most dramatic examples among these. One particular form, known as 'Milky Sea', is especially tantalizing because no wholly adequate explanation has yet been forthcoming. This is despite the fact that a substantial number of accounts of the phenomenon have been published, many of them in *The Marine Observer*. Indeed, the new Bioluminescence Database, described in Volume 62, No. 318, October 1992 edition of this journal, contains 235 reports ascribable to Milky Seas since 1915. Milky Seas are characterised by a constant white light extending over large areas (often 'to the horizon'), and lasting for hours at a time. The phenomenon is also occasionally described as 'White Water'. Sometimes the observers report an associated calming effect, change in temperature, or apparent reduction in visibility.

The descriptive analogies used are those of sailing over a sea of milk or a field of snow. This surreal effect may be so marked that the whole scene resembles a photographic negative, with the ship appearing black on a white sea and against a black sky. Four typical recent descriptions are given below:

Oriental Chief. 29.8.1986. Arabian Sea.

'A whitish glow was observed on the horizon and after 5 minutes steaming the ship was completely surrounded by a sea of a milky white colour, which was emitting an even, uniform glow similar to that of a fluorescent strip light held just under the surface of the water. The intensity of the light produced by this bioluminescence was similar to that produced by a full moon on a clear night.'

W.A. Mather. 13.8.1986. NW Indian Ocean.

'The entire sea surface took on an intense white glow which was not unlike viewing the negative of a photograph.'

Port Vancouver. 17.8.1985. Arabian Sea.

'The whole sea surface to the horizon was observed as a uniform, brilliant white glow.'

Staffordshire. 18.8.1985. Arabian Sea.

'The entire surface of the sea was glowing as though lit from beneath, a uniformly silk white. The vessel's wake and wash showed no increase in brightness. The sea appeared calm but the wind speed was estimated at 12 knots. On leaving the area of "White Water" a very marked contrast was noted between said white water and black normal colour, the line being very nearly straight with some distortion. The bioluminescence appeared to cover the entire sea surface, horizon to horizon.'

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Often observers describe feelings of awe at the sight of such unusual features. The account of Captain Kingman, in the American clipper *Shooting Star* south of Java in 1854, is a wonderful example:

> 'The whole appearance of the ocean was like a plain covered with snow. There was scarce a cloud in the heavens, yet the sky ... appeared as black as if a storm was raging ... The scene was one of awful grandeur; the sea having turned to phosphorous, and the heavens being hung in blackness, and the stars going out, seemed to indicate that all nature was preparing for that last grand conflagration which we are taught to believe is to annihilate this material world.'

The ship's surgeon provided a rather more prosaic report of the same phenomenon (Buist, 1855).

Reports of Milky Seas can be found in writings as far back as the seventeenth century and continue to appear sporadically through the eighteenth and nineteenth centuries. These earlier accounts have been identified in an unpublished manuscript made available to us by Dr T. Wyatt. The present article draws extensively on the Bioluminescence Database at the Institute of Oceanographic Science's Deacon Laboratory, derived largely from the meteorological logbooks of the Voluntary Observing Fleet. Because these reports are necessarily subjective notes made on board ship, subsequent interpretation can sometimes be difficult. Occasionally the term Milky Seas is wrongly used to describe extensive disturbed water luminescence. Thus a comment that 'the whole sea was luminescent' may just refer to the wave crests rather than to the specific features of a true Milky Sea. It is therefore probable that some of the reports classified as Milky Seas in fact relate to quite different phenomena.

Similarly the name White Water (an infrequent alternative for Milky Sea) is more appropriately applied to the daylight observations of large blooms of coccolithophores; these are tiny algae covered in microscopic chalky plates, which impart an overall chalky appearance to the sea surface. These have been described by Peko (1954) in the North Sea and have recently been the subject of extensive research by the Plymouth Marine Laboratory.

The geographical and seasonal distribution of Milky Seas

Observations of Milky Seas have been reported from many different areas of the oceans (Figure 1), but they are highly concentrated in the north-west Indian Ocean (Figure 2). Buist, in 1855, published a number of reports from vessels on the Aden–Bombay run and noted that the Imam of Muscat's naval captains were aware of the occasional appearance of Milky Seas in the SW Monsoon. Staples (1966) reported that the phenomenon is common in the Banda Sea, but this is not apparent from the distribution of recent reports. Wyatt identified 27 reports in Dutch archives (published in 1894) from south of Java between 1855 and 1880. This is a surprisingly high number for the 25-year period, when the more recent data identify only 12 Milky Seas in that region in the 76 years since 1915. Over the same time period 171 have been reported from the north-west Indian Ocean. The trade route from which these early reports originate is, however, less widely traversed today and was previously used predominantly by Dutch vessels, rather than the British ships which are the main contributors to the database.

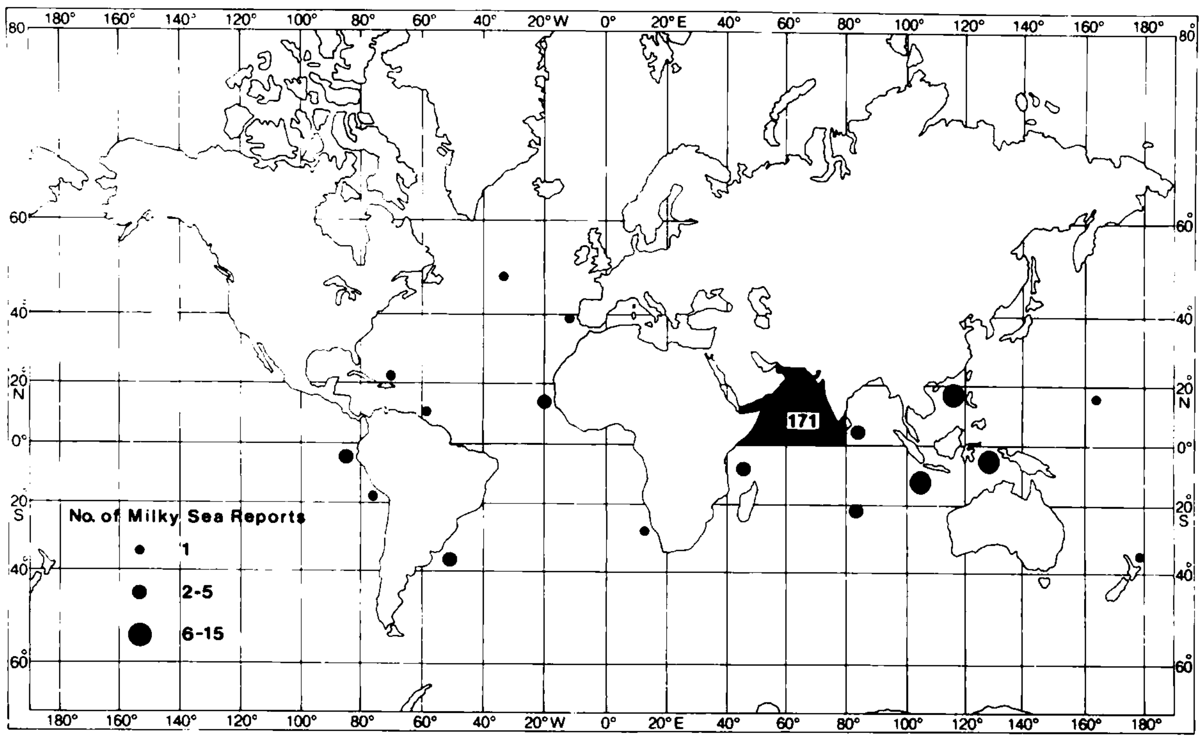

Figure 1. World distribution of reports in the database attributable to Milky Seas.

Nevertheless the same 1894 Dutch source also lists 13 reports in the Atlantic Ocean whereas the database has only 13 Atlantic reports in 76 years, 7 of which are atypical and probably not Milky Seas at all.

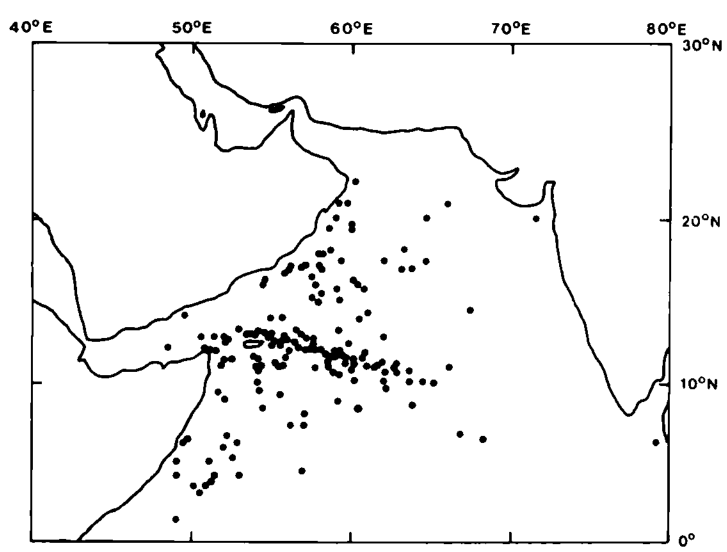

Figure 2. Positions of Milky Sea reports in the north-west Indian Ocean.

Bioluminescence of all types in the Atlantic is well-represented in the database, with almost as many reports overall as for the north-west Indian Ocean. If milky seas were more frequent there, this should be apparent in the more recent data. Their absence casts some doubt on the true attribution of some of the Dutch reports.

It is inevitable that the distribution of observations will be biassed by the trade routes. Turner (1965) suggests a coefficient to remove the bias but the method requires such detailed information on ship movements that it is wholly impractical to employ. Milky Sea reports are strongly clustered, and fine scale bias would still exist within the actual shipping lanes, unless the defined area was very small indeed. It is enough just to recognise this potential bias, and accept that it would be too difficult to eliminate. The bias, however, is not overwhelming. Although there is a definite concentration of reports along the commonly used routes out of the Gulf of Aden, there are still many reports from other areas in the same region (Figure 2). The fact that, despite the traffic through the Red Sea and Persian Gulf, there are no reports of Milky Seas from these areas, and only one anywhere near the west coast of India, must indicate that even with the shipping bias the observed distribution pattern is a true reflection of their occurrence.

Milky Seas have a very definite seasonal distribution (Figure 3). Observations are concentrated in the months of July, August and September. These are the months of the SW Monsoon in the north-west Indian Ocean. There is a smaller peak in January and February. Throughout the rest of the year there are very few reports, and some of these are atypical.

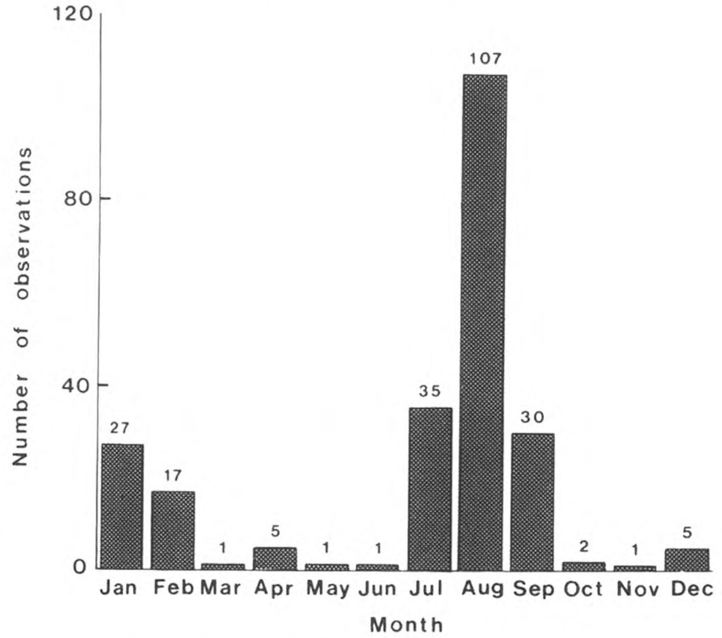

Figure 3. Seasonal distribution of Milky Sea reports (three were undated).

In general it appears that Milky Sea reports are highly concentrated in the north-west Indian Ocean (defined as north of the Equator and to 80° East) with a small secondary concentration (31 observations) in the Indo-Pacific. They are not associated with a particular depth of water or distance from the land.

Associated Features of Milky Seas

1. *The effect of uniform luminosity*

The main criterion for a Milky Sea is a uniform luminescence, which is not mechanically stimulated. The uniformity confuses the perspective and makes it very difficult to determine whether the phenomenon is on, above, or below the surface. Many reports note an apparently low-lying mist or fog, although there may be no hint of the mist at deck level. Nevertheless a few observers state clearly that the luminescence is *above* the surface of the water. In the database 88.5 per cent of the observations were reported to be on the surface, 6.4 per cent below, and only two (0.85 per cent) were clearly stated to be above the surface.

There is some circumstantial evidence that Milky Seas are extreme surface phenomena. Fish have been described as appearing black when they disturb the surface, and sometimes the bow wave and wake are also dark, suggesting that a thin surface layer is responsible for the light. Nevertheless several observers were convinced that it was a deep-seated luminescence well below the surface.

Another characteristic commonly associated with uniform luminescence is an apparent reduction in visibility, though in reality other vessels can often be seen on the horizon.

2. *The calming effect of milky seas*

Milky Seas are often said to have a calming effect on the waves, perhaps associated with a surface slick. Wyatt notes 13 reports of a calming effect, and 5 that state there was no calming effect. Forty-six of the 235 reports in the database mention a calming effect yet only 7 of these 46 actually record a drop in wind speed. Many of the observers implied that the effect was an illusion, and 4 reports (see below) stated clearly that the sea was still rough:

Tantalus. 13.7.1976. NW Indian Ocean.
The sea appeared calm, but the Aldis lamp was used to 'shine through the glow and expose the rough sea.'

Benvorlich. 25.8.1963. NW Indian Ocean.
'Waves and swell became indistinguishable though the ship continued to pitch and roll.'

Benvorlich. 26.8.1963. NW Indian Ocean.
'The sea disappeared though the wind did not diminish and the vessel continued to pitch and roll.'

Ioannis Zafirakis. 8.8.1950. NW Indian Ocean.
'The sea appeared almost glassy although rough in reality'. The vessel is also recorded to have been shipping seas.

In contrast, 2 reports give evidence that the effect was not an illusion:

Trevince. 19.8.1958. NW Indian Ocean.
'The sea appeared calmer and the ship only shipped spray once, whereas it had shipped spray frequently before.'

Somersetshire. 13.8.1925. NW Indian Ocean.
'No sound was heard, neither wind nor breaking waves. The ship which had previously been rolling heavily, had practically no movement on her: in fact, one could almost have imagined the vessel was in dock.'

Of the 235 reports of Milky Seas, 132 (56 per cent) also included a wind speed (Figure 4). Of these, 74 per cent were above force 3, the wind speed at which the surface films typical of natural slicks break up and lose their ability to damp capillary waves (Dietz & Lafond, 1950).

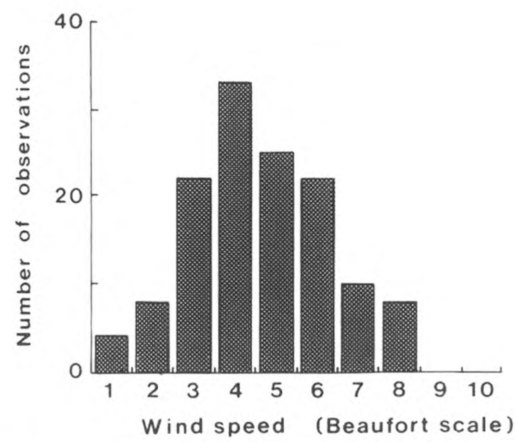

Figure 4. Distribution of wind speeds reported in Milky Seas.

3. *The reported association of temperature changes with milky seas*

The existence of a fall in sea temperature on entering a Milky Sea is another concept that has been promulgated without much supporting data. Tett & Kelly (1978) state that Milky Seas often involve temperature changes. A fall in surface temperature would be compatible with the idea that Milky Seas are associated with areas of upwelling, which bring colder nutrient-rich water to the surface. Slicks of organic material can also affect the surface temperature of the very top layers of water that is measured on board ship. Often the temperature is recorded from a metre or so below the surface.

In the present data set, only 13 of the observations (5.5 per cent) reported an associated fall in temperature, 6 (2.5 per cent) reported a rise, and 11 (4.7 per cent) measured the temperatures inside and outside the area and found no change. Whether or not upwelling is implicated, it is clear that neither a rise nor a fall in temperature is an essential characteristic of a Milky Sea.

4. *The boundaries of a milky sea are sometimes clearly defined*

A clearly defined boundary between light and dark water almost certainly indicates the presence of an oceanic front. This might implicate an association with certain water masses, e.g. cold-upwelling nutrient-rich water. In the database there are 31 reports of clearly defined boundaries at one edge and a gradual change at the other. An abrupt line probably looks more dramatic than a gradual change, and is thus more likely to be recorded. Gradual changes in brightness may not always indicate a change in the level of luminescence but rather reflect the extent of the observer's dark adaptation. In at least one report, the fading of the Milky Sea is associated with moonrise, when the light from the moon would have diminished the impact of the luminescence.

Causes of Milky Seas

What could be the cause of this extraordinary phenomenon? It has to be assumed that the luminescence is produced by some organism. No physical mechanism is known which would result in a steady glow (nevertheless eighteenth-century writers believed that the sea absorbed sunlight during the day and gave it out again at night.). The difficulty is that there are very few luminous organisms which produce a steady glow over a long period of time. Most flash or pulse for not more than a few seconds. The organism concerned must be very small, because individual light sources cannot be resolved, and very numerous, because the luminescence is so extensive and bright.

The most plausible candidates for some time have been luminescent bacteria. They are probably the only marine organisms which normally glow continually. There are about 8 or 9 species of luminous marine bacteria, (in the genera *Photobacterium, Vibrio* and *Alteromonas*), with differing temperature preferences and nutritional characteristics. Some are part of the gut flora of larger animals, others are cultured in special luminous organs in fish and squid who then use the light for their own purposes. All can also be found free-living in the sea.

It has been suggested that luminous bacteria might grow on a surface slick of oily organic material. The upwelling of nutrient-rich water could stimulate the growth of a plankton bloom, whose decay products would then provide the material for the slick. This hypothesis neatly explains (1) the surface nature of the luminescence (on a slick), (2) the association with the seasonal upwelling events, (3) the fact that the bow wave and wake may be dark (bacteria do not respond to mechanical stimuli, and (4) the absence of any visible organisms in most water samples that have been taken in Milky Sea conditions. One observation is particularly interesting in this context:

> 'On close examination, there was nothing in the sample; however, a crew member looking down on the bucket from the deck above observed the water to glow.'

Occasionally dinoflagellates or other organisms which produce mechanically stimulated luminescence are present in the samples, but these are presumably unrelated to the uniform luminosity of the Milky Sea. The only detailed experimental work was carried out by naval scientists on an American research vessel who sampled in and around Milky Sea conditions in the Arabian Sea in 1985 (Lapota *et al.*, 1988). In this case the bow wave and wake also produced disturbed water luminescence. Sea-water samples from a depth of 3 m had no luminescence and no luminous bacterial colonies appeared when they were filtered on to nutrient culture plates. However, a net tow from 5 m to the surface caught several slimy colonies of the alga *Phaeocystis*, from 0.5 to 10 mm in length, some of which glowed as if associated with bacteria. Several colonies of the luminous bacterium *Vibrio harveyi* were later cultured from a sample which had stood for three days.

Very occasionally thin luminous threads are reported in water samples. Could these also be algal colonies supporting luminescent bacteria?

Sarpedon. 31.8.1961. Javanese waters.

'Hair-like objects, khaki in colour, about 1.25 cm long' seen in sample.

Carthage. 22.8.1932. Arabian Sea.

'Thin luminous threads seen in sample. 3–25 mm long. Threads had movement of their own and kept nearly parallel to each other.'

Trojan Star. 28.8.1930. Arabian Sea.

'Sample seemed to contain thousands of very thin lines of light, some approximately 13 mm long, others were shorter.'

Solfa. 24.8.1949. Cape Gardafui.

'...in the bucket thin white threads, one inch long and smaller...Ordinary phosphorescence was also observed which was altogether different from the white threads which gave off a continuous white light or glow.'

The concept of an oily slick derived from a plankton bloom has also been linked to the supposed calming effect of Milky Seas.

Neat though this hypothesis is, some elements are difficult to equate with what is known about both bacteria and slicks. Slicks are usually patchy, not uniform over huge areas, and in light winds tend to be aligned in streaks. Only 21 of the 235 reports in the database mention dark patches at all and none of these are described as streaks. At wind speeds of greater than about force 3 slicks tend to be broken into patches and wind-induced streaks (Dietz and Lafond, 1950). Where wind speeds were mentioned in the database, 74 per cent were above force 3. This is hardly compatible with a huge persistent surface slick. Many of the reports are from oceanic locations, well away from the main coastal upwelling areas where slicks might be expected to form.

The physiology of luminous bacteria also presents a major problem. A single bacterium growing in sea-water does not luminesce. The luminescence is only switched on by the accumulation of a chemical (called an autoinducer) which the bacterium itself secretes into its surroundings. In dense colonies of bacteria this reaches a high enough concentration in the surrounding medium to initiate the luminescence. In large volumes of solution (such as the open sea) it is never likely to reach a high enough concentration to start the process of luminescence. Bacteria isolated from sea-water, in which they were present at low densities, have been shown to be naturally dark; bacterial densities need to be at least 10^7 ml^{-1} to maintain bright luminescence (Booth and Nealson, 1975). How could the autoinducer accumulate locally in sufficient quantities to 'switch on' the enormous displays characteristic of Milky Seas?

It has been calculated that at peak intensity luminous bacteria emit 10^3–10^4 photons sec^{-1} $cell^{-1}$. Knowing the sensitivity of the human eye it has also been calculated that 10^7–10^8 luminescing bacteria ml^{-1} is the **minimum** concentration at which they will be visible (Hastings and Nealson, 1979). The only measurements of luminous bacteria in the Arabian Sea area (April 1986) gave a maximum value of about 6 ml^{-1} (Ramaiah & Chandramohan, 1987). It is very difficult to accept that such high concentrations of bacteria as are required can be generated and maintained over such huge areas in the face of the dissipative processes of wind and waves.

Plankton blooms certainly can cause oily slicks in particular circumstances. Waxy films appear regularly in Canadian and Norwegian fjords and occasionally in the North Sea. They are attributable to oils from small copepod crustaceans. Similar material would be liquid at the surface temperatures of the Arabian Sea. Fish mortalities (which might generate oily slicks) do occur in the Indian Ocean, usually associated with large surface temperature changes, but do not correlate well with either the area or season in which Milky Seas are most frequent.

Staples (1966) attributes Milky Seas in the Banda Sea to the dinoflagellate *Noctiluca*. Certainly some of the reports can be attributed to dinoflagellates (e.g. that of the *Singapoor* in Buist, 1855) but most cannot. In the one scientific study of a Milky Sea, Lapota *et al.* (1989) identified dinoflagellates as a contributory factor (e.g. in the simultaneous luminescence of the wake), but their numbers were actually reduced within the Milky Sea itself compared with the water outside. Dinoflagellates do not glow brightly, in any event, but flash when mechanically disturbed. The only scenario in which they could provide the appearance of a Milky Sea would be if they were somehow stimulated to scintillate continually by high acidity at the surface, or by some equivalent abnormal condition. This has never been demonstrated.

One other organism has been reported to produce a widespread glow, namely the tiny ostracod crustacean *Cypridina* which occurs in huge numbers in parts of the Indian Ocean, including the Arabian Sea area. However, observations of its luminescence are largely restricted to the eastern Indian Ocean so it is unlikely to be involved. Even more definitive is the fact that it was not reported from the plankton samples taken in the Milky Sea by Lapota and his colleagues.

The problem of the cause of Milky Sea remains unsolved. Bacteria provide potentially the most plausible answer, but the very scale of the phenomenon presents difficulties in accepting this interpretation. If blooms and slicks are involved why are Milky Seas not frequent in other upwelling areas (e.g. north-west Africa or Chile)? What is so special about the north-west Indian Ocean? Why do Milky Seas not occur in the adjacent Red Sea and Persian Gulf, even though occasional algal aggregations are dense enough to discolour the water?

We urge observers who may encounter a Milky Sea to provide as detailed a description as they can. If it is possible to take a surface water sample this should always be examined closely. Ideally it should be preserved with formaldehyde (or even a little bleach) for later study.

The puzzle remains. Finding the solution depends on those who are on the spot.

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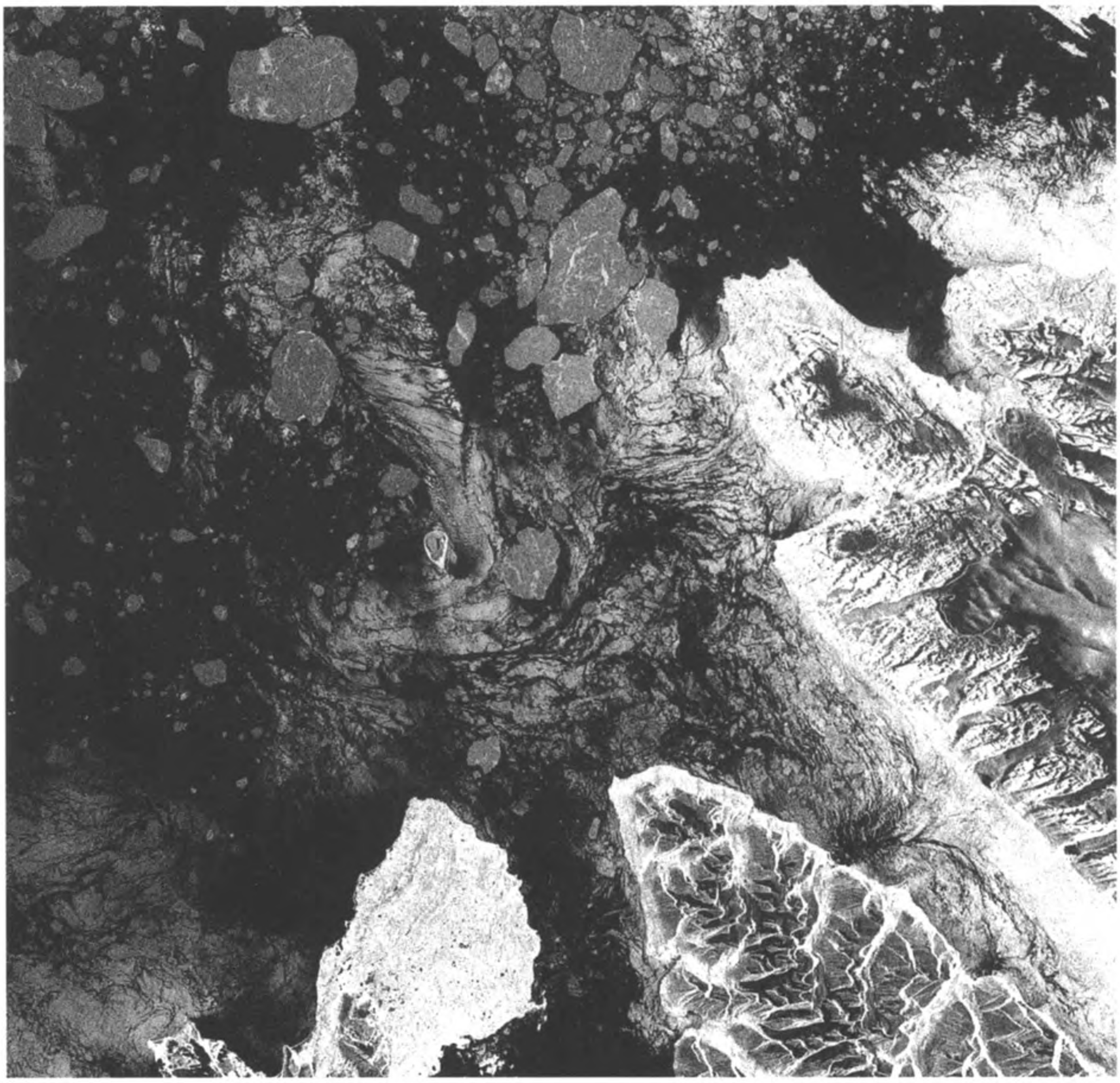
ERS-1 SATELLITE IMAGE



Example of satellite photograph showing ice concentrations. The first ERS-1 image acquired at Kiruna-Salmijarvi (Sweden) on 27 July 1991 at 1350 (Paris time) clearly shows the capabilities of the ERS-1 Synthetic Aperture Radar. The north-eastern portion of Spitzbergen between 77°N and 81°N is shown, with the entrances to two fjords and a glacier running down the one in the right of picture.

The fjords contain a considerable amount of glacier ice and there are large floes of multi-year ice in the open sea to the upper left (north of Spitzbergen). These floes have diameters up to 10 km and are up to 3.5 m in thickness. The light-grey areas are mostly multi-year ice broken into 'small' bits of ice from 10 to 50 m in diameter, and some 'slush' ice. A ship may easily penetrate these areas.

Photograph from ESA Public Relations Division provided by ERS Mission Manager, Paris.

The Northern Passages

By A.P. Maytham
(Met. Office Sea Ice Officer with METROUTE)

Introduction

The opening of the North-e [illegible] rol by the former Soviet Union is likely to ch [illegible] distance between ports in northern Europe [illegible] t may be halved according to marine experts.

The North-east Passage is [illegible] onnecting Europe with Japan via the North P [illegible] h Cape along the northern coasts of Siberia a [illegible] ges in the Soviet Union have revived interest [illegible] native to the long haul through the Suez or Panama Canals.

Captain Maytham is in Rm R201 CFO

Satellite communications will be vital for ice monitoring and ship routeing if the passage opens for regular traffic. (See satellite photograph on previous page for example of images used to monitor Arctic ice concentrations). The French have been quick to realise the potential benefits of the route, and were the first in Europe to organise a voyage along the North-east Passage after almost 60 years of Soviet control. France's traditional rivalry with Japan has given way to joint interest in the opening of the passage, which saves about 3,000 n.mile on the sea route from Europe to Japan.

The Soviets formerly operated coastal traffic along the route for four months of the year. With the assistance of their 30 nuclear-powered icebreakers, they now envisage leading cargo and passenger ships through the polar ice for up to ten months of the year.

The main competitors for the French on the route are the Norwegians, who remain cautious about the stability of the Commonwealth of Independent States, and about the cost and reliability of such a service. Whilst ice fields would reduce average speeds, the shorter distances could cut four days off the transit time. The distance from Hamburg to Anchorage, for example, is about 3,400 n.mile via the North-east Passage compared to about 8,400 n.mile via the Panama Canal. The route can be expected to generate hard currency for Russia in the same way that the transits of Suez and Panama cost thousands of dollars each.

Background

From history we gleen that about the only seafarers who have not deliberately looked for a Northern Passage, either east or west, were the Vikings. Their policy appears to have been exploration, probably because the concept of bringing spices and silks from farther shores was not even considered. Their trade in spices came from the overland trade routes.

Since the main sources of spices, sugar, tea and silks, together with various other commodities, have been the Eastern shores, anybody who is someone has been searching for a means of getting the goods back to Europe in the shortest possible economical time, preferably ahead of everybody else. The shortest distance between two points is of course a straight line, which on the Earth's surface is the Great Circle track. Due to the location of land masses and heavy polar pack-ice, the Great Circle has not been a practical solution. The Spaniards traded to and from the East via the Isthmus of Panama. The remaining trade routes were via the Cape of Good Hope out and home, and when needs must, via Cape Horn homewards. These routes remained valid for centuries, until the opening of the Suez Canal made for a shorter route to the East. The route to China and the East under sail saw many voyage records broken, and the days of sail saw the *Cutty Sark* and other well known tea clippers trading the oceans at remarkable speeds. The advent of steam ships, which could carry five times as much cargo as the clippers, changed the face of the oceans forever. No longer the song of the wind in the rigging, now the clatter and bang of reciprocating engines, triple expansion chambers and steam generators; life would never be the same again. The larger sizes of ships made the liner trades profitable due to larger cargoes, and the schedules became more certain of being maintained at consistent speeds.

It has been reported that Francis Drake searched for a passage to Europe from the Pacific and decided, quite correctly, that it was not a good idea for his wooden craft to attempt a passage through what appeared to be a heaving mass of solid ice. He was quite correct; there would have been no passage for him or his ship. Since then, Cook made a search in 1778, followed by a regular flow of explorers: Franklin in 1820, Peary in 1890, not forgetting Frobisher and so the list goes on ... until Byrd made a search from the air in 1926.

Prospects

The interest in a Northern Passage to and from Japan has been sustained by commercial enterprise. The saving of time and as a consequence, money, is a priority with all. The distance saved over the route to Japan from the English Channel via Suez and Singapore is in the order of 2,700 n.mile.

The North-west Passage is a reality. It has been used by cargo vessels, notably by the tanker *Manhattan*, which has, I believe, been reconverted to a conventional vessel due to the loss of lifting capacity when plying icebound waters.

The North-east Passage is of interest to Europeans as a shorter route than the North-west Passage. It is much used in sections by the Russian fleets. The eastern fleet plys from Vladivostok to the East Siberian Sea ports, and the Murmansk Line plys to the Kara Sea and Laptev Sea ports. Due to the icebergs calved from Siberian glaciers, and the pressure of ice from the Trans-polar Drift, the passage is not always open. The two fleets of Russian vessels each have their attendant icebreakers to assist them. No commercial cargo vessel could trade in these waters without icebreaker assistance. The Okhotsk based icebreakers also assist those from Arkhangel or Onega on their respective runs, taking supplies into the mining stations and returning with mixed products. The season is short, about three to six months maximum, and rarely a longer cycle. The New Siberian Islands trap the main icebergs and the Laptev Sea has a coastline mainly of land fast ice for up to eight months of the year. This makes running supplies in the short season essential. Neither fleet will cross the Laptev Sea if possible, as ships, even icebreakers, may become beset for long periods and may even founder under the pressure of ice.

Who wants a North-east Passage, and who could use it anyway?

The normal dry cargo ship, bulker or small tanker is out, as each type would never stand the pressure of ice. Large bulkers and tankers could not get into the ice because of their large blunt bows. Small and powerful container vessels or refrigerated ships with fine lines may manage to manoeuvre in the ice, but would suffer damage forward and probably also to an unprotected propellor. This would mean that such vessels would have to be heavily strengthened against the ice. The logistics of converting a fleet to ply the ice waters are of enormous proportion. A new fleet would have to be purpose-built. This means that for them to trade away from the ice would be uneconomical, as Lloyd's classification ✠100A1 is quite substantial and the extra steel could not be offset by cargo on other trades. Converting an existing vessel to ice classification does not, at first glance, appear a good option. Conversion or modification of every part of the vessel would be necessary, from fuel and water storage to insulation of the accommodation and upgrading of safety equipment.

The ships of the Russian fleets are all elderly, up to forty years old in some cases. These ships are patently unsuitable for containerised cargoes, and most modern goods shipped from and to Japan would need to be in insulated containers. I am sure cameras and electrical equipment would not stand sub-zero temperatures for a continuous period of up to two weeks, possibly longer.

Environmental aspects

What happens to the ecology of the Arctic, and who cares anyway?

As it happens, there are people who care. Polar bears are already being killed by oil pollution. Oil contaminates a polar bear's coat, which then loses its properties of insulation; a few hours later the bear's skin freezes, its neck freezes and then it dies. Polar bears are carnivores and they will also eat anything they find lying about. Unfortunately, most things left by man are haz... hazardous to man also, as it happens), and th... doubt the Northern Passages would ensure th... of time. The Atlantic has had a film of oil ... 1970s; the Mediterranean is already so pollute... creatures and many no longer live there, or ar... also already dying from pollution, from eating... The devastation that could be caused by running... the Arctic region could well destroy the fine ec... and which is still not properly understood.

send to:
Captain Fee
Mrs Sambrook
Captain Edward
only.

PRESENTATION OF BAROGRAPHS

Several 'firsts' were accomplished when the latest barograph award ceremony was held at Bracknell on 8 July last. We were privileged to have the new Chief Executive, Professor Julian Hunt, in our midst to make the presentations and we were also pleased to have the Reading Room of the new Archive in the Scott Building put at our disposal for the ceremony for the first time.

Those present to receive Long-Service Awards were Captain M. Edward, P&O Ferries Ltd, Captain A.J. Fee, P&O Containers Ltd and Mrs J.T. Sambrook who had accepted the Marine Superintendent's invitation to be present, together with her two daughters, to receive the barograph on behalf of her husband, Captain P.A.E. Sambrook, P&O Containers Ltd, who regrettably died in service in January 1991. Captain S. Bligh, Fleet Operations Manager for P&O Containers, attended to receive the barograph for Captain C.R. Short who was at sea aboard his command, m.v. *Resolution Bay*. Captain Short would be invited to attend to receive his barograph in person at a later date. The period considered is the twelve months to the end of 1990, and qualifications considered for the Long-Service Award are a minimum of 18 years in which voluntary observing took place and

Professor Hunt (Chief Executive, Met. Office) presents a long-service award to Captain. Bligh, receiving on behalf of Captain Short.

Professor Hunt presents a long-service award to Captain Fee.

Professor Hunt presents a long-service award to Mrs Sambrook, widow of Captain Sambrook.

Professor Hunt presents a long-service award to Captain Edward.

Presentation of barographs at Bracknell Headquarters on 8 July 1992. Standing, left to right: Captain J.A. Davenport (Fleet Director, P&O European Ferries, Portsmouth); Mrs Fee; Professor J.C.R. Hunt (Chief Executive, Met. Office); Miss Ailsa Sambrook; Mrs Caroline Bennion (Ailsa's sister); Mrs Edward; Dr P. Ryder (Director of Operations, Met. Office). Seated: Captain S.T. Bligh (Fleet Operations Manager, P&O Containers); Captain A.J. Fee (P&O Containers); Mrs Jeanette Sambrook, (widow of Captain P.A.E. Sambrook, P&O Containers); Captain M. Edward (P&O European Ferries, Portsmouth).

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Guests and staff on 8 July 1992. Upper left: Captain Edward; Mr M.W. Stubbs, (Senior Chief Forecaster, Met. Office); Mrs Edward. Upper right: Captain J.F.T. Houghton, (Nautical Officer, Met. Office); Mrs Fee; Captain Fee; Captain Bligh. Lower left: Captain G.V. Mackie, (Marine Superintendent, Met. Office); Professor Hunt; Dr Ryder; Mrs Sambrook. Lower left: Captain Mackie and Mrs Sambrook.

Photo supplied by Captain C.W. Harvey

Frigatebird pictured on board the *Merchant Principal* on 12 February, 1992, in position 13° 32′S, 179° 27′W.

Photo by P.W. Jackson

Illuminated sky off Cap Corbelin, Algeria, on 19 January, 1992, photographed from the *City of Ipswich*.

the completion of at least one meteorological logbook in the year in question. This Long-Service Award scheme has been in operation since it was introduced by the Director of the Meteorological Office in 1948, to reward annually four Shipmasters with esteemed observing service.

Before making the presentations of inscribed barographs, the Chief Executive addressed the assembled company of guests, Directors and staff members with the following words.

'I am very pleased to be able to take part in my first barograph award ceremony. This very pleasant occasion is an opportunity for the Met. Office to show its appreciation of the work done by mariners in observing the weather. This all goes back to my distinguished predecessor, Vice-Admiral FitzRoy, the first Superintendent of the Office. FitzRoy in his very far-sighted way set the scene of mutual benefits to be gained by such co-operation and we obtain very good data that enables us to make the good forecasts that the Met. Office provides and that you as mariners and others require. The occasion also serves to remind us of the long and close association that the Met. Office enjoys with professional seamen.

'I would like to emphasise the fact that forecasting is based upon scientific principles, and nowadays upon massive calculations; but it is also crucially dependent on measurements being continuously supplied around the world, over a 6-hour period and often in very difficult and adverse conditions, such as I have been hearing about today, including the typhoons recently experienced by one of the Masters present.

'There is now a new dimension to the question of observing the weather in all its forms over the sea, and that is that we are not only concerned with providing forecasts over a few days but also sometimes now over seasons and, even more, trying to study and predict the effects of climate. These may have very large effects upon the whole nature of storms and the climate of the world and the like, and so the work of the volunteers who gain data remains of extreme importance.

'All meteorological work depends on data. This is as true for real-time forecasting as it is for the studies of climate change that are becoming increasingly important. For both purposes there have always been problems in getting sufficient good quality data from the oceans. Data from ships of the Voluntary Observing Fleet have long played an important role for all these purposes and your logbooks are keyed to computer format in slower time than is used for computer modelling, and thus the data find their way into our global climatological archive that now contains some 70 million observations dating back to 1855.

'I am sure you will help dispel the illusion that we have to keep working at in our Office, that somehow our Met. Office is merely a bunch of people looking at pictures of satellites and putting them on your TV screens, and that is all there is to meteorology. But that is very far from the truth and although satellites are a help and all our forecasts these days are based upon computer models giving us basic data such as winds, temperatures, pressures and increasingly giving us more information such as the nature of the sea surface, the need is still there for the conventional types of data, and that need will continue into the foreseeable future. Traditionally, meteorologists have always used data from many different sources and this is still true in this increasingly technological era. The old and the new each have their strengths and their weakness, and we gain the maximum benefit by using them together and not separately.

'Recent studies have emphasised the need for good data over the oceans and have also emphasised the necessity for **good quality** data, especially over data-sparse areas, where checks with nearby observations are not always possible. Captain Mackie and his staff both here at Bracknell and at the ports spend a great deal of time and effort encouraging ships' officers in this vital work. The award scheme is a part of this process.

'The dedication shown by the officers of the U.K. Voluntary Observing Fleet is very evident in the quality of the data that we receive for our operational forecasting work. These data are subject to quality assurance checks and any ships that are consistently reporting poor quality data are black-listed, i.e., ignored by the data analysis programme. I am pleased and proud to say that no U.K. ship is so black-listed. (Of course this is rather academic telling you all this, as the reason why you are here is because your work has been so marvellous, and you are part of the great international scheme of meteorological data interchange.)

'The various small tokens of our gratitude in no way reflect the use we make of the data although I am sure that you realise that you yourselves benefit by better quality forecasts. In presenting these barographs to Shipmasters who have observed the weather so well for so long we are not only thanking you personally but also the very many other dedicated and very responsible officers in your shipping companies and in the many other co-operating companies. I hope when you go from here you will pass our messages to all your colleagues both at sea and ashore and say that we are thanking everybody who is involved.'

Following the presentations the party was entertained to luncheon by the Chief Executive and senior staff at a local hotel, and later conducted around the Central Forecasting Office, including the METROUTE team of Master Mariners who undertake ship routeing world-wide, as well as other parts of the Office of interest.

AURORA NOTES JANUARY TO MARCH 1992

By R.J. Livesey

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

In Table 1 are listed the observations of the aurora made by mariners during the period under review. Details of the Southern Hemisphere observations of the aurora australis have been passed on to the Royal New Zealand Astronomical Society Aurora Section for analysis with all other reports they receive, covering Australia, Tasmania, New Zealand, Campbell Island, ships at sea and any data from Antarctica. Northern Hemisphere reports are included in the British Astronomical Association annual aurora report.

The beginning of 1992 saw the completion of the high level of auroral activity experienced in the latter half of 1991. Coronal or overhead aurorae were seen down to the locations as listed in Table 2.

Table 1 — Marine aurora observations January to March 1992

Date	Ship	Geographic Position	Time (utc)	Forms in Sequence
1/2 Jan.	*Cumulus*	57° 13'N, 23° 05'W	0140–0240	qHV. Max. alt. 30°
3/4	*Cumulus*	57° 23'N, 24° 38'W	2040–0037	N.p_2N.qHV. Max. alt. 30°.
4/5	*Cumulus*	56° 58'N, 20° 35'W	2302	p_2P.qHV. Max. alt. 7°.
7/8	*Cumulus*	56° 06'N, 19° 47'W	1945–0345	N.qHV. Max. alt. 20°.
8/9	*Cumulus*	55° 40'N, 19° 27'W	2040	N.
13/14	*Cumulus*	57° 14'N, 17° 48'W	0242	N.a_3p_2RR.qHP. HN.V. Max. alt. 30°.
27/28	*Selectivity*	57° 32'N, 01° 40'W	2015–2200	RA.RR.G.
29/30	*Cumulus*	62° 20'N, 23° 55'W	2310	R_2B
2/3 Feb.	*Sulisker*	60° 40'N, 00° 42'W	1900–1940	HB.RR. Max. alt. 90°.
2/3	*Selectivity*	57° 05'N, 01° 58'W	1915–0000	N.RB.p_2mP.RR. RB.mP.RR.G.
20/21	*Encounter Bay*	39° 45'S, 141° 11'E	1300	G.G.RR.RA.G.
24/25	*Cirolana*	56° 26'N, 01° 16'E	0005	V.G. Max. alt. 30°.
24/25	*Seniority*	57° 40'N, 00° 00'E	0145–0400	P.RA.aRA.RR. Max. alt. 70°.
28/29 Mar.	*Iron Carpentaria*	39° 00'S, 148° 15'E	1540–1550	G.HB.

KEY: a = active, m = multiple, p_2 = pulsating, q = quiet, A = arc, B = band, G = glow, H = homogeneous, N = unspecified form, P = patch, RA = rayed arc, RR = rays, R_2R = medium rays, V = veil.

Table 2 — Coronal or overhead observations

Location	January	February
Fair Isle	—	9/10
Moray Firth	2/3	2/3
Firth of Forth and Clyde	20/21	26/27
Foveaux Strait (New Zealand)	18/19	20/21, 24/25

The aurora of 2/3 February was the most-widely observed event, particularly in the United States and Canada. Overhead aurora was said to be present above the Gulf of St Lawrence and Lake Superior and photographed overhead from North Dakota; it was also well seen from South Island, New Zealand.

From time to time reports are received that lack some important detail, such as location or time, and there has been the occasion where the given location has not been found in gazetteers or on maps. It is a pity to have to reject a really good report of an aurora when we do not know where the ship was in space or time.

In Table 1 the maximum altitude above the horizon at which auroral light was seen during the display has been recorded. The angle is usually measured from the polar direction up to the zenith and back down to the horizon on the equatorward side. It gives the reader an impression of the size of the display. Observers will note that a coronal structure of overhead rays and other forms tend to converge at a point equatorwards of the celestial zenith, called the magnetic zenith. The incoming electrified particles causing the aurora follow down the lines of the Earth's magnetic field that lean equatorwards in mid-latitudes, hence the magnetic zenith represents the direction the field lines take when leaving the observer's position. During some recent aurorae it has been possible to calculate the vertical heights of the tops of auroral forms by making use of simultaneous observations recorded at different magnetic latitudes. When the aurora has been overhead at the port of Leith, the angular height has been measured at Chichester. On the same night, overhead aurora at Hamburg has been observed from the Austrian alps. Typical calculations have given heights of between 400 and 450 kilometres above the Earth's surface.

In Figure 1 is shown the correlation between the observed angular height of auroral forms as may be seen from a ship, the actual height of the aurora above the

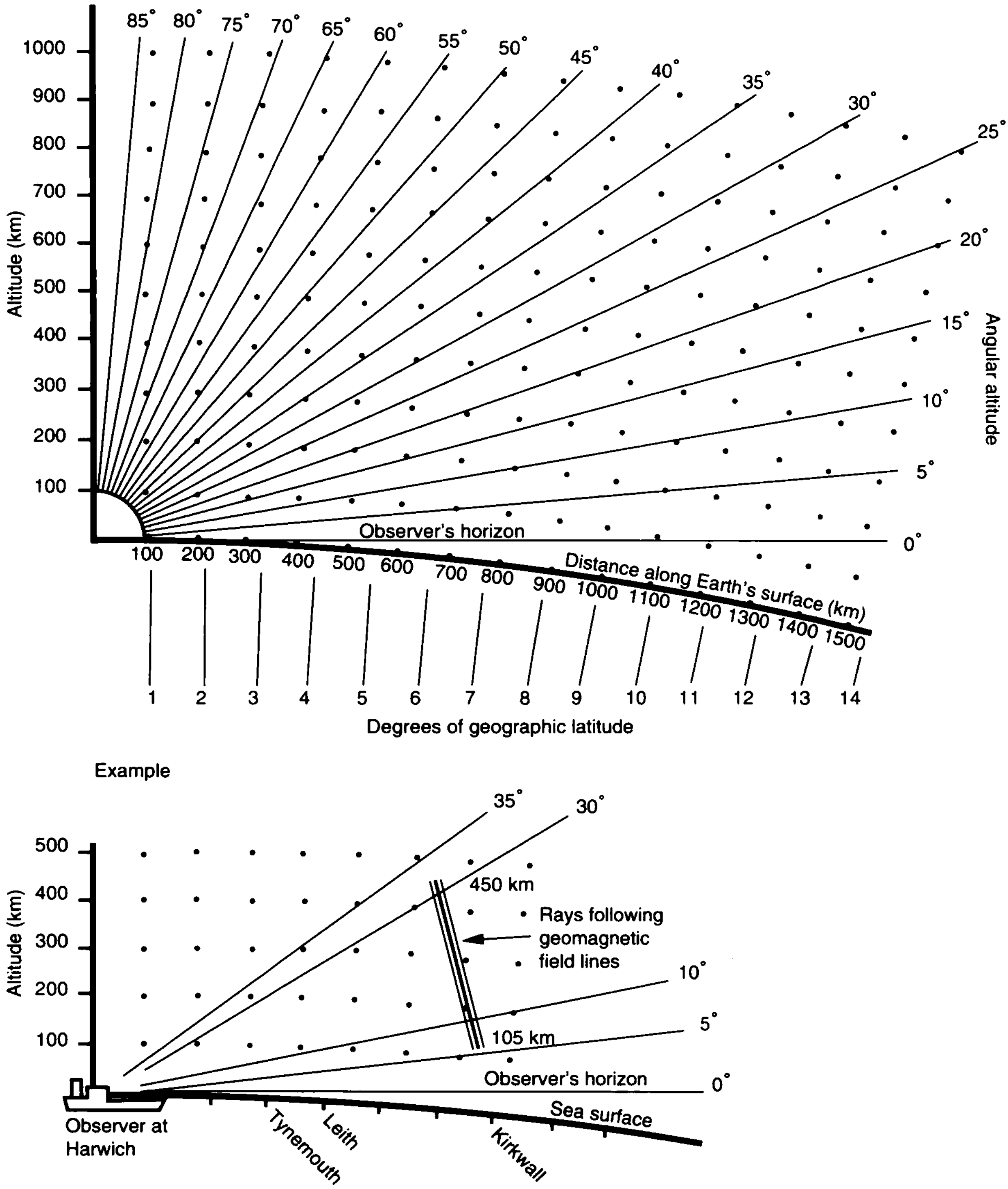

Figure 1. Correlation between observed angular altitude, vertical altitude and distance from observer. The example shows how a coronal display over the Pentland Firth would appear to a ship entering Harwich.

Earth's surface, the degrees of latitude and distance measured along the Earth's surface from the ship to the aurora. In the lower half of the diagram is an example to show how a long bundle of rays forming a corona above a ship in the Pentland Firth might be seen by a ship entering the port of Harwich. The rays at their particular latitude bend equatorwards through an angle of about 18 degrees so that the coronal point of convergence at the magnetic zenith would lie 18 degrees south of the true zenith.

Accurate measurements of auroral heights are made using pairs of photographs taken from camera stations placed at some distance from each other and linked by telephone for the purpose of timing the exposures. The original work was carried out in Norway by Professor Carl Størmer and his associates using Krogness plate cameras of very simple design that could work reliably in low Arctic temperatures. Some 10,000 pairs of photographs were used, utilising semi-graphical methods to solve the necessary mathematics. Nowadays the work of calculation can be eased using computers. The same cannot be said for 'off the shelf' roll-film cameras in which batteries fail and film becomes brittle at low temperatures.

Processing auroral observations is not without its moments of humour. Observations as received are summarised in code for ease of transmission, storage and reference, bearing in mind that there may be over one thousand reports to examine per annum. An observation of the aurora australis from the *Resolution Bay* on 9/10 July 1991 at Otago Harbour was received via Bracknell, coded and then passed to New Zealand. The geographic latitude and longitude of the vessel had not been stated on the original report, it having been assumed that Otago Harbour was sufficient identification of position. A latitude and longitude were assigned to the report from the list of observing sites used by regular reporters; then, back from New Zealand came a request for confirmation of the ship's position as that given in the coded message put the *Resolution Bay* hard aground in the middle of a farm to the west of Otago, operated by Reg Sutherland, a well-known New Zealand aurora observer, no major tidal waves having been observed. The Master and ship's company may be assured that the correct position of the vessel appears in the archives of both custodial societies, with the ship still afloat.

LETTERS TO THE EDITOR

(Letters to the Editor, and books for review, should be sent to the Editor, *The Marine Observer*, Meteorological Office, Eastern Road, Bracknell, Berkshire RG12 2PW, U.K.)

New MARID recruit

I have recently obtained employment as Master of the m.v. *Britannia Beaver* and we have just been recruited as a MARID vessel. For your interest I enclose a photograph of the vessel (see overleaf) which is a new trailer suction dredger owned by Britannia Aggregates Ltd. Initially the vessel will operate out of the Thames to dredging grounds in the southern North Sea. The vessel loads approximately 4,800 tonnes of sea-dredged aggregates and is commanded alternately by Captain Paul Phillips and myself for two-week periods. Thank you in anticipation for sending us copies of *The Marine Observer*.

Captain Robert C. Jackson.

Photo by Captain R.C. Jackson

Britannia Beaver, Britannia Aggregates Ltd, Captain R.C. Jackson. (See previous page.)

More aurora ordered

The reduction in numbers of auroral reports received from ships may reflect a downturn in the number of ships available to observe and where they are distributed around the world. For example, I assume there is no longer a deep sea fishing fleet that used to give us reports from north of Murmansk. Again, watchkeeping conditions and deck lighting arrangements have changed and have affected the visibility of auroral light. This was the reported situation with respect to Ocean Weather Ships, in certain cases, and this actually showed up in the auroral record when weather ships changed.

One might argue that land- and sea-based observing is being superseded by satellites. However, at the Scottish Astronomers' Weekend held at Stirling University last September, Dr Alastair Simmons demonstrated that work that he had done on Spitzbergen had relevance to auroral research. I recently completed an analysis of overhead aurorae in the U.K. that has been of interest to French and Greek professional investigators. We never know when something may be of value, so we never stop observing.

Please be kind enough to include this request for more auroral observations in your journal.

R.J. Livesey, British Astronomical Association, Aurora Section.

For the record, Ron Livesey is a Civil and Water Engineer by profession but continues to provide his stimulating aurora commentaries for this journal on a voluntary basis. Let us maintain our support for his useful work by providing him with as many aurora reports as possible.

Book Review

Fairplay World Shipping Directory 1992-1993. 210 mm × 295 mm, 958 pp. Fairplay Publications, P.O. Box 96, Coulsdon, Surrey CR5 2TE, U.K. Tel: 081-660 2811. Telex: 884595. Fax: 081-660 2824, or from the North American Office, P.O. Box 354, Germantown, NY 12526, U.S.A. Tel: 518-537-6682. Fax: 518-537-6667. Price: £79.

Shipping industry professionals will welcome from Fairplay Publications Ltd the publication of the *Fairplay World Shipping Directory 1992–93.*

It is not possible to get all the information that everyone in shipping needs into one book. But Fairplay is having a good try. The directory has been greatly expanded, and comes as near as possible to being a single information source for companies and contact details of all aspects of the shipping industry.

New technology makes it easier to gather and store information, which in turn makes it cheaper to sell. The *Fairplay World Shipping Directory* is available at a price which represents a considerable cost saving against comparable marine directories. This year the entries are sorted by country, making it easier to use for people trying to find out who is where; especially useful for marketing departments. It is also extensively indexed, making it easier to find entries or bodies whose name you know, but whose country of residence you do not.

There are sixteen sections, with fifteen thousand entries covering everything from shipowners and operators, through shipbuilders, equipment companies, marine insurers, lawyers, brokers and maritime organisations to ports and schools.

Notices to Marine Observers

PORT METEOROLOGICAL OFFICE IN SOUTHAMPTON

The Port Meteorological Officer, south-west England, moved from former premises in Southampton Weather Centre to a new address on 17 August 1992.

Captain Douglas R. McWhan is now at 8 Viceroy House, Mountbatten Business Centre, Millbrook Road East, Southampton SO1 0HY; telephone 0703 220632, fax 0703 337341.

Fleet Lists

GREAT BRITAIN

Updated information regarding the list published in the July 1991 edition of *The Marine Observer*. Amendments for this list are required by 15 September. Information for the main listing in July is required by 15 March.

Name of Vessel	Date of Recruitment	Master	Observing Officers	Senior Radio Officer	Owner/Manager
Chiquita Belgie	13.8.92	R.N. Cumbers	C.I. Kitchen, R. Reoyan, R.S. Gret	I.L. Guino	Logbridge Ltd
Chiquita Frances	4.4.92	—	—	—	Logbridge Ltd
Chiquita Schweiz	29.6.92	—	—	—	Logbridge Ltd
Cotswold	9.5.92	—	—	—	P&O Ship Management Ltd
Dawn Patrol	*	—	—	—	Putford Offshore Ltd
Dew-Gennen-Ny	11.5.92	R.A. George	—		Mr R.A. George
European Clearway	27.7.92	P. St J. Jervis	A.C. McFadyen, A. Delaney	—	P&O European Ferries (Dover) Ltd
Griparion	22.4.92	—	—	—	—
Gry Maritha	*	—	—	—	Isles of Scilly Steamships Co. Ltd
Helios	28.7.92	G.J. Pearson	—	—	Rederiet H.R. Myhre A/S
Jervis Bay	31.7.92	J.L. Peterson	D.J. Bailey, D.J. Newnes, C. Macleod	R. Lockhart	P&O Containers Ltd
Kamina	12.8.92	P. Underwood	W. Kowalski, A. Colobong, B. Baluyot	V.G. Sasot	OT Africa Line
Lady Beaverbrook	13.3.92	N. Northmore	N.E. Gardiner	—	Ocean Youth Club
Mar Del Sur	22.6.92	P. Moseley	T. George, A. Jacinto, S. Santy	G. Campos	Matheson Shipping Services Ltd
Nueva Andalucia	3.4.92	P. Moseley	J. Charlton, R. Gonzales, C. Manginsay	A. Adovas	Jardine Ship Management Ltd
Oriental Venture	9.9.92	—	—	—	M.O.L. Tankship Management Ltd
Pacific Venture	6.7.92	—	—	—	M.O.L. Tankship Management Ltd
Putford Skua	6.8.92	P. Crane	S. Sleet, J. Riley, D. Newbury	—	Boston Putford Ltd
Scillonian III	30.6.92	C.P. Row	D. Pascoe, P. Crawford, M. Mitchell	A. Quale	Isles of Scilly Steamships Co. Ltd
Swan Arrow	30.3.92	H.O. Gauksheim	K. Njorgan, L.E. Manalang, A.H. Da-Anoy	A.G. Abeywardene	K.G. Jebsen Skipsrederi A/S
Tinnes	31.3.92	—	—	—	Chelston Ship Management Ltd
Uruguay Express	23.7.92	H. Chiappara	E. Buzy, J. Rodriguez, F. Perera	O. Silva	Worms Cargo Services

The following Selected Ships have been deleted:

Ambra Hunter, Benalder, Benavon, Bridgeman, British Tay, Brucella, Canmar Venture, Carina, Cormorant Arrow, Eastern Trust, Edinburgh Savanah, Esso Demetia, Highland Reel, Leicesterbrook, Maersk Jupiter, Malling, Nickerie, OOCL Dynasty, Ocean Express, Ocean Link, Pacheco, Pacific Crane, Paquita, San Lorenzo.

BRITISH COMMONWEALTH

The following Selected and Supplementary Ships have been recruited or deleted since the list published in the July 1992 edition of this journal:

AUSTRALIA (Information dated 27.8.92)

Recruited (Sel.): *Iron Dampier, Lode Bay.*
Recruited (Sup.): *Kapala.*

INDIA (Information dated 1.9.92)

Recruited (Sup.): *Nand Smiti, Nicobar, Tirumalai.*
Deleted (Sup.): *Jag Dhir, Lok Vinay, Maratha Elegance, Vishva Sidhi.*

HONG KONG (Information dated 31.8.92)

Recruited (Sel.): *Asian Challenger, Highlander, MBK Princess, Maersk Asia Octavo, Micronesian Pride, OOCL Envoy, OOCL Frontier, Tapiola, Texas, Woermann Africa.*
Deleted (Sel.): *Kwangtung, Maersk Credo, Maritime Noble, Siam Star.*
Recruited (Sup.): *Green Era.*
Deleted (Sup.): *Asian Challenger, Sea Falcon, Seamaster, Toba, Torrens, Toyama.*

NEW ZEALAND (Information dated 5.8.92)

Recruited (Sel.): *New Zealand Star, Rangitata, Rangitikei, Rangitoto, T.A. Mariner.*
Deleted (Sel.): *Cotswold Prince, Gondwana, Kaharoa, Mandama.*

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First published 1993

Annual subscription
£18.50 including postage

£4.75 net

ISBN 0-11-729217-6

ISSN 0025–3251