The Marine Observer

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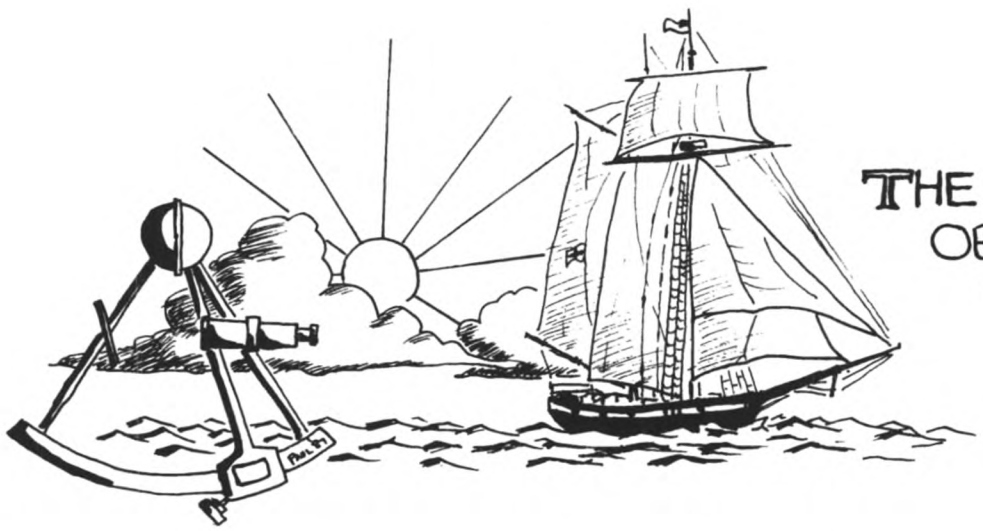


THE MARINE OBSERVERS' LOG

This section of *The Marine Observer* comprises reports of interest and scientific value contributed by individual observers or as part of a ship's meteorological logbook. All reports are welcome and, wherever possible, they are forwarded to relevant sources of expertise for comment and analysis.

Responsibility for the content of any item offered for publication rests with the contributor, although texts may be subject to amendment at the discretion of the Editor.

All temperatures in this publication are given in degrees Celsius unless otherwise stated, and the barometric pressure is given in millibars (mb) although the standard international unit is the hectopascal (hPa) which is the numerical equivalent. Where mentioned, 'mile' and 'miles' are to be taken as the nautical mile.

Tropical storm 'Kaemi'

South China Sea

21/22 August 2000

- **m.v. *Newport Bay***
- **Hong Kong to Singapore**
- **Captain R.B. Gurney**
- **Observers: Captain Gurney, A. Hughes (2nd Officer), K.T. Hart (3rd Officer) and ship's company**

At 2000 UTC the observing team had recorded the weather conditions as: air temperature 28.4°, wet bulb 27.4°, sea 28.4°, pressure 985.4 mb; wind variable, force 2, and overcast skies with showers. At 2038 the vessel experienced a violent squall with driving rain that reduced the visibility to less than a mile, and it was necessary to apply a set of 5° in order to maintain the ship's track of 195°.

The wind and swell increased rapidly and, by 2100, the vessel was in a violent storm with heavy swell, driving rain and spray in the air. A set of 7° was applied to the ship's track. At this time the ship's anemometer showed 60 knots, the pressure was 984 mb (falling) while the air temperature, wet-bulb and sea temperatures were 24.7°, 24.5° and 27.7° respectively.

A weather warning was received from the Japanese meteorological service giving the position of tropical storm Kaemi as 15.1° N, 111° E at 1200 on the 21st. The ship's position at 2200 was 14° 06′ N, 110° 18′ E, and 10° set had to be allowed for the track of 195°. The vessel was rolling and pitching moderately to a high bow sea and heavy confused swell, while shipping sea and spray across the decks. Visibility remained poor and the wind was SW'ly, force 10, but the pressure had risen to 989.7 mb.

As the night progressed, the wind decreased to an average of force 8/9 and the sea moderated while the pressure continued to increase. There was rain throughout, but the visibility became moderate by morning.

At midday on the 22nd, the ship's position was 09° 06′ N, 109° 24′ E. By this time the wind was still force 9/10 although the pressure had risen to 1003.8 mb. High bow seas and a short heavy swell were being experienced, and the sky remained overcast with moderate to heavy rain and occasional violent squalls accompanied by driving rain and spray.

Throughout the afternoon conditions remained very similar with drizzle and heavy seas but then began to improve as the wind decreased to SSW'ly, force 7.

Depression
South Atlantic Ocean
31 August 2000

- **m.v. *Ormond***
- **Dalrymple Bay to Port Talbot**
- **Captain P.A. Miley**
- **Observers: B.S. Lasheer (2nd Officer), A.V. Mehendale (3rd Officer), N. Kumar (Chief Officer and R. Jltrendren (Cadet)**

The vessel was rounding the Cape of Good Hope from east to west when she encountered a depression. Regular weather fax maps and SafetyNET reports were received which showed a depression moving eastwards across the southern coast of South Africa.

The following observations have been extracted from those taken during the 31st.

Time (UTC)	Pressure (mb)	Wind Dir'n	Wind Force
0000	1010.7	N	3
0400	1004.5	W	6
0600	1001.5	W	9
0800	1000.6	WNW	9
1000	1000.7	W	10
1200	1003.2	WSW	8
1600	1006.9	WSW	8
2000	1011.9	WSW	8

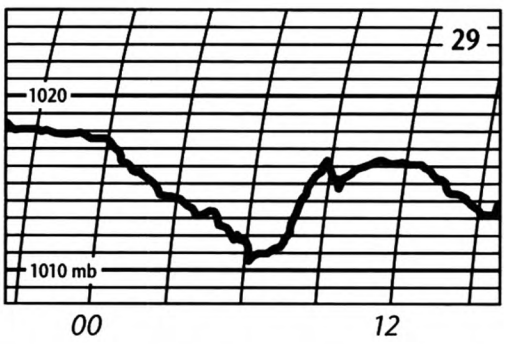
By 0400 on 1 September the pressure had risen to 1014.2 mb and the wind had decreased to WxS'ly, force 6. The vessel by this time had passed the Cape of Good Hope and was heading north-west. The wind veered to NW'ly, force 5 by noon, and remained that way for the next 24 hours. During the entire period there was a swell from the south-west with a height of 5–6 m.

Local Wind
Strait of Gibraltar
29 August 2000

- **m.v. *P&O Nedlloyd Southampton***
- **Le Havre to Suez**
- **Captain R.A. Kenchington**
- **Observers: Captain Kenchington, G. Wade (3rd Officer) and M. Lax (AB)**

As the vessel approached the Strait of Gibraltar from Cape St Vincent the pressure had been falling steadily since midnight. The wind was steady at ESE'ly, force 4 and the vessel was making a speed of 24.5 knots.

At 0600 UTC, as the strait was neared, a more rapid decrease in pressure began, as indicated by the barograph trace. The air temperature at this time was 23.8° while the wet-bulb reading was 22.0°. By 0630 the wind had backed to ENE'ly and had increased



to force 7, whilst ever-increasing mist patches were experienced which reduced the visibility to around 2 miles. The pressure had steadied at 1010.5 mb, while the air temperature and wet-bulb were 21.8° and 21.6° respectively.

At 0800, with Tarifa due north, the pressure was rising sharply whilst both wind and mist remained constant. Half an hour later the vessel was beginning to clear the strait and, at this time, the pressure was steadying at 1016 mb with the wind easing. At 0900 the vessel proceeded into the Mediterranean Sea, all the mist had cleared and the pressure was steady; the wind had also settled at NE'ly, force 4.

In brief: Whilst the *Singapore Bay* was on passage between Oakland and Kaohsiung on 25 September 2000, a large area of rain was picked up by radar although no rain was subsequently experienced, nor was there any thunder or lightning. However, a 'buzzing' sound was heard on the port bridge wing and, on closer inspection, a blue electrical discharge (corposant) was seen on the corner. This lasted for about 20 minutes during which time the observers (Second Officer J. Geddes along with L. Osa (AB) and G. Abat (AB)) were able to transfer the discharge to their fingers. The discharge was also noted to a lesser extent on the sight of the azimuth circle and on the corner of the starboard bridge wing.

Waterspout

Singapore Strait

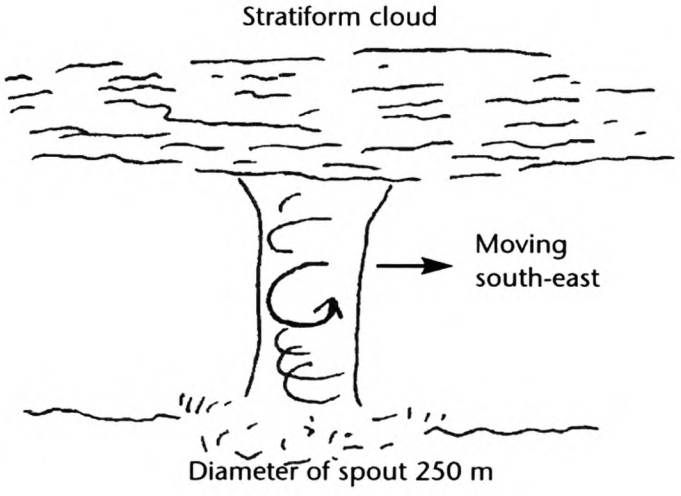
15 September 2000

- **m.v. *Repulse Bay***
- **Singapore to Hong Kong**
- **Captain K.S. Hardy**
- **Observers: Captain Hardy, K.C.S. Gregory (3rd Officer and N. Alvarez (AB)**

Whilst in the Singapore Strait, the vessel was experiencing light ENE'ly winds of around force 2 under cover of 8 oktas of cumulonimbus cloud based at about 1,000 feet (possibly less). Frequent rain showers were present, and there were lengthy periods of drizzle reducing the visibility to approximately 5 miles.

At about 0015 UTC some very low cloud (believed to be stratiform) was sighted to port and, shortly afterwards, a large waterspout was sighted on the port quarter at a distance of 2–3 miles. The ship's speed was 21.5 knots and the waterspout was overtaking with a relative speed of approach of about 8 knots.

The waterspout, see sketch, appeared to originate from the low cloud and seemed to be rotating in an anticlockwise direction whilst travelling south-eastward; severe disturbance was created in the waters around the spout, rising to about 2 m in height. It was estimated that the diameter of the spout was about 250 m, and its size removed



several ships from vision. The waterspout persisted until it was just forward of the beam before heading in a more northerly direction and dispersing. Precipitation ahead of the spout obscured a small vessel 4–5 miles away, but less heavy rain followed it.

The air temperature was 28.3°, wet bulb 25.4°, sea 29.8°, pressure 1008.1 mb. Occasional lightning had been experienced, and there had been a large flash off the port wing accompanied by an immediate crack of thunder.

Sea smoke
Gulf of Finland
16 September 2000

- **m.v. *Maersk Suffolk***
- **approaching Porvoo, Finland**
- **Captain S. Cresswell**
- **Observer: S. Gallaway, Chief Officer and members of ship's company**

The vessel had picked up the pilot and was on her way into Porvoo. Despite it being a reasonably cloudy night, the observers could make out islands as they passed them. At first, the impression gained was that they all had pale strips of what was assumed to be rock banded across them, but as the berth area was approached it became readily apparent from the shore and installation lights, that these pale strips were in fact sea smoke. It looked as if the sea was about to boil, and steam was just starting to rise.

The sea smoke could be seen rising from the sea surface quite clearly by then, and the observers could see patches that appeared to have got trapped and built up in small bays or inlets. There was a very light breeze and this caused the sea smoke to gently writhe about. Several photographs were taken, including one at 0530 UTC [see page 117] when the sun had just risen.

Within 30 minutes, as the sun rose higher, the sea smoke disappeared completely. Later, in the evening, the phenomenon started to reappear once more and, by sailing time at 0120 on the 17th, it had become quite dense and had built up to a height of 15–20 m, reducing visibility from the bridge somewhat. The dry-bulb temperature at this time was 3.2°, the sea temperature was 16° while the wind was light and variable.

As *Meteorology for Mariners* pointed out, 'There is some evidence that sea smoke does not form unless the air temperature is at least 9 °C below the temperature of the sea surface ...' and '... (sea smoke) can only persist while strong or gale force winds continually renew the supply of cold air'. See the temperature figures above to concur — and the wind details to disagree!

Editor's note. The observed weather conditions do indeed confirm a large air-sea temperature difference that enables sea smoke to form. Another term for this phenomenon is 'steam fog', and it forms in exactly the same way as steam over wet roads after a shower. It is formed when vapour escaping from the water surface is cooled immediately above it and condenses again to form a shallow fog, but the rising moisture soon evaporates into the drier air layers above and the fog is therefore restricted to a few metres in depth. However, the presence of a night-time inversion would cause the fog to become trapped beneath it and accumulate into greater depths such as observed in the above report.

The fog disappears when the lower layers of air are warmed (by the sun in this case) and the escaping vapour then evaporates at the surface instead of above it. Had the observers been experiencing stronger winds, then it is likely that the fog would have persisted for a much longer period as there would have a been a ready supply of cold air drawn across the warm sea.

Whale
North Atlantic Ocean
26 August 2000

- **m.v. *P&O Nedlloyd Genoa***
- **Charleston to Southampton**
- **Captain A. Ball**
- **Observer: D. Hinson (1st Officer)**

A large whale was sighted close to the port side of the vessel at 1533 UTC. It was about 15 m long and its upper surface was light-brown in colour with lighter spots or blotches, but it appeared to be pale-grey or white on its lower sides and underneath.

The observer also noted that there was a single blow, and that the dorsal fin was not visible. Additionally, the front third of the whale's length was noticeably wide or 'tubby' in appearance.

The whale was heading west and was very close to the ship although not visibly disturbed by it. At the time of observation, the sea temperature was 16° and the vessel's heading was 071° at 23 knots in position 47° 31′ N, 43° 36′ W. There was a slight sea with a low easterly swell.

Whales
North Atlantic Ocean
12 September 2000

- **m.v. *Arunbank***
- **Le Havre to Panama**
- **Captain J.J. Millar**
- **Observer: R.J. Sanderson (Cadet)**

At 0951 UTC two blows were observed about one point off the starboard bow, and two whales later passed down the starboard side less than 100 m away. It then became clear that the pair was an adult accompanied by a calf, swimming in an east-south-easterly direction.

The adult was 9 m long whereas the calf was estimated to be 2–3 m long. Blows were observed at frequent intervals from both parties, coming from approximately one-quarter of the way back from the nose; they were vertical and always appeared before the dorsal fin came into view.

The dorsal fin itself was angled at less than 40° to the body. The whales were very 'tubular' in shape and had blunt noses. They were predominantly light-grey in colour with a slightly whiter underside.

At the time of observation the vessel was on a heading of 241° at 17.5 knots, and was in position 40° 57.6′ N, 20° 44.7′ W.

In brief: Whilst the *Western Bridge* was on passage from Port Talbot to Hampton Roads, scattered pods of pilot whales were observed on 18 July 2000, swimming eastwards. Captain C.R. Bamford and Chief Officer S. Chase noted that the whales were 3–4 m long and that there were 10–20 in each pod. The ship's position was 45° 34.6′ N, 46° 21.4′ W.

In brief: A number of small whales (about 10) were spotted at roughly 50 m on the port side of the *Speybank* during the change of watch at 0200 UTC on 17 September 2000. The whales dived as the vessel approached and were not seen again. After consulting a reference book, Chief Officer E.D. Guy, Second Officer S. Arbatskiy and S. Zhdanov (AB) later identified them as pilot whales. The ship was on passage between Papeete and Auckland in position 21° 13.1′ S, 156° 01.6′ W.

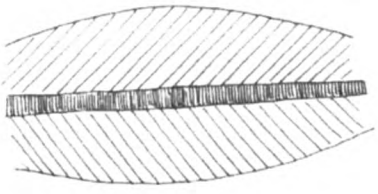
Whale
North Atlantic Ocean
6 August 2000

- **m.v. *Grafton***
- **Dunkerque to Norfolk, Va.**
- **Captain A.M. Diesh**
- **Observers: Captain Diesh, U.P. Singh (Chief Officer), M. Bansal (2nd Officer), S. Rojesh (3rd Officer) and R. Sunderlal (Cadet)**

At about 1005 UTC, after the change of watch, a 'water spray' [blow] was seen at the port bow approximately 3–4 cables from the ship. After two or three minutes the blow was sighted again. It was identified as a whale which was swimming in an easterly direction.

It was 9–10 m long with a black body, and the width of the visible part of its body was about 2 m. The dorsal fin looked like the crescent shape of the moon. Sketches (a) and (b) indicate what was seen.

(a) Whale viewed from the side



(b) Viewed from above, showing a thick central 'bone'

The whale passed the ship at a distance of approximately 30 m and it was very closely observed when abeam. Its blows were timed at intervals of two or three minutes, and they were vertical, some 2–3 m high. As the whale approached the ship, it changed direction and started to head south. When the whale was at the surface, a thick 'bone' could be seen along the centre of the body for 10–15 seconds but it could not be seen along the whole length. The ship's position was 46° 42.8′ N, 33° 52.8′ W.

In brief: On 29 September 2000 at 1230 UTC, Third Officer D. Cox noted bioluminescence in a "cart-wheel effect" passing down the side of the *British Spirit* which was on passage between Khor Fakkan and Brisbane in position 34° 17.1′ S, 152° 10.3′ E at the time. The phenomenon was visible for 300–400 m once it had passed astern.

Whales
North Atlantic Ocean
13 July 2000

- **f.p.v. *Norna***
- **Scottish Fishery Patrol duties**
- **Captain M. Donnelly (Acting Master)**
- **Observers: Captain Donnelly, members of ship's company and Kelly MacLeod, supernumerary**

At approximately 1100 UTC the vessel was on routine patrol in the vicinity of 60° 04′ N, 07° 03′ W when a group of about 12 Long-finned pilot whales (*Globicephala melas*) was noted in close proximity. The sea temperature was 10°.

Fortunately, on this patrol, the *Norna* was accompanied by the eminent cetologist Kelly MacLeod, who was able to point out several calves in the group and, in addition, highlighted to the observers the whales' characteristic behaviour of 'spy-hopping'. This

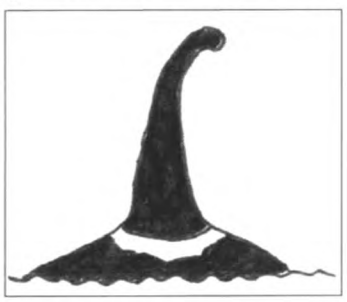
was a practice where individual whales were seen to rise vertically several metres out of the water, as if standing up and looking around.

Later on the same day a pod of a similar size was observed at 1700 in position 59° 36′ N, 08° 16′ W, also with calves within the group and displaying characteristic behaviour. The sea temperature recorded on this second occasion was 10.7°.

Whale
North Pacific Ocean
2 September 2000

- **m.v. *Jervis Bay***
- **Tokyo to Seattle**
- **Captain C.C. Woodward**
- **Observer: R. Wood (First Officer), G. Feleppa (3rd Officer) and R. Thomas (Cadet)**

At 1600 UTC, whilst in the Juan de Fuca Strait, a single Killer whale was sighted on the port side of the vessel. It was approximately 200 m off, swimming towards the port bow; when amidships and about 30 m away, the whale turned right and swam directly away while still breaking the surface every few seconds with its 2-m tall dorsal fin.



As indicated in the sketch, made when the whale was swimming away, the fin also showed a small 'flop' to the right at its tip, and a white patch was visible at the base of it. The ship's position was 48° 14.4′ N, 124° 02.5′ W and the sea was calm at the time of the observation.

Editor's note. Kelly MacLeod, of the Natural Resouces Institute, University of Greenwich, said:

"Killer whales within the British Colombia area have been the focus of studies since the 1960s and have provided the most detailed information on Killer whales anywhere in the world. However, animals off the west coast of Vancouver in the Juan de Fuca Strait have gained attention only since the 1990s.

"Since the beginning of Orca research in the British Colombia, Washington and Alaska areas, a photo-identification catalogue of recognised individual Killer whales has been established. This was partly in response to a live-capture fishery to supply captive facilities, which began in 1973, to enable population levels and dynamics to be monitored.

"The Killer whale in this sighting was likely to be a male, as judged by its solitary nature, 2-m high dorsal fin. The observers mentioned that the top of the fin was bent to the right. It has been suggested that 'fin-flops' are sometimes associated with ill health in Killer whales, mainly because of the prevalence of this condition in captive animals. Fin-flop has also been recorded amongst wild animals although it can right itself, probably making it an unreliable feature for photo-identification, at least for long-term studies."

DID YOU KNOW...?

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Seals
South Atlantic Ocean
10 August 2000

- **m.v. *Resolution Bay***
- **Port Chalmers to Rio Grande**
- **Captain M.D. Moore**
- **Observer: M.K. Hill (2nd Officer)**

After rounding Cape Horn at 1030 UTC the vessel was heading north-east into the South Atlantic Ocean on a heading of 025° at 21 knots. At 1540 the vessel was passing the south-east tip of Argentina, transiting the Estrecho de Le Maire (the straits that separate the Argentina mainland from Isla de los Estados to the East).

At 1550 whilst in position 54° 49.0′ S, 64° 58.5′ W many mammals were observed. Initially, they appeared to be dolphins, but when seen from the port bridge wing it became very apparent that they were in fact seals. They seemed to just appear from the port side of the vessel as it passed, and it was suspected that they had crossed underneath the vessel. They appeared in three groups, all very close together and all heading westwards towards the mainland shore which was 8 miles away.

There were many seals in each group — it was estimated that the largest group consisted of at least 150–200, and the smallest probably about 30–40. It is very difficult to say how accurate this estimation was because they were all jumping around and frolicking so much once they were clear of the vessel. All three groups appeared to be very playful. They were jumping around each other, leaping high out of the water and, through binoculars, could be seen playing in the wake once the vessel had passed. No more seals were spotted after this time. The following readings were taken: air temperature 8.3°, wet bulb 5.6°, sea 7.5°, pressure 1018.6 mb, wind WxN'ly force 2.

Birds
Mediterranean Sea
5/6 September 2000

- **m.v. *Providence Bay***
- **Southampton to Port Said**
- **Captain K.W. Smith**
- **Observers: I. Renders (2nd Officer), A. Graham (3rd Officer) and H. Renders, supernumerary.**

Whilst proceeding through the Sicilian Channel at 2100 UTC on the 5th it was observed on radar that there were numerous small targets crossing the vessel's path. Upon closer inspection, no navigation lights could be seen, and it was assumed that the targets were small pleasure craft on which the lights had not been activated.

However, the targets were put on the vessel's ARPA and were estimated to be making 35 knots. The same phenomenon was encountered at 0000 on the 6th (ship's position 36° 48.1′ N, 13° 06′ E); again, numerous small targets appeared but there were no navigation lights.

It was not until the afternoon, at 1300, that the source of the targets was finally established. They were in fact large numbers of birds, 200 or more, that were flying south for the winter. Although they were flying too high for the observers to make out the species, they were in a 'V-shape' formation at around 1,500 feet , and moving at 35 knots. Three more similar formations were seen flying south during the afternoon.

At the time, the wind at the surface was N'ly, force 4, there was scattered light cloud and the horizon was clear.

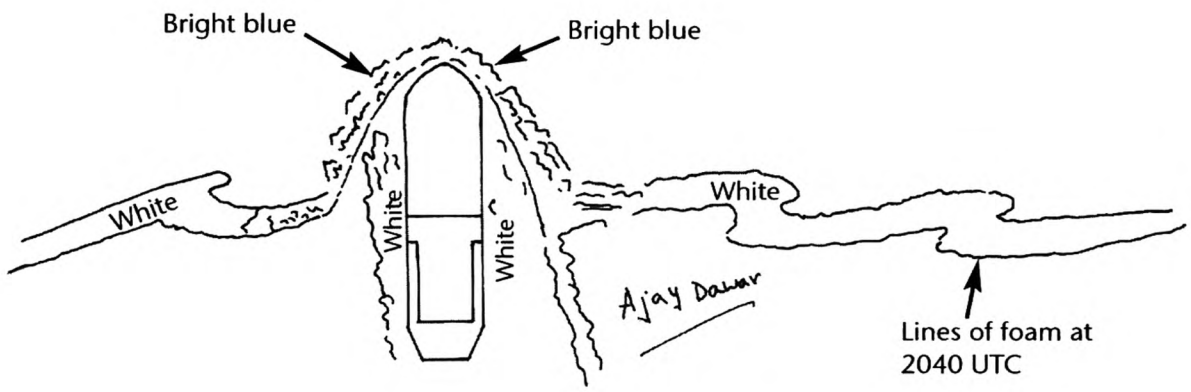
In brief: Bioluminescence was observed from the *British Skill* at 2030 UTC on 27 September 2000 when the ship's position was 19° 51.7′ N, 62° 57.3′ E. It took the form of a glowing white or light-blue colour in the bow wave, but faded quickly in the wake.

In brief: On 8 August 2000 at 0420 UTC Chief Officer D. Miller and Cadet P. Barney observed bioluminescence in the wake of the *CGM Caravelle* in position 47° 50.6′ N, 16° 25.9′ W. It was really bright in the centre of the wake where the screw effect from the propeller was strongest, and was present until 0435 when dawn approached. A searchlight was shone on the sea surface during the period, but the water seemed very clear. The ship's heading was 080° at 19.7 knots and the sea temperature was 18.2°.

Bioluminescence
North Atlantic Ocean
18 August 2000

- **m.v. *Vine***
- **Tenerife to Bristol**
- **Captain V. Philip**
- **Observers: A. Dawar (3rd Officer) and E.I. Agu (GP)**

Whilst north-east of Madeira at 2040 UTC on a heading of 016° at 14.6 knots, bioluminescence was first noticed in the turbulent water along the ship's sides and also in the bow waves, all of which glowed white. The vessel was passing through several lines of foam that lay across its course. The sketch indicates what was seen.



As these lines were crossed, the edges of the bow wave were lit in a very bright-blue colour that was visible down the entire length of the ship, even abreast of the crew accommodation abaft the bridge where the glare from fluorescent lighting would usually outshine bioluminescence.

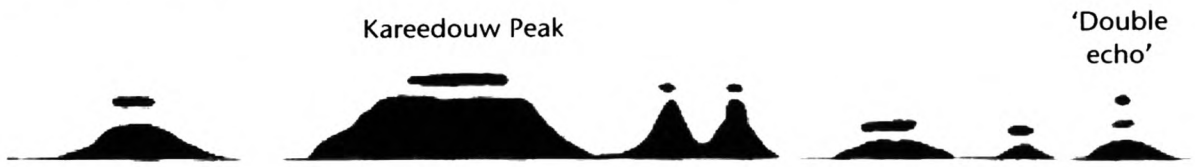
The night was cloudless, with stars visible down to altitudes of about 10°. Moonrise was on the starboard side during the display, and the bioluminescence was brightest before this, although still visible afterwards. The ship's position at 2040 was 34° 12′ N, 13° 56′ W.

In brief: Whilst the *Jervis Bay* was on passage between Los Angeles and Panama, in position 14° 02′ N, 97° 00′ W, Captain C.C. Woodward and First Officer R. Wood sighted a large bird at 2300 UTC on 10 September 2000. It was of the size and character of an albatross, and was identified from a seabird guide by Captain Gerald Tuck as a Waved albatross. Another similar bird was also sighted, although seeming to be a younger one and brownish in colour.

Refraction
Indian Ocean
20 September 2000

- **m.v. *British Resolution***
- **Qua Iboe to Vadinar**
- **Captain S. Allibone**
- **Observers: D. Morrice (2nd Officer) and G. Topolewski (3rd Officer)**

During the hand-over of the watch at 1400 UTC the coastline of South Africa was clearly visible along the port side. Abeam of the vessel, there appeared to be a fog-bank or haze, although details of the coast were visible through it. The sketch shows the effect observed further round towards the bow, where it appeared that land up to 60 miles away was visible.



The land was believed to be Kareedouw Peak (north-west of Cape St Francis) and the associated hills of roughly 1,004 m elevation. Noted above the 'peaks' were mirages of them resembling orographic clouds, but these diminished as the vessel closed. One in particular was capped by a 'double image'.

At the time of observation the dry-bulb temperature was 20.5° while the sea temperature was 17°. The pressure was 1015 mb, wind E'ly, force 2 and the cloud cover was 6 oktas of cirrus, cirrostratus, altocumulus and cumulus. The ship's heading was 080° at 12.75 knots in position 34° 40′ S, 23° 17′ E.

Meteor
South Atlantic Ocean
13 September 2000

- **m.v. *British Resolution***
- **Qua Iboe to Vadinar**
- **Captain J.Y. MacAlpine**
- **Observers: D. Morrice (2nd Officer) and A. Rashid (AB)**

During the morning watch, at the very beginning of nautical twilight, the horizon was just becoming discernible against what was an overcast sky. At 0425 UTC a sudden and rapid increase in light, apparently overhead, was experienced.

At the time, both observers were inside the wheelhouse but the light was bright enough to enable them to see all deck fittings and the horizon all round. It was almost as if twilight had gone into 'fast forward' to almost sunrise.

The effect lasted for about 5 seconds before ending just as rapidly. The observers went outside but could see no cause of the sudden illumination of the sky, there being a fairly thick layer of altocumulus overhead. They believed the light might have been caused by a large meteor. The ship's position at the time was 04° 35′ S, 08° 25′ E and it was on a heading of 171° at 12.5 knots.

In brief: Numerous meteors were observed from the *Tobias Maersk* between 0200 UTC and 0300 on 23 July 2000 when the ship's position was 19° 58′ N, 56° 46′ W. Third Officer J. Barnes noted that several appeared as "burning, bright-blue balls" while three others seemed to be falling vertically prior to burning out with a brilliant flash before reaching the surface.

In brief: On 12 August 2000 the *Maersk Rapier* was in position 05° 29.2′ S, 31° 13.4′ N, on a heading of 025° when, at 0030 UTC Fourth Officer H. Kite, L. Price (Cadet) and D. Finkle (GP) witnessed a meteor falling ahead. It was about three times as bright as an average 'shooting star' and had a multicoloured afterglow. Visible for at least 6 seconds, it then faded away at an altitude of about 20°.

In brief: At 1230 UTC on 3 September 2000, Third Officer J. Stanley and E. Lacanlale (AB) observed a bright flash lighting up the sky for 2–3 seconds. It was similar to lightning, but had a green tinge and lasted longer. The light, following a path from 240° to 030°, was thought to be a meteor; the observers looked forward but saw only a green 'sliver' disappearing at 5° altitude. The event was seen from the *British Spirit* at 19° 46′ N, 119° 25′ E.

In brief: A 'shooting star' was seen from the *Vine* at 0100 UTC on 16 September 2000. Third Officer A. Dawar noted that it had originated at an altitude of about 15°, bearing 185° from the ship, and left a bright white trail to a bearing of 190°, altitude 10°, where it then burnt out. The sighting lasted roughly 1.5 seconds. The ship's position was 25° 49.2′ N, 54° 32.9′ W, on a heading of 230°.

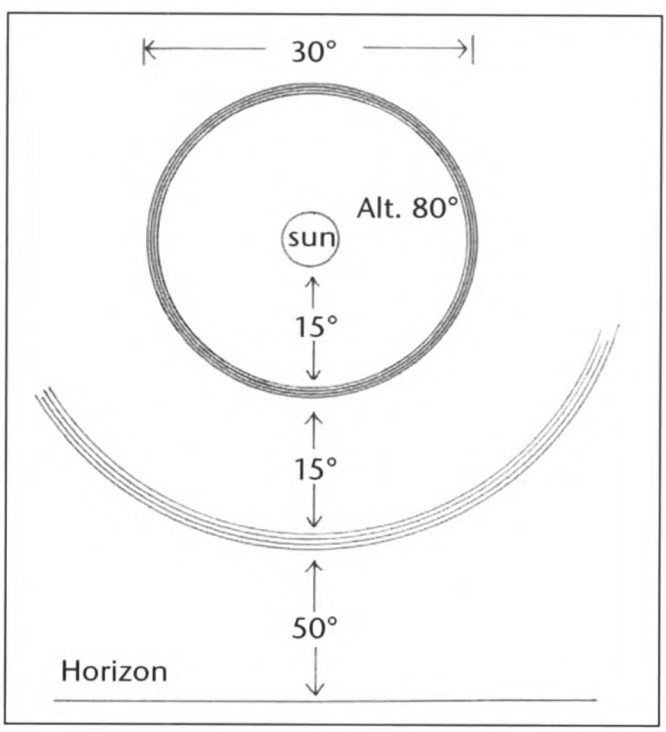
Halo

North Atlantic Ocean

28 July 2000

- **m.v. *Helios***
- **Santos to José**
- **Captain D.T. Simpson**
- **Observers: Captain Simpson, D. Rosalina Jr (3rd Officer) and H. Steel (2nd Officer)**

At 1415 UTC the 'corona' shown in the sketch was observed around the sun. Surrounding the sun was a circle of radius 15° showing the colours of blue, green, yellow, orange and red (with red on the inside, nearest the sun). Below this was an arc of 130° of another circle showing the same sequence of colours. The radius of the arc was 30° with the lower edge lying at an altitude of 50° above the horizon.



The altitude of the sun was 80°, and it was covered by cirrus cloud. At the time of observation the ship's position was 03° 02.5′ N, 47° 18.5′ W.

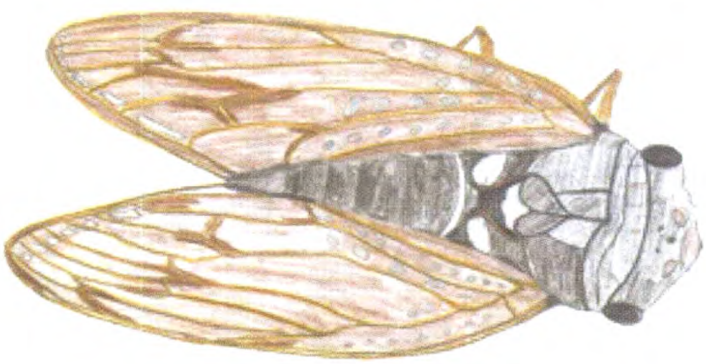
Editor's note. Although referred to as a corona, the cirrus cloud reported in this observation identifies the phenomenon as a halo, which is among the optical effects formed only in clouds comprising ice crystals (such as cirrus), whereas the corona forms in clouds comprising water droplets (frequently but not always altocumulus). Another visible difference between haloes and coronae is the sequence of colours displayed in each. In a halo, the 'red end' of the spectrum is always nearest the sun, whereas it is furthest away in the corona.

Insect
Andaman Sea
12 August 2000

- **m.v. *P&O Nedlloyd Kobe***
- **Singapore to Suez**
- **Captain D. Baily**
- **Observers: Captain Baily, O. Ridyard (3rd Officer), G. Anderson (Seaman) and J. Phillips (Cadet)**

The 'fearsome beastie', shown in the drawing [approximately life size] by the Third Officer, was discovered on deck the day after leaving Singapore, the ship's position at 1000 UTC being 06° 07′ N, 95° 15′ E. However, the body was an empty shell, so it had possibly been dead for some time, and the observers thought it had probably originated from Japan earlier in the vessel's schedule.

Notable features included the 'Everton Mint' colouration of its thorax and abdomen, the big bulging eyes (about 2.5 mm across) and the red markings behind its head.

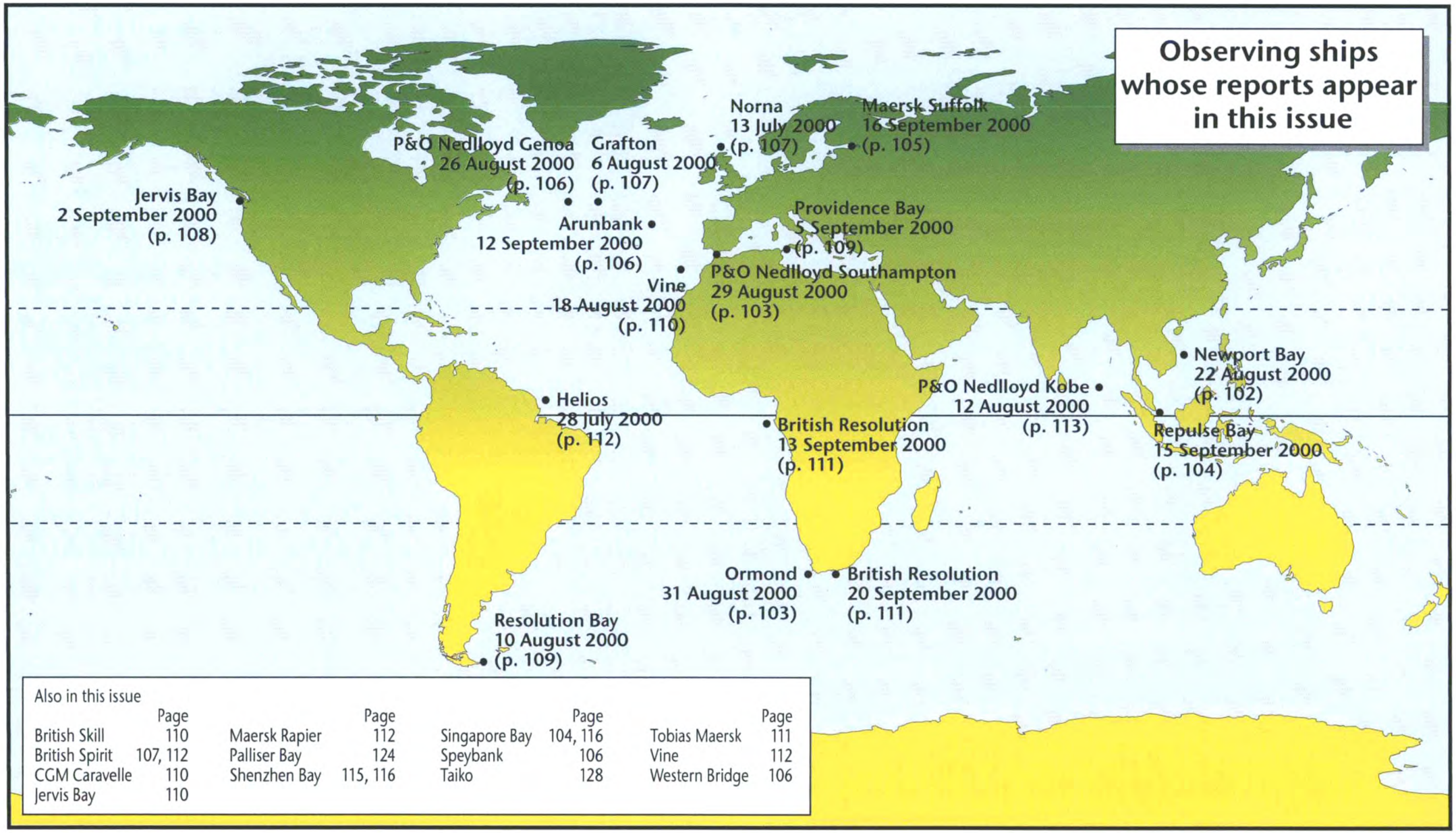


The specimen had two pairs of wings — the outer pair measured 4.8 cm, while the smaller (inner) wings were 3.2 cm long. Both sets of wings were a light-brown transparent colour. Its length over all was 5.7 cm, the distance across the tips of its folded wings was 2.8 cm, and the distance between its eyes was 1.3 cm.

Editor's note. This insect was identified by Mr A. Whittington, of the National Museums of Scotland, as a cicada, although he was unable to name the exact species. He said that cicadas are sucking bugs, generally found in woodland and associated with trees. Their larvae live underground (sometimes for a prolonged number of years) feeding on roots and root nodules of plants (generally grasses, trees and shrubs). The adults are probably best known for the prolonged and acoustically penetrating sound, produced by a flat plate (tymbal) clicking to and fro over a resonation chamber in the base of the abdomen.

Correction

With apologies to the observers on the *Matco Clyde*, their report of a whale in the North Sea on 1 May 2000, published in our April 2001 edition, was headed erroneously as 'Waterspout, North Atlantic'.



Also in this issue

Scene at sea

(a) 1745 UTC

Cloud phenomenon photographed from the *Shenzhen Bay* by Captain D.W. Lax on 10 February 2001.

Images (a) and (b) show the cloud at a distance of about a mile; (c) shows the ship entering the cloud; (d) and (e) show two views of the cloud after the ship passed through it.

(b) 1745 UTC

(c) 1749 UTC

(d) 1751 UTC

(e) 1755 UTC

Scene at sea

Crown copyright

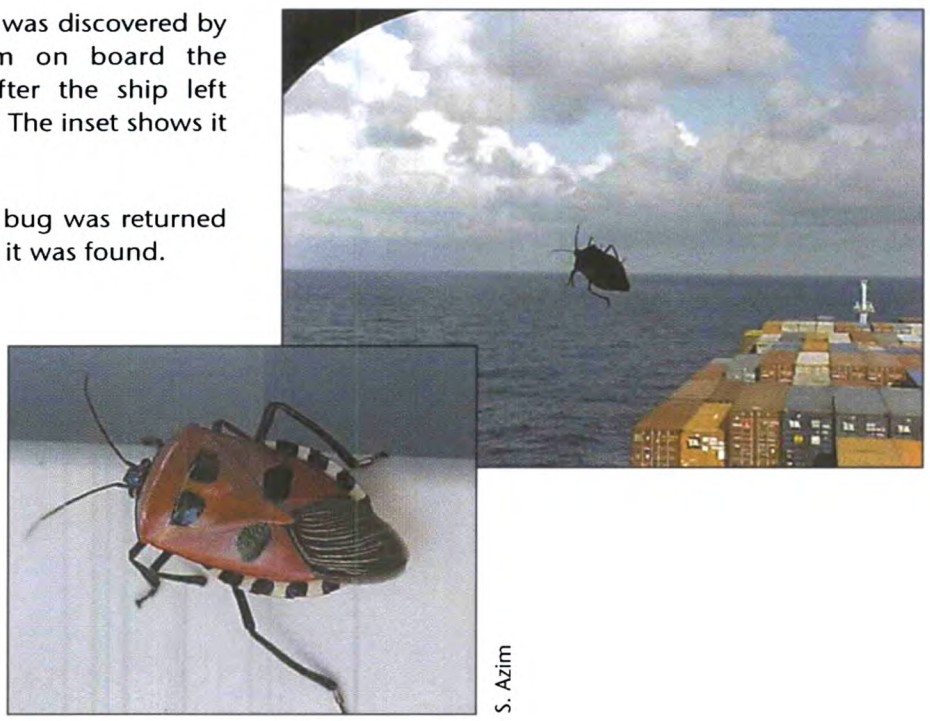
Crown copyright

Butterflies found on board the *Singapore Bay* in November 1999 in position 21° 30′ N, 114° 00′ E.

Left: A swallowtail *Papilio helenus*, the larva of which feeds on plants of the citrus family. ***Right:*** A Nymphalid *Hypolimnsa bolina*. (Identified by Dr Andrew Whittington, of the National Museums for Scotland.)

Right: This colourful bug was discovered by Second Officer S. Azim on board the *Shenzhen Bay* shortly after the ship left Colombo on 1 May 2001. The inset shows it approximately life size.

Once photographed, the bug was returned to the bridge wing where it was found.



S. Azim

S. Azim

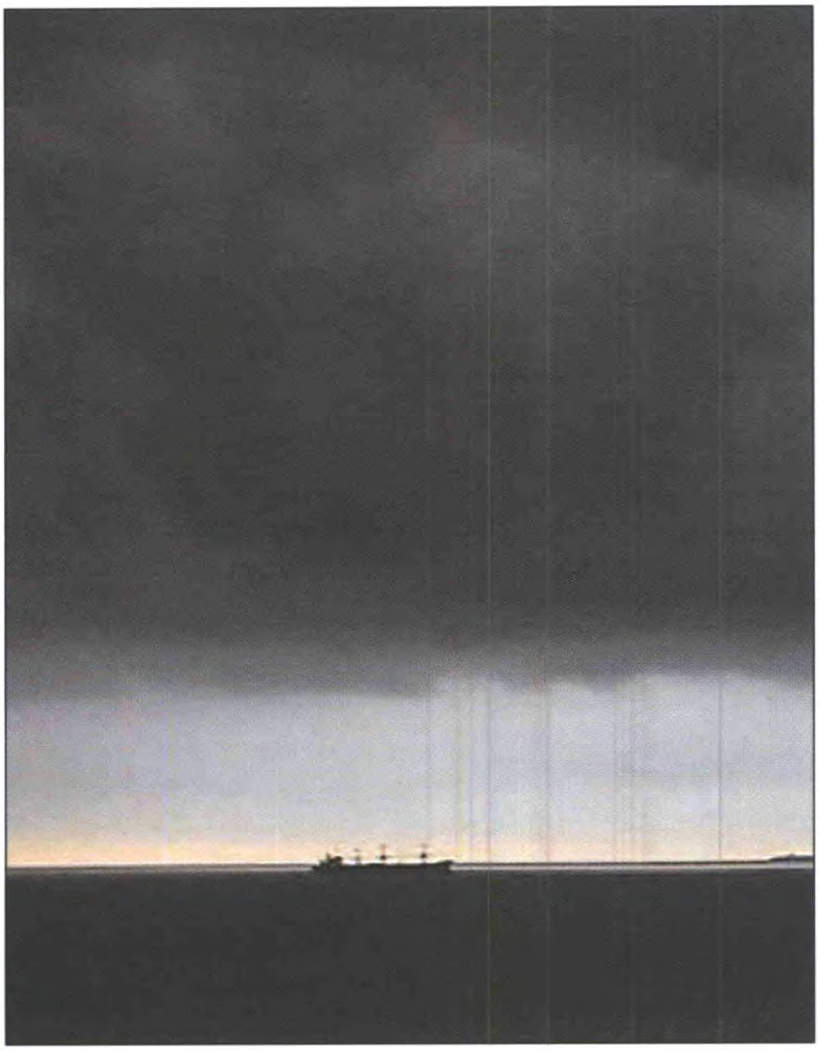
Editor's note. The insect was identified by Dr Andrew Whittington as a shield bug from the family Pentatomidae. He said that shield bugs are also known as 'stink bugs' in certain parts of the world because of their distinctive and unpleasant smell, exuded from glands within the body. The body size ranges between 4 mm and 20 mm, the example here being among the large species.

Pentatomids are plant feeders, sucking on young fruits and seeds through the 'drinking-straw' mouthparts. A fascinating and striking feature of their biology is the protection of eggs and young nymphs by the female. Maternal care of this nature in insects is unusual. There are over 4,000 species of pentatomid bugs in the world, making them one of the larger families of bugs. This species belongs to the genus Catacanthus, and is possibly the species *Catacanthus violarius*.

Scene at sea

S. Gallaway

Left: Sea smoke photographed from the *Maersk Suffolk* on 17 September 2000 when the vessel was at her berth at Porvoo, Finland. [See page 105]



Anon

Left: A vivid example of 'daylight darkness' in the Gulf of Mexico.

Editor's note. The details of time, vessel and photographer are not known.

Climate change and the Continuous Plankton Recorder survey

Philip C. Reid

(Sir Alister Hardy Foundation for Ocean Science, Plymouth)

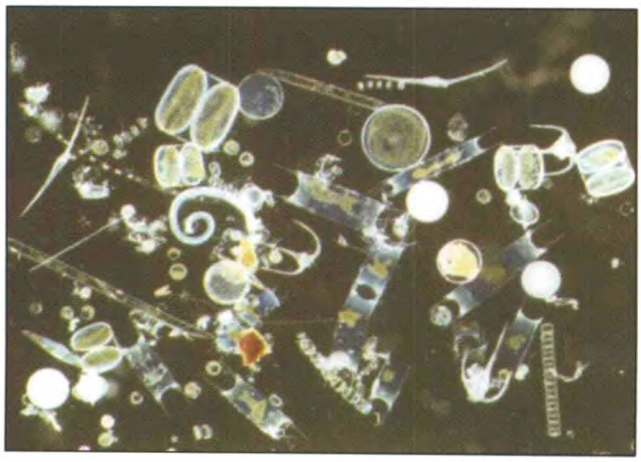
The Continuous Plankton Recorder (CPR) survey, which is operated by the Sir Alister Hardy Foundation for Ocean Science (SAHFOS) will be 70 years old in 2001 during which time close to 4 million nautical miles of the oceans have been sampled. This remarkable achievement has only been made possible through a partnership with more than 200 vessels and the voluntary assistance of many shipping companies, agents, stevedores, Masters and crew. All onboard operations including deployment and recovery are carried out in totality by the ship's crew. The survey and its products are unique as they comprise the only long-term operational monitoring programme for plankton, that extends in most ocean basins.

In contrast to the meteorological sciences there are few long-term datasets of biological information in the world, and on land those that do exist are difficult to interpret because of the development of agriculture and the effects of pollution. The oceans and shelf seas are still relatively pristine and changes in the abundance and composition of the plankton are more likely to be a response to 'natural' variability. As free floating organisms they are highly dependent on their immediate environment and can integrate effects of meteorological and hydrographic variability. Plankton has a second more direct role with respect to climate change through the export of CO_2, via what is known as the 'biological pump', to the deep ocean and in the production and export to the atmosphere of chemicals such as Dimethylsulphide (DMS) that may reinforce global warming. Clear evidence of pronounced trends and decadal change is seen in the results of the CPR survey. These changes may be acting as a 'barometer' or early warning of the effects of climate change on the oceans.

Plankton

The free floating plant life of the sea (phytoplankton), at the base of the food web, provides food for the animal plankton (zooplankton) and in turn the fish and their predators. Many of these tiny organisms exhibit spectacular patterns of shape and colour (Figure 1). For example, the dominant group in the phytoplankton, diatoms, are enclosed in two glass cups like an old fashioned pill box, often with attached spines, and under the microscope are often iridescent. Copepods are the dominant zooplankton group in the North Atlantic. They are small (typically 1 mm long) crustaceans with long antennae at the front of a muscular body that may be bright red due to oily storage products.

Light, nutrients and the degree to which the water is mixed are the main agents governing the growth of phytoplankton. Many of these factors in turn are dependent on, for example, wind strength/direction/frequency, cloudiness and precipitation which exert a strong influence on the upper 100 m of the water column. Even in clear tropical waters light only penetrates down to 100 m so most



Norman Nicholl

Figure 1: Phytoplankton

phytoplankton are found in the upper 40 m. The majority of zooplankton are also found in the upper layer of the water column although some show patterns of daily vertical migration over hundreds of metres, apparently as a predator avoidance mechanism.

The Continuous Plankton Recorder survey

The CPR towed body (Figure 2) is deployed at a depth of approximately 10 m from merchant ships, weather ships (to 1996) and more recently some naval hydrographic survey vessels on their normal routes of passage. Plankton is filtered on a band of silk that moves past an aperture at a rate that is proportional to the speed of the ship. A roll of four metres of silk is equivalent to a tow of 400 nautical miles. To enable sequential tows to be made on long routes a cassette system is used. The silks are cut into 10 nautical mile samples on which phytoplankton and zooplankton are counted and identified under a microscope into ~400 taxonomic categories.

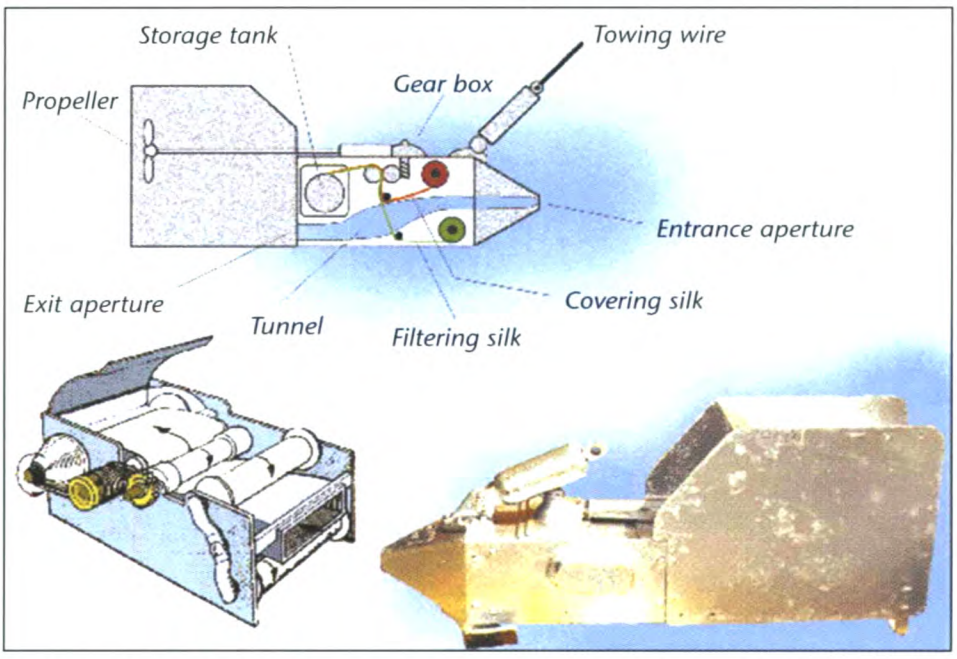


Figure 2: The Continuous Plankton Recorder and its components

Starting in the North Sea in 1931 the survey extended out into the Atlantic in 1939. Currently, the core operational area reaches from the east coast of the USA to the north west European shelf between approximately 37° N and 64° N. While most CPR samples have been obtained in this core area the database, which contains more than 2 million data points for the period from 1946 to present, includes samples from all the oceans of the northern hemisphere. In addition a small CPR survey is operated by the US National Marine Fisheries Service in the Gulf of Maine and to Bermuda. In 2000 a new synoptic survey, operated by SAHFOS, was initiated in the north-east Pacific with five tows between Alaska and California using the s.s. *Polar Alaska* and s.s *Polar Independence* and one between Canada and Kamchatka using the m.v. *Skaubryn*.

A sister survey which operates in the Southern Ocean uses the research vessels of the Australian Antarctic Division to tow CPRs between Tasmania and the Australian bases in Antarctica. Three parallel north/south CPR transects across the Southern Ocean along approximately 25° E, 110° E and 158° E were completed by this survey in collaboration with the Japanese Polar Institute within a two-week period of the winter of 1999. The CPRs towed for this unique initiative used the Australian research ship *Aurora Australis* and the Japanese vessels *Kaiyo Maru* and *Shirase* (an icebreaker). The plankton of the Southern Ocean has been little studied and the samples generated by this programme are giving a new insight into the dynamics of the major plankton group in this region of the world, crustacean euphausiids known as krill.

Logistics and operations of the CPR survey

The one-metre long, 87-kg CPR is a well-proven technology that is rugged, reliable and capable of withstanding at times harsh handling experienced during transport and deployment. Machines have even survived operation in up to force 12 storm conditions and are rarely lost at sea, which is a compliment to the seamen that deploy them and the skill of the SAHFOS workshop staff. Typically 90 per cent of tows return useable plankton samples. The length of the towing cable is adjusted according to the speed of the ship and may be up to 80 m astern. For most vessels a purpose-made davit or tow point is installed from which to deploy CPRs.

Maintaining a routine synoptic survey using ships of opportunity is a major exercise. Typically 22 routes are towed in the core region each month and more than 80,000 nautical miles are sampled each year. Dispatch of CPRs in their distinctive yellow boxes by road carrier to a UK port and return to the Laboratory in Plymouth may take anything from two weeks to many months. At present, trading patterns of ships are continually changing and it is proving increasingly difficult to maintain tows on standard routes for long periods.

By tradition the survey has employed an ex-merchant navy Captain as Marine Survey Manager, and much of the success of the current survey is down to the enthusiastic liaison of the present holder Captain Peter Pritchard. Peter regularly visits tow vessels and supervises the design and installation of davits as well as assisting with trials of new instrumentation. Our naval links were further strengthened in 2000 by the appointment of Commander Alan Johnson (RN Retd) as Assistant Director with responsibility for administration.

The North Atlantic Oscillation

Strong associations have been demonstrated between the plankton sampled by the CPR and a major mode of atmospheric variability in the northern hemisphere known as the North Atlantic Oscillation (NAO). The NAO is an alternation in the atmospheric pressure difference between the low pressure zone that is typically centred over Iceland and the subtropical high pressure zone centred over the Azores[1]. The oscillation has a pronounced effect on temperature, wind and precipitation especially in northern Europe and has been linked to changes in current strength and direction as well as the formation of deep water in the Greenland Sea and intermediate water in the Labrador Sea. Four layers of increasing density can be distinguished in the northern Atlantic from top to bottom. An upper layer equivalent to the depth of winter mixing by the wind (typically 0–600 m), an intermediate layer (normally down to 1,500 m), a deep layer down to 4,000 m) and, in the west below this layer, northerly penetration of Antarctic bottom water.

Formation of dense salty water at the surface in Nordic seas that sinks rapidly to top up the deep water layer is what pulls the warmer surface waters of the Atlantic towards the Arctic Ocean. This exchange is part of what is known as the 'Global Conveyor Belt' and ensures that Europe has a much warmer climate than its equivalent latitude (Labrador) on the other side of the Atlantic. Some copepod plankton sampled by the CPR have undergone large vertical migrations as they are normally associated with intermediate or deep water or 'hibernate' in these waters during winter months. Their patterns of occurrence reflect some of the dramatic changes that have been observed by hydrographers in the formation and distribution of intermediate and deep water over the last few decades. Since 1988 we have been in a strong positive phase of the NAO

[1] To characterise variability in the NAO, an index is calculated from the difference in sea-level pressure between the Iceland Low and Azores High (determined at standard met. stations). This index is a measure of the strength of the westerlies especially in winter months. When the index is high the westerlies are strong and vice versa.

index; in consequence, deep water formation has ceased in the Greenland Sea and, in the early 1990s, the Labrador Sea became an important site of intermediate water formation (Figure 3). Penetration of water from the North Atlantic current into Nordic seas appears to have reduced compared to a low NAO situation as found during the 1960s to 1970s, at the same time as an apparent increased northerly penetration of warmer water in the shelf edge current at the eastern margin of Europe. These patterns of physical change are backed up by biological evidence from CPR plankton.

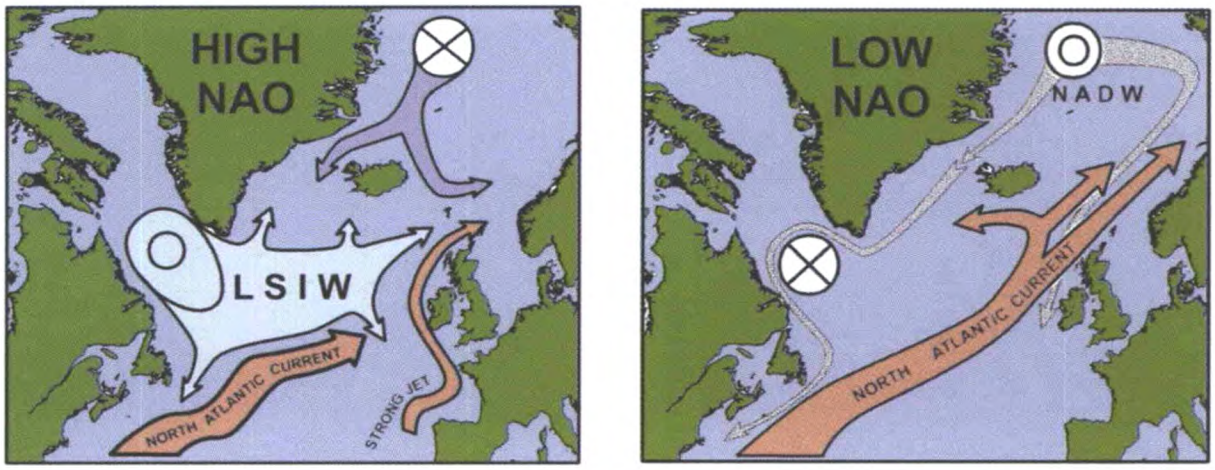
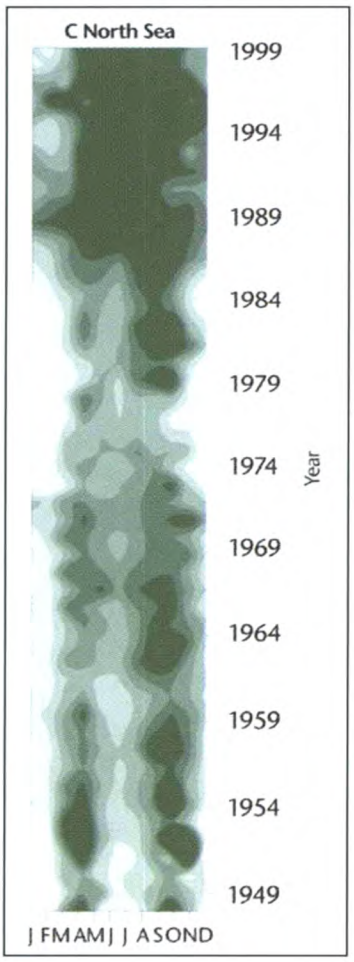


Figure 3: Phases of the North Atlantic Oscillation. (LSIW — Labrador Sea Intermediate Water formation. NADW — North Atlantic Deep Water formation)

Regime shift in the North Sea

What has been termed a regime shift occurred in the North Sea around 1987/88, approximately when the NAO changed to a strong positive phase. Regime shifts are step-wise alterations in the composition and productivity of plankton and fish, at a regional scale, that reflect major hydrographic change. The changes seen in the North Sea are clearly evident in the Phytoplankton Colour index of the CPR survey (Figure 4). When CPR silks are returned to the laboratory the colour on the surface is visually characterised (based on a standard colour card) into three levels of greenness and zero colour. While only a coarse visual index of chlorophyll, the many samples taken in the central North Sea each month of the year over the last 50 years (>20,000) clearly define progressive changes in the abundance and timing of the phytoplankton growing season. Large increases also occurred in the catches of some fish species and in the biomass of organisms living on the bottom. Associated changes in the physical characteristics of the North Sea included an increased influx of oceanic water and higher sea temperature.



Coinciding with the beginning of the regime shift a major incursion of oceanic water into the North Sea from the eastern boundary shelf edge current to the west of the British Isles appears to have occurred. This water carried with it unusual southerly plankton more characteristic of the Bay of Biscay and further south. These lusitanean species included a gelatinous tube-like plankton species that sucks and filters

Figure 4: Phytoplankton Colour Index for the North Sea, 1949–1999

very large volumes of water to derive its food known as *Doliolum nationalis*. This species had not been seen in the North Sea since 1911 and then only occurred rarely. In contrast, in the autumn of 1989 and in 1998 when a second major incursion of oceanic water appears to have occurred, this species was extremely abundant. Evidence that the eastern boundary current was stronger at these times has been derived from hydrographic sections made across the Rockall Trough. Satellite measurements of sea surface temperature along the European shelf edge suggest that pulses of warm water have extended north along the shelf over hundreds of miles. A number of fish species, some subtropical, appear to have extended their northerly range as part of these events possibly as a response to the higher temperatures found in European waters in recent years.

Plankton changes in the north-west Atlantic

The CPR routes operated by SAHFOS in the western Atlantic form an integral part of the monitoring programme of the Canadian Department of Fisheries and Oceans. The cod fishery of the North-west Atlantic was of major economic and social importance to Eastern Canada until it started to decline in the mid to late 1980s reaching a crisis in 1990/91 when the fishery was closed. Unfortunately, the CPR survey in this region was not operating during the crucial period of change in the cod fishery because of a lack of funding. It is however possible to make a comparison between sampling that was undertaken between approximately 1960 and 1980 and the new survey, which started again in 1991. Pronounced differences are evident between the two periods. Since the early 1990s in the western Labrador Sea and over the Grand Banks there has been a sharp decline in juvenile copepods and euphausiids at the same time as a marked rise in the Phytoplankton Colour index and changes in the composition of the phytoplankton. Small copepods form possibly the main food source for larval cod and the reduction in their abundance is likely to be a major factor in the decline of cod recruitment.

The Biological Pump and DMS

Phytoplankton play an important role in determining the atmospheric concentration of CO_2 by transporting CO_2 from the surface ocean to the deep ocean. They uptake CO_2 by photosynthesis in the surface waters and export a fraction of this carbon to the deep ocean in what is known as the 'biological pump'. The operation of this pump means that the atmospheric CO_2 concentration is lower than it would be if the ocean was devoid of phytoplankton. Any substantial alteration, on a global scale, of the composition or functioning of the present-day phytoplankton distribution would have significant implications for atmospheric CO_2, in addition to anthropogenic carbon release. This could act as a feedback mechanism altering the pace of climate change.

A second potential ocean biological feedback to climate is through the natural sulphur compound Dimethylsulphide (DMS). DMS is produced by many phytoplankton, and the amount of DMS produced by different groups of phytoplankton can vary greatly. A fraction of DMS passes to the atmosphere where it can form aerosols that modulate cloud properties such as cloud lifetime and albedo. Simulations by the Met Office Hadley Centre using their Global Climate Change model have indicated that climate is sensitive to ocean DMS emissions (personal communication: Steve Spall). As little is known about how ocean DMS emissions may alter in the future, this is a further potential feedback mechanism that may influence climate change.

Conclusions

Observations from the CPR survey and analyses of other long data sets have shown that pronounced changes have taken place in the shelf sea and oceanic ecosystems of the world. The extent to which these are natural events as part of long-term cycles or may be forced by global warming is still far from clear. What is evident is that these

changes have major implications for the productivity of regional seas and their harvestable living resources. Part of the reason for the collapse of the cod fishery in Canadian waters, and for the similar collapse of the herring fishery in the North Sea in the late 1970s, is now believed to be linked to associated changes in the plankton, although over-fishing is clearly also implicated. The observed changes in the plankton appear to be closely associated with alterations in the circulation and strength of major currents, which have implications for future weather patterns of adjacent land regions. If climate change is forcing these events, feedback mechanisms may reinforce or reduce the biological pump with possible major consequences for the CO_2 cycle. Developing an improved understanding of plankton abundance and distribution is thus of key importance to understanding and forecasting future climate change scenarios.

The CPR survey was incorporated in 1999 into the Initial Observing System of the Global Ocean Observing System (GOOS). The Inter-governmental Oceanographic Commission and the World Meteorological Organisation jointly co-ordinate GOOS. The survey, as a long running existing survey, fits well into the developing plans of GOOS. The Initial Observing System includes measurements from ships, buoys, coastal stations and satellites although up to the present the emphasis has been on physical measurements. In collaboration with the merchant marine SAHFOS has pointed the way to a system that could be extended to form a series of regional scale programmes to monitor the biology as well as the physics and chemistry of the oceans under the flag of GOOS.

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The CPR survey is funded by a consortium that has recently comprised agencies from Canada, Denmark, Faeroes, France, Iceland, Ireland, Netherlands, UK, USA, the European Union, UNIDO and IOC.

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It's a WRAP !

In our January issue [1] we reported that conceptual planning to initiate a new Worldwide Recurring ASAP [2] Project (WRAP) had advanced considerably and that a potential line and ship had been identified to host the new system. Less than six months later the project has now become a reality, installed on UK observing ship *Palliser Bay*.

All the necessary equipment and systems were installed on board during the ship's recent visit to Tilbury and on Saturday 31 March 2001 when, with less than one hour remaining before the ship's departure, work was completed and a successful test launch performed.

G. Allen

Palliser Bay (P&O Nedlloyd Ltd)

GPS radiosondes are launched using 350-g balloons from a specialised self-contained deck launcher. The helium used to fill the balloons is stored on the port side of the main deck and fed via copper tubing to the port and starboard bridge wings and thence through a flexible hose to the balloon.

The basic sequence of operations necessary to perform a successful launch is shown in Figures 1–6 (opposite). The deck launcher (Figure 1), which is easily transportable, is firstly assembled on the lee side bridge wing. When assembled the launcher essentially comprises a flat waist-high table covered by a black retaining shroud in which the deflated balloon is placed prior to filling. The helium supply is turned on at the bottle rack (Figure 2) and on the respective bridge wing, then the balloon, secured within the black shroud, is filled using the flexible hose (Figure 3).

The sonde, once prepared, is then connected to the balloon via an unwinder which ensures that when launched the sonde unwinds beneath the balloon at a specified rate (Figure 4). When the balloon has been filled to the desired capacity, and the sonde correctly attached, the balloon is released by carefully unzipping the black retaining shroud (Figure 5).

Signals from the sonde are received via a dedicated aerial located on the monkey island and thence displayed on a PC-based Digicora III sounding system located in a corner of the wheelhouse (Figure 6). This system allows the balloon to be tracked throughout its ascent and records all the elements of the upper-air observation, i.e. wind speed and direction, pressure, temperature and humidity. When the ascent has been completed the processed data is transmitted through Inmarsat to the National Met Service (in this case to the Australian Bureau of Meteorology via LES Perth).

Upper-air soundings from the vessel commenced, as planned, on 20 April as the vessel cleared the South African coast at approx. position 37° S, 24° E heading east across the southern Indian Ocean. Of the 20 launches executed during this passage 16 were successful.

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[1] *The Marine Observer*, January 2001, 40–41

[2] Automated Shipboard Aerological Programme

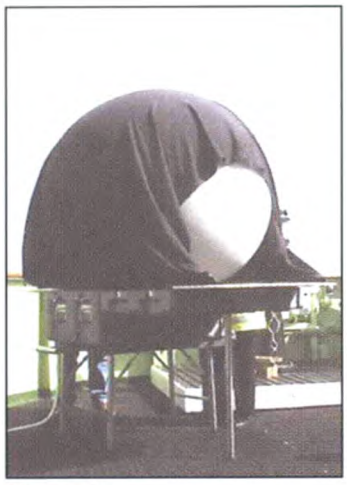
At this stage of the project soundings will only be taken in the Indian and Southern Oceans and in the Tasman Sea. However, as the project takes shape, it is anticipated that additional soundings will be made on other legs of the vessel's round-the-world service. Such soundings will not only be invaluable for operational forecasting but also for global climate studies.

S. North

Figure 1:
Deck launcher

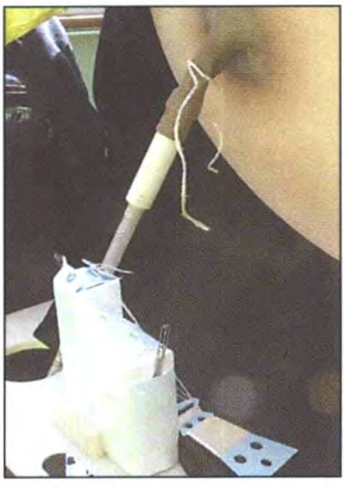
S. North

Figure 2:
Helium storage



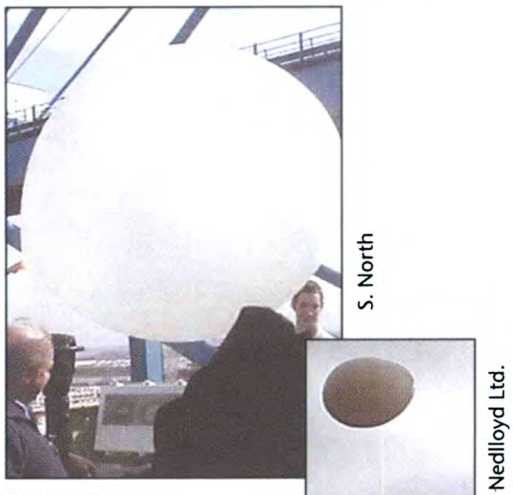
S. North

Figure 3:
Shrouded balloon



S. North

Figure 4:
Sonde and unwinder



S. North

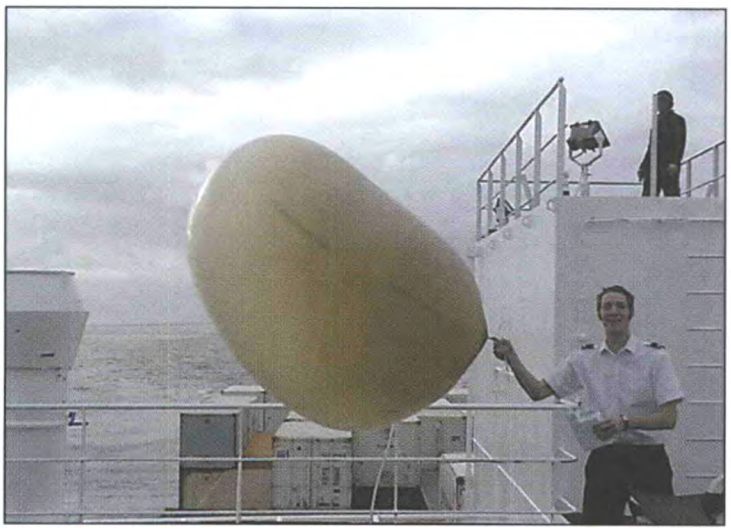
P&O Nedlloyd Ltd.

Figure 5:
Balloon released from shroud. and rising (Inset).

S. North

Figure 6:
Digicora III sounding system

The project has been a testament to the spirit of international co-operation with the launcher and associated sounding system supplied by the United States (NOAA), the consumables funded by the Australian Bureau of Meteorology, and the testing, training of shipboard staff and installation provided in the UK by the Met Office.



P&O Nedlloyd Ltd

However without the willing co-operation and assistance of the ship's owners, officers and crew the project would not have succeeded. We would therefore like to take this opportunity to thank all those concerned.

Left: A launch by hand as Third Officer Brian Simpson prepares to release the balloon, with its sonde package, from the *Palliser Bay*.

Addendum

During the ship's voyage two drifting buoys supplied by the Met Office on behalf of NOAA were successfully deployed by the ship's staff on the southbound leg of her voyage from north-west Europe to the Cape of Good Hope at 04° N and 01° N.

Feedback from the NOAA Global Drifter Center in Miami indicates that both buoys started transmitting quality data immediately after deployment.

US Port Meteorological Officer Workshop 2001

The first US Port Meteorological Officers' (PMO) workshop following the transfer of the NOAA/VOS programme from Silver Spring, Washington to the National Data Buoy Centre (NDBC) at the Stennis Space Centre , Mississippi, was held during 13–15 March 2001. The workshop provided a forum for the exchange of ideas and information and an opportunity to discuss the recent VOS Management Report. Operations, procedures, policies and priorities with respect to the US VOS programme were also addressed.

At the invitation of Mr David McShane (National Weather Service/NDBC VOS technical leader) Captain E.J. O'Sullivan (Manager, Observations Supply, Marine Networks) attended on behalf of the Met Office. Dr Moersdorf (Director NBDC), opened the workshop, the wide-ranging agenda of which included the Voluntary Observing Ships (VOS) programme, the VOS Climate project, PMO training, new technology, and communications.

Above: Delegates at the US PMO workshop

NOAA: The United States National Oceanic Atmospheric Administration

Similarities between Met Office actions to improve and modernise observing methods in a cost effective manner, and those proposed by our US counterparts were noticeable, such as in the use of laptops, the transmission of ships' observations via Sat-C, and the introduction of automatic observing systems.

The Canadian and UK representatives were invited to brief the meeting with presentations on all aspects of their respective programmes, and it was especially pleasing to note that these generated a high degree of interest, demonstrated during question and answer periods which followed each briefing. The UK Automated Shipboard Aerological Programme drew particular attention owing to the possibility of future upper-air profiling requirements from oceanic regions by NWS/NOAA being achieved by similar cost effective means.

The Workshop ended with a guided tour of the Stennis Space Centre, including the large Data Buoy assembly building and workshops.

Excellent Awards

With the nominees for the next round of these annual awards (for the year ending 31 December 2000) already known, we must now draw a line under the proceedings for 1999.

Outstanding claims for 1999

Eligible observers who have not yet claimed for 1999 (or for other earlier years) are still permitted to do so, and their nomination still stands, but unfortunately we cannot guarantee a book prize in recognition of weather observations submitted for that year. Instead, claims arriving later than the recommended date of 30 April 2001 will be honoured by certificate or an alternative form of award.

For this round of awards, the use of e-mail and fax as alternative means of claiming awards was encouraged; although 63 per cent of replying nominees preferred to send their claim forms via conventional mail, it was encouraging to note that e-mail was used by 24 per cent, while a further 11 per cent faxed their claims. The remainder chose to write or use the telephone.

However, the proportion of unclaimed awards for 1999 stood at around 30 per cent by the end of April. This was a disappointingly large figure that almost mirrored the number of claims left at the end of the previous round. Therefore it is understandable, that we would like to improve our 'strike rate' considerably.

Among the reasons for nominees not hearing of their awards could be a change of employer or interrupted postal services to or from ships at sea. It is particularly important that all observers check for their names in past copies of *The Marine Observer* and contact us if they have not already done so.

Forthcoming awards for 2000

The names of the nominees for this round of awards will be published in our October edition. Everyone should receive individual notification by letter well before that time, subject to the vagaries of the post.

All observers should check for their names in the listings when they are published. If you see your name but have not received a letter, then please let us know.

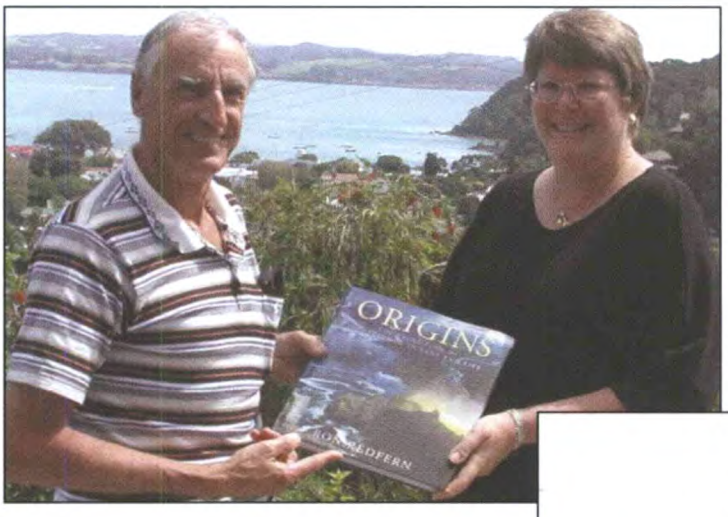
'Missing person' found

It is always pleasing to track down 'missing' individuals, and we were very glad recently to make contact with one nominee from 1999 who had indeed changed employer and had also moved house — to New Zealand.

Now working contentedly as 3rd Officer on the *Taiko*, operated by Coastal Tankers Ltd, of New Zealand, and contributing to the work of New Zealand's observing fleet, John Briand (erstwhile Master on Shell International's *Lampas*) had spotted his name in the listings of the October 2000 edition of this journal. Realising that we were probably unaware of his new (and somewhat distant) address, he e-mailed us to claim his award.

Delighted to hear from him, and ever eager to please, a member of staff was despatched to John's home in Russell (Bay of Islands) to deliver the award book in person in March. [See photograph below.] In truth, what actually happened was that the member of staff (the Sub editor of this journal, Jan Freeman) was, coincidentally, about to leave for a holiday in New Zealand, to stay only about an hour's drive from Russell, and offered to escort the book to its destination!

The delivery of John's award was an exception to the rule, but the moral of this story is that we will do everything we can in order to unite observers with awards, but we do need to know where you are. When letters of notification are prepared, our only source of contact information comes from the details entered at the rear of ships' logbooks, so please ensure that all these are clear and correct. Make sure that you include your signature too, as this will be of great assistance to us in cases where observers share the same name and initials as well as, albeit rarely, the same employer.



D.R. Freeman

J. Briand

Above: John Briand finally receives his Excellent Award for 1999, and ***(Right)*** his current observing ship, *Taiko*

Radio-facsimile broadcasts – GFA bids goodbye

By Martin W. Stubbs

On Tuesday 3 April 2001 at 10:42 UTC the last chart — the 24-hour forecast mean sea level pressure for the North Atlantic and Europe —was transmitted from the Met Office at Bracknell via the GFA radio-facsimile service. This ended almost half a century during which products from the Central Forecast Office at Dunstable and then Bracknell, and latterly the National Meteorological Centre at Bracknell were transmitted by radio-facsimile, including analysis and forecast charts of particular value to the mariner.

Efforts made to transmit graphical products by land-line or radio had been made by the Meteorological Office prior to the Second World War using BBC apparatus. In the *Annual Report of the Meteorological Office* for 1947/48, the comment is made that 'the idea of transmitting pictures by land line or radio is an attractive one since it may possibly eliminate the necessity for plotting separate maps at each outstation'. In the eight months following December 1945, some 600 charts were transmitted from Dunstable to HQ Transport Command, Victory House, and Gloucester via land line. Progress was quite slow thereafter and it was not until the Annual Report for 1950/51 that mention is again made of the use of facsimile by which time the techniques had improved such that charts with plotted observations could be transmitted from one centre to another. But it was 1952 before the first omni-directional broadcasts of facsimile products began from Dunstable, by which time satisfactory results were being obtained in the reception of broadcasts made by the United States agencies in places such as Alaska, Washington and in the Far East. In the Autumn of 1955 the Naval Weather Service was provided with a special amplified broadcast while the Fleet was engaged in exercises in northern waters.

It was not until the early 1960s that the availability of charts via the medium of radio was realised to be of considerable value to the merchant navy. Writing in *The Marine Observer* (31, 1961, 138–140) Commander C.E.N. Franckom explained the value of getting synoptic charts at sea. At this time one has to appreciate that weather information received on board a vessel on the North Atlantic was limited to the Atlantic Weather Bulletin [to become known by users as the 'North Atlantic Bulletin']. The 'NAB', broadcast twice a day, had five parts which included Storm Warnings, Area Forecasts for the following 24 hours, a set of land observations in abbreviated code form and a selection of ships' observations. The fifth part of the NAB was broadcast once a day, in the late morning, and consisted of a coded analysis of the pressure centres, fronts and isobars at 0600 GMT in the International Analysis Code. This enabled the construction of a simple chart on board ship. Commander Franckom in his article quoted the *International Convention for the Safety of Life at Sea* (1948): 'contracting Governments should include in their weather bulletins for shipping "when practicable, sufficient additional information to enable simple weather charts to be prepared at sea" '. Radio facsimile was the answer to the provision of charts, not only the analyses, but also the forecast products prepared in the Central Forecast Office at Dunstable and later at Bracknell. By early 1963, the value of facsimile at sea was being realised and, in the January 1963 edition of *The Marine Observer*, a list of facsimile broadcasts around the world considered useful for use aboard ship was published. Transmissions by this time could be picked up in most of the oceans of the world. The *International Convention for Safety of Life at Sea* (1960) fully acknowledged the value of radio-facsimile broadcasts in the context of marine safety in stating clearly the requirement that contracting Governments 'encourage the transmission of suitable facsimile weather charts'.

During the following 40 years the availability of charts via radio facsimile continued to provide that vital extra information to the mariner that complements the forecasts. The North Atlantic Bulletin has changed little in the same period except that responsibility for the forecasts for the eastern part of the North Atlantic is now divided between the United Kingdom and France, and the bulletin is called the 'High Seas Bulletin for Metarea I'. But the plain-language forecasts are still much the same as they were 40 or 50 years ago — that is, they are still for just 24 hours — indeed one would find it difficult to see any difference in the texts available now to those available in the 1950s! Also there is now neither coded analysis nor a selection of observations for the staff on the Bridge to construct a simple chart. Thus, the mariner has become totally dependent upon the availability of charts via radio facsimile to provide that essential background information in the understanding of the forecast and an appreciation of potential dangers in the period beyond that of the 24-hour worded forecast.

But the world of communications is changing rapidly, and graphical products may now be exchanged in digital format much more satisfactorily than via the medium of analogue facsimile broadcasts which, by their nature, are very expensive to maintain. Thus when the requirements of National Meteorological Services for the provision of radio-facsimile broadcasts for their own purposes diminished (with the continued improvement of land-line and satellite communications), member states have been forced to take a careful look at the costs of providing such broadcasts specifically for shipping. It should also be remembered that the costs of the radio-facsimile broadcasts in the UK were borne through the clawing back of funds from those organisations such as the aviation community which have provided funding for some of the broadcasts until quite recently. Once that funding ceased it was obvious that the marine community could not itself support the costs of such a service unless there was help from central government.

Although the Bracknell broadcast has now ceased, meteorological information for the North Atlantic is still available via the radio-facsimile broadcast maintained by the Deutscher Wetterdienst. This broadcast originates at Offenbach with input from the Marine Office in Hamburg (see page 137 of this edition for further details). The Fleet Weather and Oceanographic Centre (FWOC) at Northwood, Middlesex, maintains a broadcast primarily for Royal Navy use although the transmissions can be received generally over much of the central and eastern part of the Atlantic and in UK home waters (details in the *Admiralty List of Radio Signals*). The Ministry of Defence accepts no liability for product accuracy nor for any non-service use to which the products disseminated by Northwood are put since the content of the broadcast is not bound by the regulations within the Convention for Safety of Life at Sea (SOLAS).

With access to the Internet and the availability of digital products via satellite communications becoming increasingly more feasible in the next few years, the days are numbered for the continuation of analogue facsimile broadcasts world wide. However, for the time being the safety of many ships on the North Atlantic will continue to depend to some considerable extent on the availability of analyses and forecast products via radio facsimile broadcasts from the WMO listed stations, namely the Offenbach broadcast in Europe, Halifax in Canada and Boston on the east coast of the USA. Details of all these broadcasts are contained in the various publications from HM Hydrographic Office, such as the relevant volumes of the *Admiralty List of Radio Signals, (Volumes 3(1) and 3(2))* and in the new series of *Small Craft* editions. Details are kept up-to-date via the amendments to these volumes in the weekly editions of *Admiralty Notices to Mariners* (also now available on-line at www.ukho.gov.uk).

Editor's note: This article describes how sea temperatures and sea ice data obtained from ships and other marine sources are incorporated into the numerical modelling process. Numerical weather prediction (NWP) is the process of obtaining an objective forecast of the future state of the atmosphere by solving equations describing the evolution of temperature, pressure, wind speed and humidity. The process begins by analysing the current state of the atmosphere and updating computer 'fields' of the above variables with the latest observations.

Operational sea-ice and sea surface temperature analyses *

Clive Jones

The sea surface temperature (SST) and presence or absence of sea-ice can have an important role in determining the behaviour of the overlying atmosphere, so these model fields need to be updated regularly to ensure an accurate forecast. Daily analyses of both the SST and sea-ice extent and concentration are produced as part of the Met Office operational NWP system, and used in our model forecasts.

The sea temperature often provides the forcing [or trigger] for shower formation, and affects the formation and subsequent evolution of tropical cyclones, convection, sea fog and sea breezes. Similarly, the presence of sea-ice has a significant impact on the exchange of energy between the atmosphere and the underlying surface, with a dramatic effect on the surface temperature. This in turn can affect satellite radiance retrievals and thus the distribution of sea-ice influences the entire tropospheric air column [a vertical section through the lowest layer of the atmosphere] of the NWP model.

For these reasons, model errors would quickly develop if a climatology [averages and statistics] were used, and so we have included an operational SST analysis as part of our forecasts for many years — the current scheme has been in use since 1991. The sea-ice analysis has had a rather more chequered history, as obtaining suitable data for analysis has not been easy. Our current scheme was introduced in July 1999.

Defining the SST

First of all it is necessary to define exactly what is meant by the sea surface temperature — which is not as easy as it may seem. The SST at the very surface, within the top few micrometres, is termed the skin SST, and that immediately below is called the bulk SST. The skin SST may be significantly cooler, by as much as 1K, than the bulk SST immediately below it. This temperature difference is due to the fact that heat transfer is usually from the ocean to the atmosphere, and therefore the ocean is losing heat to the atmosphere by molecular conductance.

Beneath the skin layer, the temperature may be relatively constant to a depth of a few metres if the ocean is well mixed, or there may be a pronounced temperature gradient known as the diurnal thermocline.

There are several factors that determine the skin-bulk temperature difference and the magnitude of the thermocline, but the principal ones are wind speed and the amount of incoming solar radiation. Both effects usually exhibit a diurnal cycle. The most favoured conditions for both the establishment of a skin-bulk difference and a thermocline are calm winds in strong sunlight.

* For more information about Numerical Weather Prediction (NWP) visit the Met Office web site at http//:www.metoffice.com/research/nwp/index.html

Satellites can only measure the skin SST, although the retrieval algorithms are formulated to attempt to give a 'pseudo-bulk' SST. *In situ* observations, mainly ships and buoys, measure the bulk SST, but the depth at which these measurements are made varies considerably. Some ships lower a bucket over the side, others measure the temperature of the water being drawn in for the engine cooling system, whilst others have a sensor mounted on the hull. The method of measurement, and other factors such as the size of the ship, can have a significant effect on the SST that is reported.

It is for these reasons that defining exactly what is meant by the SST is rather difficult. What we can say is that the analysis is of the bulk SST, and we assume a nominal depth of 1 m as this is approximately the depth of sensors mounted on buoys. It could be argued that the analysis should be of the skin SST, as that is in direct contact with the atmosphere. However, it is counter-argued that it is the bulk SST that provides a heat reservoir to the atmosphere, and in fact the numerical models have been formulated to use the bulk SST.

SST analysis method

A separate analysis is performed for the global and mesoscale models. All observations made within a 24-hour period from the following sources are included:

- ships;
- buoys;
- bathythermographs; and retrievals from the AVHRR (Advanced Very High Resolution Radiometer) carried on board the NOAA polar orbiting satellites.

The observations are first quality controlled by checking that the observation is located over sea and by comparing against a background SST field (the previous analysis). There are also checks to ensure that reports from buoys are consistent, as one would expect little variation within a 24-hour period. All observations from a single buoy are averaged to create a single 'superob' for use in the analysis.

The analysis is based on the analysis correction method of Lorenc *et al.* (1991). The first step is to perform an increment towards climatology, so that even if observations are not received the seasonal cycle is maintained. A correction scheme is used to compensate for any bias that may exist in satellite data: satellite observations are compared with collocated in-situ observations and adjusted accordingly. The main analysis follows.

The analysis correction method first calculates the difference between the observations and the background value (the previous analysis) at observation locations, the background value having first been interpolated to the observation location. From these increments, a field of increments on the model grid can be calculated which is then used to 'nudge' the background field towards the observations. This process is repeated for a number of iterations so that a best-fit is obtained. In addition to the analysis field, an anomaly field — the difference from climatology — is also calculated.

Sea-ice analysis

An analysis of the sea-ice concentration — the proportion of sea covered by ice within a given area — is also performed daily. In the past this has been set manually, using a bulletin that just gave the line of the sea-ice edge and, most recently, by climatology. These methods only gave an indication of whether sea-ice was present or not, i.e. only concentrations of either 1.0 or 0.0 were allowed. The current scheme was introduced in July 1999 and meant that for the first time leads (areas of open sea within the sea-ice cover) were introduced.

The sea-ice concentration is calculated using retrievals made by the Special Sensor Microwave/Imager (SSM/I) which is an instrument carried by the Defense Meteorological Satellite Program (DMSP) series of satellites. The SSM/I is a seven-channel, four-frequency, linearly polarised, passive microwave radiometer. The fundamental quantity measured is the total power received by the radiometer, which can be converted to the antenna temperatures and brightness temperatures. The sea-ice concentration is calculated from the brightness temperatures.

The ocean modelling branch of NCEP (National Centers for Environmental Prediction, Washington) processes the satellite data to calculate the sea-ice concentration, which is mapped to a regular 0.5° x 0.5° grid and downloaded each day to the Met Office. The data are then interpolated to the required model grid.

The interpolated field is then scanned and possibly altered in an attempt to fill in any holes in the retrieved sea-ice cover. These holes may exist as a result of deficiencies in the retrieval algorithms, or may actually be melt ponds lying on the surface of the sea-ice. It is a matter of some debate as to whether melt-ponds should be treated as open sea or sea-ice and the answer probably depends upon the precise application. Finally, all concentrations of less than 0.5 are zeroed, as below this concentration the satellite instrument is unreliable.

The model is updated with these new analyses, which remain unchanged during the evolution of the forecast. The wave model also uses the sea-ice analysis.

References

Lorenc, A.C., Bell, R.S. and Macpherson, B. 1991: The Meteorological Office analysis correction data assimilation scheme. *In* QJR Meteorol Soc, **117**, 59–89.

Book review

The American Line 1871–1902 by William Henry Flayhart III. 230 x 260 mm, *illus.*, 404 pp. inclusive. Published by W.W. Norton & Company Ltd 10 Coptic Street London WC1A 1PU. ISBN: 0 393 04710 5. Price: £29.95.

This book recalls three decades of North Atlantic passenger trade; between 1871 to 1902. The American Line was started by the Pennsylvania Railroad, who wanted to get ahead with the expansion westwards, their main competitors being the New York Central Railroad. After the American Civil War both wished to expand into all areas where markets were developing, for which people were required for both the development of the West, and for a massive expansion of the industrial East. Therefore immigrants were needed for settlement of new lands, and as a work force for expansion of industry.

Passenger ships on the North Atlantic route were therefore desirable; that there were none was partly due to insurance costs following the Civil War, and partly due to hostile action between the two opposing factions. References to actions that influenced the development of the American Line are frequent, and throughout the book the reader is transported to another period and date, all with relevant explanations. These I found more interesting than the mundane plans and board meetings that are — of necessity — the main part of the book.

Increasing the flow of trade plus encouraging immigrants to the mid-west was the aim. One bill of lading/ticket would cover a passenger from Europe to the mid-west, right through, with all connections and timetables tied in. The acquisition of foreign flag companies was also an option considered at the development stage.

The book is a reference work for the American Line. This reviewer has not even considered checking the accuracy for the author admits all errors are his own, and hopes he has not led too many readers astray. That it is a reference book is unquestionable, however not all the historical background may be well known. The American Civil War which created the need for the expansion of the railways, the growth in the work-force, and the subsequent development of the North Atlantic passenger trade, etc., is well documented elsewhere. The need for ships that could be used as naval craft, yet without the financial support of government, is not largely known.

Further historical background is provided in a chapter devoted to the American Line's actions during the war between Spain and America, declared in 1898 after hostilities had already begun. It appears to be included because the American Line made up a considerable part of naval power, with many of the ships being renamed and armed. (An armed merchant fleet was frowned upon by the Royal Navy and others. The reasons for this make interesting reading.)

This book is a history with a story, and all the chapters have interest to the mariner. There are all the references the reader could ever require to check the details in greater depth, or for further reading. There are no less than 323 footnotes all of which are expanded towards the rear of the book, and the constant referral there is a distraction, but this is an imaginative and well documented work, with a vast store of information. Well worth including in the ship's library.

Captain Austin P. Maytham
Port Met. Officer — Bristol Channel

Noticeboard

Changes to the Observations–Voluntary (Marine) section

With effect from 1 April 2001, the section of the Met Office hitherto known as Observations–Voluntary (Marine) became part of the Surface Networks section of a newly-created Observations Supply branch. To reinforce this restructuring, the section, now known as Marine Networks, was also relocated to a local satellite site attached to the Met Office close to Bracknell.

As a consequence of these changes, the new postal address that should be used for all correspondence concerning the VOF (including *The Marine Observer*) is now:

Met Office Beaufort Park Easthampstead
Wokingham Berkshire RG40 3DN
Tel: +44 (0)1344 855732
Fax: +44 (0)1344 855873
E-mail users can contact any member of the section's Bracknell-based staff at: **obsmar@metoffice.com**

The Marine Networks section comprises the following staff who can, if necessary, be contacted by telephone.

Captain E.J. O'Sullivan	Manager of Marine Networks	Tel: +44 (0)1344 855723
Geoff Allen	Technical Liaison	Tel: +44 (0)1344 855714
Sarah C. North	Nautical Officer and Deputy Editor of *The Marine Observer*	Tel: +44 (0)1344 855617
Michelle Ayres	Admin Assistant	Tel: +44 (0)1344 855872
Jan Freeman	Sub-editor of *The Marine Observer*, distribution of Excellent Awards	Tel: +44 (0)1935 424285 Fax: +44 (0)1935 428028

The Marine Networks section continues to co-ordinate the operations of the UK Port Met Officers and Offshore Adviser, who can also be contacted as required:

Liverpool:
Colin B. Attfield
Met Office 8 Tower Quays Tower Rd
Birkenhead CH41 1BP
Tel: +44 (0)151 6490541
Fax: +44 (0)151 6490547
E-mail: pmoliverpool@metoffice.com

Cardiff:
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Met Office Titan House
Cardiff Bay Business Centre Lewis Road
Ocean Park Cardiff CF24 5BS
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Fax: +44 (0)29 2045 1326
E-mail: pmocardiff@metoffice.com

Tilbury:

Captain Harry H. Gale
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E-mail: pmolondon@metoffice.com

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Fax: +44 (0)23 8033 7341
E-mail: pmosouthampton@metoffice.com

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E-mail: pmohull@metoffice.com

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Tel: +44 (0)1224 407557
Fax: +44 (0)1224 407568
E-mail: iain.hendry@metoffice.com

During the reorganisation, the opportunity was taken to further rationalise the overall structure of the section prior to the expected relocation of the entire Met Office to Exeter in 2003. As a result, the Port Met Office at Middlesbrough was closed on 22 March 2001 and the duties carried out by Captain Gordon Young (who opted to take retirement) were transferred to Captain John Steel at the Port Met Office in Hull.

At Bracknell, Jennifer Mynott who had been part of the Administration team, also processing ships' logbooks and Observing Officers' records, moved jobs to begin work with the quality control of logbook data.

We wish them both well for the future, and thank them for past endeavours.

Northwood radio-facsimile broadcast

There have been some amendments recently to the Northwood Radio facsimile broadcast. The revised schedule is broadcast at 0236 UTC and at 1424 UTC daily on 2618.5, 4610, 8040 and 11086.5 kHz.

This broadcast is primarily for Royal Navy use and the Ministry of Defence accepts no liability for product accuracy or for any non-Service use to which the products may be put. Full details can be found in the *Admiralty List of Radio Signals, Admiralty Marine Communication* with updates and corrections in the weekly *Notices to Mariners*.

Offenbach radio-facsimile broadcast

The broadcast is transmitted on 3855, 7880 and 13882.5 kHz. Isobars on the Mean Sea Level Pressure charts are at 5-hPa intervals.

UTC	Chart	UTC	Chart
0430	Analysis	1050	Analysis
0512	T+30	1111	Schedule
0525	Analysis	1600	Analysis
0717	T+30	1800	Analysis
0730	T+48	1834	T+24
0743	Analysis	1847	Rpt 0730
0804	T+72	1900	Rpt 0804
0817	T+96	2200	Analysis

UK Fleet Lists

Selected ships reporting from 1 April 2000 to 31 March 2001

(Information based on latest available logbook/TurboWin data received during the period.)

Recently recruited ships from which data had not been received by 31 March are indicated by *. Ships fitted with TurboWin software are indicated in bold face.

VESSEL	MASTER(S)	OBSERVING OFFICERS	OWNER/MANAGER
Aberdeen	MK Ahrens, V Golding	KD Blackwood, T Crowley, CT Hendry, A Mackenzie, GB O'Kelly, D Gentry	Northern Marine Management Ltd
Al Samidoon	DR Kent, PJ Ward	A Al Sulaihem, K El Emam, A Rashid, A Tewari, O Moussa, L Al Azemi, E Blaza	Kuwait Oil Tanker Company
Al Zohal 1	MM Murshed, AN Mudalige	KMVN Barammane, B Thangavelu, KWK Gunnasekara, P Parana, Z Guruge	London Ship Managers Ltd
Alliance	L Holtschmidt, JA Holst	D Wood, J Davies, N Dunbar, P Darlington, G Jones, I Stone	Denholm Ship Management (UK) Ltd
Ambon	R Chadha	B Ali	Wallem Shipmanagement Ltd
Anja C	D Hubers	C Harrell	Carisbrooke Shipping plc
APL Iolite	FG Klasson, LY Min	- Gunalan, - Shaowei, V Nanda	Neptune Shipmanagement Services (Pte) Ltd
Arcadia	M Carr, R Fennelow	DM Roberts, I Jamieson, B Lloyd, K O'Callaghan, A Wentel	P&O Cruises (UK) Ltd
Argentina Star	P French, T Burleton	AC Rayburn, G Bongat, FC Go, ED Gaygay	P&O Nedlloyd Ltd
*Astrid Schulte **			Eurasia Shipping & Management Co. Ltd
*Aurora **			P&O Cruises (UK) Ltd
Arunbank	JJ Millar	A Plisenko, G Pollock, RJ Sanderson	Andrew Weir Shipping Ltd
Auckland Star	SG Mortimer, JF Dobson	HJ Jalos, NF Codera, EN Narra	Norbulk Shipping UK Ltd
Baltic Breeze	JS Williams, VI Basely	M Lwin, NN Kyaw, K Kyaw, W Zaw, KL Min, W Adng, WH Baw	Wallenius Lines Ltd
Baltic Eagle	PM Anthony, DW Torr	CR Stone, DE Wardle, DJ Levins, S Moore	Andrew Weir Shipping Ltd
Baltic Tern	KF Steven, N Kelly	LC Pink, M Causan, C Taylor, P Mount	Andrew Weir Shipping Ltd
Barbet Arrow	MM Grass, PS Mosely	A Marinovic, A DA-Anoy, D Jimenez, D McGregor, A Norwood, - Diocisiho	Gearbulk (UK) Ltd
Berge Atlantic	SK Nordfjord, SK Jain	PS Hegde, ND Levillard, A Mannath, AV Mascarenhas	Bergesen d.y. ASA
Berlin Express	IM Hill	JP Farr, R Hawthorne, RWM Cooper, LPV des Landes	Mobil North Sea Ltd
British Admiral	JE Docker, J Tarling, T Johnston	NF Haysom, MM Robinson, W Olaman, CJ Green, T Ruth, M Young	BP Amoco Shipping Ltd
British Adventure	CC Johns, P Anderson	A Lane, G McCracken, JJ Dulley, C Winterbottom, B McGregor, S Wong	BP Amoco Shipping Ltd
*British Energy **			BP Amoco Shipping Ltd
British Harrier	CS Gaukroger, NJ Greig	AB Ridgley, T Radford, JL Welford, PR Anderson, P Cavagan	BP Amoco Shipping Ltd
British Hawk	GM Hallett	R Janus, D Austin, C Nesbitt, P Gibson, DMS harp, TL Tilbury	BP Amoco Shipping Ltd
British Hunter	TL Cullen, JO Bailey	SSC Magalotte, PI Preston, TRE Forrest, TW McDonald, S Moss, D Appleby	BP Amoco Shipping Ltd
British Pioneer	A Macleod, PD Seaman	DA Moss, M Graaskov, C Henrickson, R Rykala	BP Amoco Shipping Ltd
*British Progress**			BP Amoco Shipping Ltd
British Purpose	KE Peacock, NE Hannam	EM Salmon, DM Way, AD Wheatley, JP Rumsby, RC Moss, MP Kozlowski	BP Amoco Shipping Ltd

British Skill	M Mansbridge, B Pritchard	W Olaman, P Westgate, C WKelly, A Singleton, M Hagan, M Newton	BP Amoco Shipping Ltd
British Spirit	AM Lakey, JA Buchanan	D Lavery, D Cox, RK Harding, GSL Williams	BP Amoco Shipping Ltd
British Steel	RA Whistler	D GLyon, JA Daria, LP Rillera, JZ Castro, JR Holland, MA Beare	Furness Withy (Shipping) Ltd
British Strength	E Davis, D Mulhern	J Hassall, AN Shearer, N Haysom, CC Gault, MF Orchard, M Dowd	BP Amoco Shipping Ltd
British Valour	M Phillips, JN Gregson	AB Ridgley, GJ Davies, C Beaton, MD Bongartz, J Lewandowski	BP Amoco Shipping Ltd
British Vigilance	S Keitch, B Wardman	M Tofinga, M Hindhaugh, T Kazalski, AJ Gillies, O Stacey	BP Amoco Shipping Ltd
BT Nautilus	MJ Broomwich, AK Thakur	VS Rupade, M Mahesh, SB Pal, R Sindhwani, R Nair	BT Shipping (London) Ltd
BT Navarin	N Fillingham	J Garpa, EM Ramirez, RE Buenaventura	BT Shipping (London) Ltd
BT Nestor	CJ Bland, SK Maini, DK Malkotra	J Woodcock, KK Murali, J Mehta, V Wasudev, BP Singh, V Kumar, H Raheja	BT Shipping (London) Ltd
BT Nimrod	J Ranvir, AK Thakur	A Garg, S Panigrhi, S Gharkar, R Loci, R Khanna	BT Shipping (London) Ltd
BT Stream	G Sharatkumar	G Ashwanz, A Euisadio	BT Shipping (London) Ltd
Buccleuch	SD Bhathena	S Ahmed, PS Devarpalli, RS Shah, SF Ahmedi, DK Bhakta	Zodiac Maritime Management Services
Bulk Ispat Leher *			Anglo-Eastern Ship Management Ltd
C.S.Nexus	AK Ullah, PM Crowe, D King	PG Lloyd, S de Jonge, PJ McKay, A Lowiki, RG Barry, AM Huntington	James Fisher (Shipping Services) Ltd
Cable Innovator	IW Crane, DS Hibberd	S Crookes, SD Palmer, S Lakshmanal, D Smith	Global Marine
Caledonian Isles	A McCrindle	P Welsh, J Stewart, R Littlefield, P Harkness	Caledonian MacBrayne Ltd
ConMar Conquest	FS Bulsara, P Bland, C D'Souza	JF Dias, ZF Mistry, J Miranda, R Lochan, TS Narula, NA Fadra, PS Pillai, V Kumar	Canada Maritime Services Ltd
CanMar Courage	JM Mistry, C Mendonce	KS Singh, BS Singh, MJ Homavazir, PS Valles, R Tavadia, S Sharma	Canada Maritime Services Ltd
CanMar Glory	L Pereira, S Bharti	J Miranda, P Pratap, CP Surendran, R Kumar, AD Moghe, RA Gangoli	Canada Maritime Services Ltd
CanMar Honour	AK Sharma, R Lakhani	A Ganapathy, AK Engineer, GK Kapri, M Pinto	Canada Maritime Services Ltd
CanMar Pride	V Chanla, JP Simcox	S Mondal, A Kanwar, H Sohari, S Nangia, D Das, S Bhattacharya	Canada Maritime Services Ltd
Canterbury Star	DJ Jones, GW Bryson	SM Ross, PF Senador, R Rontero, L Villacencio	Norbulk Shipping UK Ltd
Cape Horn	I Salter	S Jones, M Hingpit, C Ranario, E Leseur	MOL Tankship Management Ltd
Caribbean Reef	AR MacPherson, DS Winser, T Elahi	PP Guvindra, YM Karunasundara, HADA Pushpakumara, EADH Edirisinghe, S Bashkaran	London Ship Managers Ltd
Caronia	R Heath, R Bolton	LE Asplino, A Hashmi, IK Olsen, C Douglass, J Dawson, J Barlow	Cunard Seabourn Ltd
Cast Performance	AD van Hees, MB Iranpur	RK Verma, A Kanwar, D Pal, C Rai, MHH Surve	Canada Maritime Services Ltd
Cast Power	K Nayyar, LFK Pereira, A van Hees	JP Nair, C Sumit, PS Valles, JK Fernandes, BF Mathias	Canada Maritime Services Ltd
CGM Caravelle	RM Raybould, EF Stewart	DJ Miller, S Shalygin, A Danilyuk, Y Danil'chuk, Y Bulash, I Yefimenko	Andrew Weir Shipping Ltd
Charles Darwin	KO Avery, GM Long	JC Holmes, TA Owoso, PW Newton, JW Mitchell, PIT Oldfield, JD Noden	NERC Research Vessel Services
Chiquita Belgi	A Ruszcynski, M Cherry, M Szalek	M Miraflores, L Buhay, N Dejino, M Pelc, DJ Ahern, R Paala	Great White Fleet Ltd
Chiquita Bremen	G Bent, M Cherry	W Ortiz, A Ayazo, D Aquino, M Dziurka	Great White Fleet Ltd
Chiquita Brenda	G Walker, P Scarrot	GV Pastrana, F Santillan Jr, J Tampus, GV Pastrana	Great White Fleet Ltd
Chiquita Deutschland	CF Campbell, B van Meensel	JR Velasco, M Ranis, O Piechacek, BA Azarcon	Great White Fleet Ltd
Chiquita Elke	W Tebbutt, M Szalek	VA Battad, CA Contreras, JH Clamp, A Ayazo, D Fernandes	Great White Fleet Ltd
Chiquita Frances	H Eriksson, B Erikson, P Nicholson	L Brosas, M Stopford, G Requillo, J Talandzis, R Villanueva	Great White Fleet Ltd
Chiquita Nederland	A O'Neill, A Wilson, I Gladstone	R Pacis, P Tandog, W Artymionek, D Orcales	Great White Fleet Ltd
Chiquita Rostock	H Erikson, H Wright, B van Hulle	B de Celis, NU Lanente, M Dziurka, R Colon, D Mamisay, R Albasco	Great White Fleet Ltd
Chiquita Scandinavia	D Tomlinson, E Lyon	L Alfarero, J Calderon, J Pena, MA Miquiabas	Great White Fleet Ltd
Chiquita Schweiz	B van Meensel, T Coornaert, B Philip	LC Lapitan, J de las Alas, W Crook, GG Dolores, M Morshed, R Manantan	Great White Fleet Ltd

VESSEL	MASTER(S)	OBSERVING OFFICERS	OWNER/MANAGER
City of Amsterdam	GM Railson, R Lyall, WM Bartlett	EL Dzameh, MW Bingham, J Lewis, BRG Tasker	Denholm Ship Management (UK) Ltd
City of Barcelona	W Bartlett, GM Railson	BRG Tasker, J Hunter, SC Benstead, J Charlton, J Fallon	Denholm Ship Management (UK) Ltd
City of Cape Town	GJH Preston, JC Harris	RJ Platt, Z Berry, A Lewington, A Firman, M Grimshaw, JH Beale	P&O Nedlloyd Ltd
City of Paris	A Hamilton	D Hutchinson, I Hodges, D Quinney	Azalea Maritime Agency
City of Rome	PW Jackson	NM Davies, RS Nassoro, R Copeland, D Quinney, ML Lynch	Azalea Maritime Agency
Clansman	H Sinclair, I Dewar, IF Scarr	C McCurdy, J Gillies, G Mills, G Matthews, R Nicolson	Caledonian MacBrayne Ltd
CMBT Asia	R Thomas, CR Mackenzie	R Boniao, J Daguman, F Dinglasan, V Adobo	Safmarine Ship Management
CMBT Europe	AC Havenga, P Doyle, C Mackenzie	J Hedges, BD Jordaan	Safmarine Ship Management
Colombo Bay	PD Davies, CK Urwin	S Frediani, AG Wilson, RJC Neale, HF Radha, SW Capes, M Stewart	P&O Nedlloyd Ltd
Condor Arrow	A Baijal, JS Rekhi, NI Beg	D Kartik, A Alndurkaz, Z Pagarkar, HS Pawar, JJ D'Souza	Gearbulk (UK) Ltd
Constantia *			The South African Marine Corporation Ltd
Coppename	DW Bunyan, CD Eames	JMC Cinco, WC Eleria, PC Coles	Celtic Marine Ltd
Coral Reef	SJ Davies, RJ Kendall, SP Harris	AUKL Arachchige, AK Abeyratne, WUC Mendis, AU Kasturiarachchi, DMCIB Danasekara	London Ship Managers Ltd
Cotswold	IW Connor	UL Shenai, MBN Satish	Zodiac Maritime Management Services
Cottica	C Eames, D Robinson	R Quiambao, JM Cinco, J Charlton, R Lankay, P Coles, D Alagon	Celtic Marine Ltd
Criscilla	MA Patterson	G Cooper, K Batty	Marr Vessel Management Ltd
Curico	RJ Kendall	NC Nacu, ED Espiritu, MD Chowdury, JR Pesudas	London Ship Managers Ltd
Dallington	C Grahame, B Tucker, P Johnson	C Lewis, K Gruchot, HD Nutt, R Bennett	Stephenson Clarke Shipping Ltd
Discovery	RA Appleby, DA Young	AMF Baker, NG Young, TT Latto, J Trant, M Fitrzyk, I Wight, C McNielly	Stolt Comex Seaway Ltd
Discovery	KO Avery, RC Plumley, RJ Chamberlain	MP Hood, TA Owoso, PT Oldfield, R Warner, C Vrettos, PC Sarjeant	NERC Research Vessel Services
Dominica	RJ Hawkins, AB Ward, J Antonsen	M Andrzej, K Jaskiewicz	IUM Ship Management AS
Donnington	B Tucker, B Standerline, P Johnson	M McKinnon, H Shaw, K Doyle J Roemmele, J Bore	Stephenson Clarke Shipping Ltd
Dove Arrow	A Kvernroed	JAM Dimailig	Gearbulk (UK) Ltd
Drin	S Butalia, AS Yadav	PA Gordon, JAM Sultan, SK Sharma	V.Ships (UK) Ltd
Duhallow	MJ Walker, A Sinha, AM Deshmukh	G Thevar, D Prakash, DS Baweja, M Joshi, A Banerjee	Zodiac Maritime Management Services
Durrington	B Raper, M Mckinnon, B Standerline, CDG Grahame	J Bore, MBW Wdowikowski, T Evans, NM Williams, M Abedin	Stephenson Clarke Shipping Ltd
Eastern Express	TS Bajwa, R Kumar, BP Das	SV Salian, RK Sampath, P Rayso, R Prabhat, AGD Mansur	Univan Ship Management Ltd
Ebalina	RN Richards, CG Pogue, JP Taylor	D Lowe, R Aurthur, D Geddes, R Haviland, P Nottle, M Kadir	Shell Marine Personnel (IOM) Ltd
Eclipse *			International Marine Transportation Ltd
Elk	N Hardy, B Kay	S Holding, A Anning, D Turner, R Jones, D Davies, RG Ryder, P Marcon	P&O Ferrymasters Ltd
English Star	J Bird, JF Dobson, NJ Barr	S Recamadas, EC Gerona, PJ Reville, JE Jumawan, JC Barton, SV Soliven	Norbulk Shipping UK Ltd
Eridge	SB Tudor, R Lakhotia	LA Corda, KR Meher-Homji, SP Thattam	Zodiac Maritime Management Services
Erna Oldendorff	Y Hossny, C Maciej	PSN Fernando, R Kurdyumov	Egon Oldendorff
Ernest Shackleton	SJ Lawrence	AR Liddell, A Wallis, S Buxton	British Antarctic Survey
Erradale	JA Hofton, D Watkins	MD Bagley, E Escaro, EJ Porthouse, SP Edwards, KM Chester, N Satrain	The China Navigation Co. Ltd

European Envoy	J Jamieson, R Pinchen, N Cantwell	D Crerar, M Robarts, S Harwood	P&O Ship Management (Irish Sea) Ltd
European Pathfinder	KP Riley, AL Sodhi	D Thornton, W Bailie, K Cooper, S Harwood, C Jackson, I Tranter	P&O Ship Management (Irish Sea) Ltd
European Seafarer	R Small, J Jones, M Ingram, M Austin	JA O'Dwyer, WM Terry, A Hamilton, RT Jamieson, S Harrison, R Burnett	P&O Ship Management (Irish Sea) Ltd
Falcon Arrow	SK Mathur, GM Kerur	R Modar, R Tyagi, N Ambosta, P Kumar	Gearbulk (UK) Ltd
Federal Rhine			Anglo-Eastern Ship Management Ltd
Finch Arrow	P Gour, AK Babbar, HSPS Bhandari	V Ramesh, KR Dhananjoy, S Chopra, RV Raghauan, AL Mukhopadyay, AA Indurkar	Gearbulk (UK) Ltd
Foylebank	EM Pallister	IM Vishnevskiy, D Porublev	Andrew Weir Shipping Ltd
*Gisela Oldendorff **			Egon Oldendorff
Glasgow Maersk	M Nash, AG Groom	AW Smith, R Beattie, G Brown, GH Smith, SM Green, J Legge	The Maersk Company Ltd
Gosport Maersk	GW Wostenholme, AH Peermohamid, A Haynes	SJ Eves, AW Smith, NP Gilbert, D Johnstone, J Steen	The Maersk Company Ltd
*Graceous **			Anglo-Eastern Ship Management Ltd
Grafton	PS Ghuman	D Thapa, M Bansal, ZS Irani, E Desai	Zodiac Maritime Management Services
Grand Princess	MJ Moulin, A Proctor	R Surez, M Grossi, G Genovese	Princess Cruises Inc.
Grasmere Maersk	MHF Kenney, GW Wostenholme, A Groom	A Simpson, M North	The Maersk Company Ltd
Grebe Arrow	V Vasiljevic, M Sobol	JRR Pepino, A Perez, D Jasic, B Zezelu	Gearbulk (UK) Ltd
Greenwich Maersk	BE Jakobson, S Grainger, M Kenny	AW Smith, J Hannam, MW Urquhart, C MacSweeney, GA McCarthy, D CDuffy	The Maersk Company Ltd
Harmac Dawn	RP Yadav, -.Bhat	N Hafiz, MCN Fernando	Barber Ship Management AS
*Harmane Spirit **			Teekay Shipping (Canada) Ltd
Hato Arrow	B Saban, B Vuksa, F Ponos	S Stabile, M Matijas, R Perovic, A Abelardo, NJR Macapayag Troy, B Srdan, K Karabatic	Gearbulk (UK) Ltd
Havdrott	R Tanguy, TA Andrews	MA Pagente, A Urbano, N Tumbocon, F Bautista	Bergesen d.y. ASA
Havkong	DJ Elson, CMJ Payton	NJ Blacker, GM Pardilla, NL Hapitan	Bergesen d.y. ASA
*Hebrides **			Caledonian MacBrayne Ltd
Helios	DT Simpson	M Steel, L Echeandia, D Rosaluna	Bergesen d.y.ASA
Hemina	TN Ferguson, G Phillips	WG Uyammi, BS Pagsuguiron	Bergesen d.y. ASA
Ironbridge	R Whistler, D Bowman	JZ Castro, EM Miguel, A Tayo, T Still, J Mealor, P Kenny, J Keeshan, A Valenzuela, J Holamby	Furness Withy (Shipping) Ltd
Isomeria	DH Rayfield	MV Bhagwat, A Rashid, SSS Abidi	Shell Marine Personnel (IOM) Ltd
James Clark Ross	MJS Burgan	JA McCarthy, GP Chapman, R Kilroy, SJ Mee	British Antarctic Survey
Jarikaba	JR Bell	JB Clemente, D Alagon, P Gonera, CK Marquardt	Celtic Marine Ltd
Jervis Bay	CC Woodward, KV Riddick	GE Wade, FH Munro, IS Norris, RGC Noble, PJ Fowler, MC Sutcliffe	P&O Nedlloyd Ltd
Kagoro	J Wrigley, A Macpherson	J Narh-Appiah, R Snerberger, S Dukic, K Torto-Rockson, N Guergio, M Linic	Acomarit (UK) Ltd
Kazimah	SM Omar, GM Abbott	M Mairza, S Al Enezi, M Taieb, KAl Zamel, EP Danico	Kuwait Oil Tanker Company
Kent Voyageur	R Spencer, I Biggs	Z Soja, R de Guzman, A Marte, M Adamiak	Kent Line Ltd
Kintampo	MA Cully, AGJ Macpherson	EP Perlas, JB Parcon	Acomarit (UK) Ltd
Knock Allan	M Holland-Lloyd, G Bielinski	A Bacatan, G Barba, G Gorecki, K Broka, L Centeno	Red Band AS

VESSEL	MASTER(S)	OBSERVING OFFICERS	OWNER/MANAGER
Knock Stocks	J Del Rio, I Ikonomopolous	T Jokiel, C Wilsbeck, J David, A Cervantes	Red Band AS
Licorne Pacifique	JC Gillis	W Kalagayan, B Bagaporo, ELC Suan, AC Beriga, A Woltanski	Sosema S.A.
Linares	SP Harris, M Light	AG Benadera, JL Panghulan, KDAP Sedrick	London Ship Managers Ltd
Linderos	DP Colley	AA Saparamadu, D Mendis, KP Senadipathy, TAI Skouti	London Ship Managers Ltd
Lord Nelson	MK Betty, G Mills, J Etheridge	D Hood, D Neil, CL Cupples, LC Woodall, RWR Lamoureux	Jubilee Sailing Trust Ltd
Lord of the Isles	J Still, K Cameron, M Scott	M MacNeil, T Dunn, G Mills, A Ross	Caledonian MacBrayne Ltd
Lowlands Rose	WS Palomar, EJ Villena	F Cuizon, ND Legaspi, CB Galia, M Gaspar, AC Montehermoso	Euroship Services Ltd
Maersk Baffin	NA Lovesy, J Blake	FP Wright, J Carter, S McKenzie, RJA Brearley, J Mielniczuk	Dorchester Maritime Ltd
Maersk Biscay *			The Maersk Company Ltd
Maersk Dee	BJ Leeding, S Close	IG Ferguson, G Colby, G Barton	The Maersk Company Ltd
Maersk Holyhead *			The Maersk Company Ltd
Maersk Humber	N Vause	BD Nisbet, D Frost, I Roberts, P Wood, B Hughes, D Jones, G Cogg, S Lynas	The Maersk Company Ltd
Maersk Rapier	NA Lovesy	HL Kite, C Gannon, D Jones, DM Macleod, SJ Birt, A Largan	The Maersk Company Ltd
Maersk Rochester *			The Maersk Company Ltd
Maersk Rye *			The Maersk Company Ltd
Maersk Scotland	R Orange, JL McCorquodale	DG Keaney, HR James, FJ Spencer, P Wood, M Mahon	Maersk Company (IOM) Ltd
Maersk Shetland	EI Narraway, PA Carmichael	RS Nair, A Morrison, CJ Deasy, W Wallace, R Macaulay, KM Nair, K Hede, P Heron, RJ Wilson, AD Bailey	The Maersk Company Ltd
Maersk Stafford	DM Tee, RM Banton	FL McMahon, HR James, R Hildebrand, AP Hodgson, P Wood,	The Maersk Company Ltd
Maersk Suffolk	T Sinclair, JW Blake	RC Stacey, DM MacLeod, JL McCorquodale, RS Payne, D Hill, P Harrison, LA Jenkins, EJ Anderson	The Maersk Company Ltd
Maersk Surrey	F Mulrooney, KE Hammerman	S Davey, R Lavoie, KM Nair, J Howard, W Morgan	The Maersk Company Ltd
Maersk Sussex	PA Carmichael, AB Waller	S Fenton, R Kulkarni, IR Gray, S Gillies, S Docherty, P Turnbull, D Rolfe, I Blair, G McFarlane, S Moule	The Maersk Company Ltd
Mairangi Bay	AW Ellis	KE Fuller, SC Lugg, DRN Cropley, JGS Pemberton, T Coelho	P&O Nedlloyd Ltd
Maracas Bay	PI Jameson, A Jehaes	DC Fermin, H Ruzic, A Cacatian, A Azucena, E Baluyot	MOL Tankship Management Ltd
Mark C	JW Jackson	S Chutter, BE Rees, JW Jackson	Carisbrooke Shipping plc
Matco Clyde	SW Turner, P Chambers, K Dye	B McKenna, WB Goswell, C Scothern, R Pressier, R Hood, M Fennell	Mobil North Sea Ltd
Matilde	L Andrews, J Barrett	M Sloan, G Lyall, P Janson, V Goggin	Souter Shipping Ltd
May Oldendorff *			Egon Oldendorff
Meynell *			Zodiac Maritime Management Services
Mineral Century	R Raghavan, G Rajiv	D Kadam, MDA Ali, A Selvan, S Pandey	Anglo-Eastern Ship Management Ltd
Mineral Dragon	AM David, BK Singh, AS Kale	R Atoliya, WS Naik, A Kamran, HM Monir, M Hossain	Anglo-Eastern Ship Management Ltd
Mineral Europe	VR Krishnan	AA Paranjape, M Rohatgi, A Shetty, SS Ranjan, GR Wani	Anglo-Eastern Ship Management Ltd
Naparima	A Jehaes	N/S	MOL Tankship Management Ltd
Nariva	JG Richard, R Robic, S Thompson	R Pacedo, O Dominguez, EFJ Bianes	MOL Tankship Management Ltd
Newport Bay	RB Gurney, LJ Fletcher	SD Westall, CG Puttock, EFS Harrison, A Firman, GSJ Rice, GR Jackson	P&O Nedlloyd Ltd
Norna	MCJ Jewell	MP Donnelly, CS Turner, DG Boynton	Scottish Fisheries Protection Agency
Ocean Princess	C Dital, R Zecchin	P Hutchison, P Maguire, P Ausilpi, C Leccese, T Fleming, S Holland	P&O Cruises (UK) Ltd

OOCL Belgium	DR Llewellyn, D Prichard, S Lloyd	AJ Scarrott, G Hand, NP Goh, B Keegan, P Ivory	OOCL (UK) Ltd
OOCL Canada	S Lloyd, PD Connolly, DJ Prichard	GT Bell, AJ Scarrott, JN Balkwill, J Hann	OOCL (UK) Ltd
Oriana	MS Burgoine, C Cambell, R Smith	PJ Miller, W Sadler, W Passfield	P&O Cruises (UK) Ltd
Oriental Bay	PR Kaye, R Moxon	TE Davidson, GH Argyle, JA Hale, BK Quayson, MS Reynolds, RH Ellison, MP Willis, DJ Vickery, B Griffiths	P&O Nedlloyd Ltd
Ormond	SB Tudor	F Moraes, BS Lasheer, RL Smith, T Rajesh	Zodiac Maritime Management Services
P&O Nedlloyd Drake	DC Thomson, K Worthington	JL Annand, A Graham, AN Murray, CW Longmuir, AW Lewington, AA Ward	P&O Nedlloyd Ltd
P&O Nedlloyd Genoa	AJ Ball	G Collier, DJ Hinson, PJ Fowler, CI Macleod, SK Prime, SL Rayson	P&O Nedlloyd Ltd
P&O Nedlloyd Hudson	PA Furneaux, JGW Dixon	R Halewood, A Mackenzie, RH Ellison, CJ Hughes, MA Samin, H Ajam	P&O Nedlloyd Ltd
P&O Nedlloyd Kobe	JL Peterson, DJ Bailey	OR Ridyard, JA Milner, CJ Hughes, S Fish, JW Beviere, KF Kassim	P&O Nedlloyd Ltd
P&O Nedlloyd Lyttelton	L Colam, TJ Burleton	JC Kagadam, R Cabrero, I Damolo	P&O Nedlloyd Ltd
P&O Nedlloyd Marseille	KD Campbell, DK MacCorquodale	JL Annand, J Cross, RGC Noble, LPV des Landes, GP Smith, AH Abid	P&O Nedlloyd Ltd
P&O Nedlloyd Southampton	RA Kenchington	GE Wade, T Oliver, SW Capes, FN Cambra, TF Bebbington	P&O Nedlloyd Ltd
P&O Nedlloyd Tasman	RJ McLarty, P Manson	SP Sturdy, S Frediani, DR Moody, A Lewington, AS Bell, IJ Hampton	P&O Nedlloyd Ltd
P&O Nedlloyd Texas	LHM Johnson, K Worthington	OR Ridyard, KR Smith, SJ McNeill, C Henderson, GT Hill, AN Murray, GP Smith, MB Doyle, R Hawthorne	P&O Nedlloyd Ltd
Pacific Crane	GP Farrell	BH Birch, B Worthington, NAJ Wilkins, J Anderson, J Rawlinson, R Crawford	James Fisher (Shipping Services) Ltd
Pacific Sandpiper	PA Booker	MD Brown, DP Hadfield, RJ Walby, AJ Howlett, RS Macmeikan	James Fisher (Shipping Services) Ltd
Pacific Swan	BD Miller	PW Brown, T Bannister, BJ Worthington, CP Brockbank	James Fisher (Shipping Services) Ltd
Palliser Bay	DR Lewis, R Turner	SC Lugg, R Burn, J Weber, SP Sturdy, AJ Cox, SW Francis, MP Green	P&O Nedlloyd Ltd
Pegasus Bay	TD Morrison, DAK Bamford	RW Olive, M Thornber	P&O Nedlloyd Ltd
Peninsular Bay	S Millar	JE Nuttall, PE Garner-Richards, MCP Sutcliffe, GT Hill, C Grundy	P&O Nedlloyd Ltd
Petro Fife	A Hodgson, DW Ling	DF Campbell, DJ Buckley, A Khan	International Marine Transportation Co. Ltd
Pharos	W Tulloch, DJ Davidson	A Provan, S Tyler, S Rathbone, I Murray	Northern Lighthouse Board
Pisces Trader	NPS Bharaj, A Nayyar	S Mandrekar, JA Fernandes, K Shetty, F Netticadan, H Shahinshah, A Kumar	Bibby-Harrison Management Services Ltd
Pisces Voyager	I D'Souza, MS Babu	V Bist, B Kumar, JL Verma, G Suma, KPN Nair, NK Francis	Bibby-Harrison Management Services Ltd
Plover Arrow	MD Cummins, K Finckenhagen	EA Maxino, K Bjorgan, A Sta Maria, HVA Tupas, RE Halten, V Cruz, I Kausland	Gearbulk (UK) Ltd
Pride of Bilbao	CE Banks, J Hutchins, RJ Ross	E Tiller, S Telford, T Rynd, C Heil, M Voisey, P Ogg	P&O European Ferries (Portsmouth) Ltd
Pride of Portsmouth	PO Meyerhoff, AF Bonehill, J Williams	AJ Dyer, TJ Vincent, CPJ Robins, P Johnston, DA Hunter, J Stone	P&O European Ferries (Portsmouth) Ltd
Pride of Suffolk	DT Kirkwood, D Strange	AN Coombes, P Flanagan, MEJ Dunbar, AM Smith, RA Hawkes, JA Stone, CG Vernon	Northern Marine Management Ltd
Prince of Waves	PN Joor, AP Agabao	RT Santos, RB Canete, RM Sapido	Seatrade Groningen B.V.
Providence Bay	DL Batchelor, KW Smith	JA Milner, A Graham, MK Hands, I Renders, TJGY Mills, LS Mahdi	P&O Nedlloyd Ltd
Putford Achates	J Yensen	R Roach, R Head, A Hepburn, M Watson	Boston-Putford Offshore Safety Ltd
Pytchley	MJ Walker	L De Jun, D Yi-Wen, F Suizhen, L Dong-bo	Zodiac Maritime Management Services
Queen Elizabeth 2	RW Warwick, PF Wright	RR Clunas, OS Ghoshroy, RBE Firth, RN Hone, C O'Shaughnessy, GE Hunter	Cunard Seabourn Ltd
*Quorn **			Zodiac Maritime Management Services
Regina Oldendorff	R Pritam, S Arun, K Yadav	C Barino, A Miramontes, Palta Turkin, E Rivera, H Aranton	Egon Oldendorff

VESSEL	MASTER(S)	OBSERVING OFFICERS	OWNER/MANAGER
Repulse Bay	KS Hardy	KCS Gregory, N Edhah, JA Weber, L Macleod	P&O Nedlloyd Ltd
Resolution Bay	AM Tweedie	G Mathias, RJC Neale	P&O Nedlloyd Ltd
*Rutland **			Zodiac Maritime Management Services
*Sabina **			Carisbrooke Shipping plc
Safmarine Nomzi	J Smith, T Burke	V Keller, J van Rooyen, G Mackenzie	Safmarine Ship Management
Saga Horizon	T Haxel, IA Coulter	RR Honrubia, ER Mariano, ND Arligue, DS Perlas, SC Abinon	Patt Manfield & Co. Ltd
*Saga Wave **			Denholm Ship Management Ltd
Saga Wind	JW Sutton	CM Medina, GC Somera	Patt Manfield & Co. Ltd
Sagacity	T Sienkiewicz, T Hatalski, -.Tretkiewicz	P Wroblewski, J Bielawski, M Smigielski, A Badziak	F.T. Everard & Sons Ltd
Saloma	KC Nunes	Thet Htun, Than Zaw Tun, N Ananth	Univan Ship Management Ltd
Schiehallion	S Cowie, N White	P Berglund, F McHardy	BP Amoco Shipping Ltd
Scott Guardian	RM Coull, J Cargill	I Sanderson, M Bradley, I Duthie, R Sorensen	BUE North Sea Limited
Scottish Star	JF Dobson, P Buckley	R Husain, F Octa, R Acha, D Caparaz	Norbulk Shipping UK Ltd
Sea Amethyst	W Venning	M Smith, J Roemmele	Stephenson Clarke Shipping Ltd
Seabourn Sun	T Lura, JT Gundersen	IK Olsen, T Verfaille, J Barlow, A Stratford	Cunard Seabourn Ltd
Shenzhen Bay	DW Lax, J Dodworth	KR Smith, OR Ridyard, JA Richardson, MN Messenger, DJ Hinson, J Christensen	P&O Nedlloyd Ltd
Shun Kim	N Passey, JH Bhombal	GV Kumar, M Salahuddin, M Kanatt, SQ Naqvi	Wallem Shipmanagement Ltd
Singapore Bay	J Kennedy, M Watts	SN Foster, G Mathias, M Rossiter, R Burn, A Smith, I Hampton	P&O Nedlloyd Ltd
Snow Crystal	I Minnis	OB Gonzaga, D Ladasic, H Nonesco	Holy House Shipping AB
Snow Drift	B Yelland		Holy House Shipping AB
Snow Flower	M Baker	M Rosas, N Jabay, N Tonog, G Bakovic	Holy House Shipping AB
Snow Land	R Somerville, WG Lockie	F Guillen, R Dajay, M Estrada, G Son, S Faelnar	Holy House Shipping AB
Sociality	I Anderson, M Bailey, S Jenkins	J Funge, GA Odeh, A Jones	F.T. Everard & Sons Ltd
Southampton Star	MJ Richardson	GG Dencio, AS Hermosura, CT Tuquero	World Marine Co. Ltd
Speybank	W Campbell	ED Guy, CR Broome, V Arbatskip, S Khaydukov	Andrew Weir Shipping Ltd
Sponsalis	PTI Pinches, J Koenraad	D Pinteric, D McFarlane, J Currie, E Templado	Shell Marine Personnel (IOM) Ltd
St Clair	S Allen, N Barnes	G Gove, E Mackay, E Smith, R Greig, S Spiers	P&O Scottish Ferries Ltd
St Helena	DNR Roberts, MLM Smith, I Minnis	L Davies, G Grey, PJ Milton, B Bennett, R Young	Curnow Shipping Ltd
St Lucia	J Antonsen, R Hawkins, AB Ward	J Gardon, M Wojciechowski, D Malowski, J Chmielecki	IUM Shipmanagement AS
St Sunniva	W Duncan, D Wheeler	CAN Wedge, MR Pickles, JA Strathearn, G Stage, S Speirs, J MacAuley, M Edwards, A Henderson	P&O Scottish Ferries Ltd
Star Isoldana *			Masterbulk Pte Ltd
Stolt Kittiwake	J Frisby, Q Bretherton	P Yull, A Cardina, IP Orlovs, E Spokononis, K Mjaseth, S Kyrkjedelen, C Sanjen, S Cabrisan	Stolt-Nielsen Rederi AS
Storrington	B Standerline, CDG Grahame, B Tucker	DM Shaw, T Bennett	Stephenson Clarke Shipping Ltd
Sulisker	JP Laycock, DW Temple	MW Fergusson, IA Craig, M Worsnop, BJ MacNeil, PJ Harris, DT Carus	Scottish Fisheries Protection Agency
Summer Flower	WP Masnayon, JC Hare	N/S	Hoegh Fleet Services AS
Summer Wind	GP Dequito	HZ Pasaporte, RD Mercado, RG Mutiangpili	Hoegh Fleet Services AS

Sun Suma	R Lakhotia, RS Gokhale	IDS Duggal, A Zachariah, MN Churai, KK Haridas, L Maben	United Ship Management Ltd
Superiority	EK Andoh-Wilson	J Hughes	F.T. Everard & Sons Ltd
Swan Bay	PL Punay	EN Palmos, CG Cordero, FN Roco, C Pacifico	Swan Shipping A/S
Swan Stream	R Rasquinha	S Dutt, AB Garcia, M Encino, S Sharma	Wallem Shipmanagement Ltd
Taunton	RM Ellsmoor, JW Scarisbrick	DB Irani, R Talli, SS Rodrigues, I D'Silva, DP Bhokta	Zodiac Maritime Management Services
Teignbank	C Baines	A Siyukhov, A Stammers, I Kirichenko, A Tack, R Wade, S Cocks	Andrew Weir Shipping Ltd
Tenacious	JPH Fisher, JC Etheridge	P Compton, S Catterson, S Wesener, R Love, M Drew	Jubilee Sailing Trust Ltd
Tepozteco II	VMG Cruz, MM Martinez	LB Adrian, SG Arturo, PA Leonardo	TMM S.A. de C.V.
Thorkil Maersk	JS Anderson, KC Townley	RD Keown, GW Gibson, D O'Donovan, C MacSweeney, PC Handley, A Murray	The Maersk Company Ltd
Tobias Maersk	C Diaz, C Robinson, I Khan	SJ Eves, S Charley, JJ Barnes, K Goggin, K Treacy, S Craig	The Maersk Company Ltd
Toisa Perseus *			Sealion Shipping Ltd
Toisa Petrel	J Dick, PA Yardley	DJ Oriatto, NE Blythe, A Kaliterna, D Disken	Sealion Shipping Ltd
Torben Maersk	F Revill, EA White, C Dias	SR Craig, KA Walker, WM Jenkins, KF Macdonald, D Stinson	The Maersk Company Ltd
Toucan Arrow *			Gearbulk (UK) Ltd
Trade Cosmos	MC Cameron, AB Uddin	T Xiangfu, H Wei, PS Vedamuttu, ZY Zhou, S Uddin, MA Zhijie	Wah Kwong Shipping Agency Co.Ltd
Trade Maple	R McMilian, RE Fletcher,	Ni Zhang Wei, Jing Shu Ping, Lu Chin Kus	Worlder Shipping Ltd
Trade Selene	N/S	N/S	Wah Tung Shipping Agency Co. Ltd
Transporter *			Graig Ship Management Ltd
Trein Maersk	OH Cook, MI Khan	SM Green, S Charley, SJ Eves, NG Barratt, J Parkin, D Browne	The Maersk Company Ltd
Trojan Star	JM Harneis, P Richards, J Bird	DH Hermogino, FT Octa, CM Almari, FJ Tac-An, DY Caparaz, N Codera	Norbulk Shipping UK Ltd
Tudor Star	A Tibbott, SM Ross, RJW Bentley	VM Ballesteros, E Mariblanca, JS Monton, R Canete	Norbulk Shipping UK Ltd
Tundra Princess	JK Moen, Z Tyszko, P Baranowski	N/S	Swan Reefer ASA
Tycho Brahe	N Stevens, M Rodaway	A Antoy	Hanseatic Shipping Co. Ltd
Ullswater	NRS Bahnan	N Gulati, N Ray, AP Desai, RTS Mattos	Zodiac Maritime Management Services
Vigilant	DL Beveridge, S Horsburgh, DW Temple	A MacCallum, AST Beveridge, P Weylhan, CE Holmes, DG Parke	Scottish Fisheries Protection Agency
Vine	SK Ghosh, V Philip	A Dawar, E Fernandes, S Singh, P Dasgupta	Zodiac Maritime Management Services
Waterford	D Kapoor	CN Dubey, LJA Vaz, M Gopal	Zodiac Maritime Management Services
Western Bridge	SJ Honey	PJ Perera, AG French, P Shanmugarajah, J Mealor	Furness Withy (Shipping) Ltd
Westfield	Z Novak, M Raguz	JP Galam, M McCourt, P Ege, C Gotancco	Gearbulk (UK) Ltd
Whitcrest	B Wilson, J Mooney	DJ Williams, JA Forbes-Simpson, G Sizer	John H. Whitaker (Tankers) Ltd
World Nord	KRA Krishnan	ZX Gen, R Srinivasan, YT Xue	World-Wide Shipping Agency (S) Pte. Ltd
World Place	R Gronholm	M Lubi, A Nobleza, R Moises	Univan Ship Management Ltd
World Spark	A Gairola, AK Sharma	N/S	Eurasia Shipping & Management Co. Ltd
Wren Arrow	V Buskovic, D Perusina	J Te, L Ormilla, M Carreon, V Kegasoina, N Vijallon	Gearbulk (UK) Ltd
Yeoman Bridge	IC Gravatt	JMISK Jayaweera, SB Dasanayake, G Sivanesan	Acomant (UK) Ltd
York	EM Holmyard, FX Pereira	S Mathews, B Augustine, S Gupta, RK Srivastava	Zodiac Maritime Management Services

Auxiliary ships: *Al Fujairah, Alam Baru, Amer Choapa, Arklow Vale, Chin Shan, Cielo di Spagna, Endeavour, Green Ice, Hightide, Jupiter Diamond, Lady Sushil II, Meridian Ace, Mineral Ordaz, Crude Transporter, Nordbeach, Ratna Deep, Safflower, Stena Shipper, Takamine, Uraga, Vectis Isle, Venus Diamond*

UK Selected ships from which logbooks and/or TurboWin data are awaited

This list details those vessels which have not been able to return logbooks or for which it has not been possible for UK Port Met Officers to download TurboWin data during the period. (Ships fitted with TurboWin software are indicated in bold face.)

It is recognised that this may be due to unsympathetic trading patterns, and that many of the following vessels are actively transmitting their observations.Vessels holding completed logbooks (containing more than 30 days' data) are asked to return these as soon as possible using the pre-paid envelope provided.

SHIP	OWNER/MANAGER
Abidjan Star II	Barber Ship Management Inc.
African Ruby	MOL Tankship Management Ltd
Al Awdah	Kuwait Oil Tanker Co. S.A.K.
Al Funtas	Kuwait Oil Tanker Co. S.A.K.
Al Shuhadaa	Kuwait Oil Tanker Co. S.A.K.
Al Tahreer	Kuwait Oil Tanker Co. S.A.K.
Al Wajba	United Arab Shipping Company (S.A.G.)
Alam Selaras	Pacific Ship-Managers Sendirian Berhad
Al-Farahidi	United Arab Shipping Company
Alkman	Wallem Shipmanagement Ltd
APL Agate	Neptune Shipmanagement Services (Pte) Ltd
APL Cyprine	Neptune Shipmanagement Services (Pte) Ltd
APL Orchid	Neptune Shipmanagement Services (Pte) Ltd
APL Pearl	Neptune Shipmanagement Services (Pte) Ltd
Arctic Goose	Holy House Shipping AB
Arctic Swan	Holy House Shipping AB
Atlixco	TMM S.A. de C.V.
Audacity	F.T. Everard & Sons Ltd
Auk Arrow	Gearbulk (UK) Ltd
Aya II	TMM S.A. de C.V.
Baltic Eider	Andrew Weir Shipping Ltd
Belo Oriente	Eurasia Shipping & Management Co. Ltd
British Argosy	BP Amoco Shipping Ltd
British Esk	BP Amoco Shipping Ltd
British Success	BP Amoco Shipping Ltd
C.S .Monarch	Global Marine Ltd
C.S.Sovereign	Global Marine Ltd

SHIP	OWNER/MANAGER
Cable Installer	Global Marine Ltd
Cable Retriever	Global Marine Ltd
Cabo Negro	MOL Tankship Management Ltd
CanMar Fortune	Canada Maritime Services Ltd
CanMar Triumph	Canada Maritime Services Ltd
CanMar Victory	Canada Maritime Services Ltd
Cartagena	Enterprises Shipping & Trading S.A.
Cast Privilege	Canada Maritime Services Ltd
CEC Force	Elite Rederi A/S
Cheshire	Bibby-Harrison Management Services Ltd
Chiquita Italia	Great White Fleet Ltd
Chiquita Jean	Great White Fleet Ltd
Chiquita Joy	Great White Fleet Ltd
Chrismir	Souter Shipping Ltd
CIC Vision	Elite Rederi A/S
Cirolana	CEFAS
City of Sunderland	Denholm Ship Management (UK) Ltd
Copiapo	London Ship Managers Ltd
Cormorant Arrow	Gearbulk (UK) Ltd
Corystes	CEFAS
CSO Marianos	Coflexip Stena Offshore Ltd
Eagle	International Marine Transportation Ltd
Earl of Romney	The Marine Society
Emily C	Carisbrooke Shipping plc
Enchanter	Mammoet Shipping B.V.
Ernst Oldendorff	Egon Oldendorff
Euplecta	Shell Marine Personnel (IOM) Ltd

European Leader	P&O Ship Management (Irish Sea) Ltd
European Navigator	P&O Ship Management (Irish Sea) Ltd
European Pioneer	P&O Ship Management (Irish Sea) Ltd
European Shearwater	James Fisher (Shipping Services) Ltd
Eye of the Wind	Crediton Country Courier
Falcon Arrow	Gearbulk (UK) Ltd
Fantasy	Dynacom Tankers Management Ltd
Federal Bergen	Anglo-Eastern Ship Management Ltd
Federal St Laurent	Anglo-Eastern Ship Management Ltd
Fernie	Zodiac Maritime Management Services
Flinders	ASP Ship Management
Frederike Oldendorff	Aboitiz Jebsens Shipmanagement
French Bay	Unique Shipping (HK) Ltd
Front Rider	Acomarit Oriental Shipmanagement Pte. Ltd
Front Sunda	Wallem Shipmanagement Ltd
General Villa	Aboitiz Jebsens Shipmanagement
Glen Maye	MOL Tankship Management Ltd
Glen Roy	MOL Tankship Management Ltd
Golden Duke	Jardine Ship Management Ltd
Gull Arrow	Gearbulk (UK) Ltd
Hadiyah	Kuwait Oil Tanker Co. S.A.K.
Havjarl	Bergesen d.y. ASA
Hebridean Isles	Caledonian MacBrayne Ltd
Hekabe	Bergesen d.y. ASA
Hesiod	Bergesen d.y. ASA
Heythrop	Zodiac Maritime Management Services
Hoegh Duke	Egon Oldendorff
Hoi Siong No.1	IKS Fishing Co. Ltd
HSH Kusu	OW Ship Management Pte. Ltd
Ibis Arrow	Gearbulk (UK) Ltd
Ibn Abdoun	United Arab Shipping Company (S.A.G.)
Iolair	R&B Falcon Ltd
Isle of Arran	Caledonian MacBrayne Ltd
Isle of Lewis	Caledonian MacBrayne Ltd
Isle of Mull	Caledonian MacBrayne Ltd
Ivory Dawn	Cool Carriers AB
Jeannie	Tomazos Shipping Co. Ltd
Judith Borchard	Charles M. Willie & Co. (Shipping) Ltd
Kalahari	The South African Marine Corporation Ltd
Karoo	The South African Marine Corporation Ltd
Kedah	Kapal Management (Pte) Ltd
Kiwi Arrow	Gearbulk (UK) Ltd
Kota Sahabat	OW Ship Management Pte. Ltd
Lady Barbara	Anglo-Eastern Ship Management Ltd
Lapponian Reefer	Holy House Shipping AB
Leopardi	Barber Ship Management Inc
Lincolnshire	Bibby-Harrison Management Services Ltd
Lough Foyle	G. Heyn & Sons Ltd
Macoma	Shell Marine Personnel (IOM) Ltd
Maersk Gannet	Maersk Company (I.O.M.) Ltd
Maersk Mariner	The Maersk Company Ltd
Maersk Somerset	The Maersk Company Ltd
Magnolia	International Marine Transportation Ltd
Matco Thames	International Marine Transportation Ltd
Mauranger	MOL Tankship Management Ltd
Mineral Colombia	Anglo-Eastern Ship Management Ltd
MSC London	Worlder Shipping Ltd
Murex	Shell Marine Personnel (IOM) Ltd
Myrina	Shell Marine Personnel (IOM) Ltd
Nandu Arrow	Gearbulk (UK) Ltd
Newton	Royal Maritime Auxiliary Service
Nivaga II	Govt of Tuvalu (Ministry of Home Affairs)
Nord Sea	Wallem Shipmanagement Ltd
Nordstrand	Carisbrooke Shipping plc
Norrisia	Shell Marine Personnel (IOM) Ltd
Norsea	P&O North Sea Ferries Ltd
North Pacific	Wallem Shipmanagement Ltd
Northern Horizon	Marr Vessel Management Ltd
Northern Prince	Marr Vessel Management Ltd
Ocean Goose	Yacht "Ocean Goose"
Ocean Spirit of Moray	Gordonstoun School
Ogooue	Jolane S.A.
OOCL Britain	OOCL (UK) Ltd
Oriental Venture	MOL Tankship Management Ltd
Orion Reefer	Wallem Shipmanagement Ltd
Pacheco	Andrew Weir Shipping Ltd

SHIP	OWNER/MANAGER
Pacific Emerald	Botany Bay Management Services Pty. Ltd
Pacific Guardian	Global Marine Ltd
Pacific Pintail	James Fisher (Shipping Services) Ltd
Pacific Princess	P&O Cruises (UK) Ltd
Pacific Teal	James Fisher (Shipping Services) Ltd
Pacific Venture	MOL Tankship Management Ltd
Pacific Wave	MOL Tankship Management Ltd
Pantokrator	Athenian Management S.A.
Pelican Arrow	Gearbulk (UK) Ltd
Pioneer Leader	Wallem Shipmanagement Ltd
Pisces Trader	Bibby-Harrison Management Services Ltd
Pride of Bristol	The Pride of Bristol Trust
Pride of Cherbourg	P&O European Ferries (Portsmouth) Ltd
Pride of Hampshire	P&O European Ferries (Portsmouth) Ltd
Pride of Le Havre	P&O European Ferries (Portsmouth) Ltd
Primo	Barber Ship Management Inc.
Princess Katherine	Ravenscroft Shipping Inc.
Princess Nadia	Ravenscroft Shipping Inc.
Puerto Cortes	Sea Containers Services Ltd
Queensland Star	P&O Nedlloyd Ltd
Raven Arrow	Gearbulk (UK) Ltd
Regent Rose	United Sea Service S.A. de C.V.
Rhone	United Ship Management Ltd
Rixta Oldendorff	Egon Oldendorff
Rocknes	Wilson Ship Management (Bergen) AS
Royal Princess	P&O Cruises (UK) Ltd
Safmarine Infanta	Target Marine S.A.
Safmarine Nolizwe	Safmarine Ship Management
Saga Rose	Saga Shipping Co. Ltd
Saldanha	The South African Marine Corporation Ltd
Scillonian III	Isles of Scilly Steamship Co. Ltd
Scotia	Marr Vessel Management Ltd
Sea Princess	Princess Cruises Inc.
Seniority	F.T. Everard & Sons Ltd
Severn Fisher	James Fisher (Shipping Services) Ltd
Shetland Service	BUE North Sea Limited
Sir Eric Sharp	Global Marine Ltd
Siskin Arrow	Gearbulk (UK) Ltd
Solitaire	Allseas Engineering
Spar Topaz	Spar Shipping AS
Speciality	F.T. Everard & Sons Ltd
Stavros S Niarchos	STA Tall Ships
Summer Meadow	Hoegh Fleet Services AS
Swan Arrow	Gearbulk (UK) Ltd
Swan River	Wallem Shipmanagement Ltd
Talca	London Ship Managers Ltd
Tema	Target Marine S.A.
Teno	London Ship Managers Ltd
Toisa Cougar	Sealion Shipping Ltd
Toisa Sentinel	Sealion Shipping Ltd
Trade Apollo	Worlder Shipping Ltd
Tsuru Arrow	Gearbulk (UK) Ltd
Victoria	P&O Cruises (UK) Ltd
Voc Frontier	Dockendale Shipping Company Ltd
Westra	Scottish Fisheries Protection Agency
William Oldendorff	Aboitiz Jebsens Shipmanagement
Zetland	Zodiac Maritime Management Services
Zuljalal	United Ship Management Ltd

UK ships recruited to report in the MARID code

This list details the ships from which the only instrumental observations received are reports of sea temperature.

SHIP	OWNER/MANAGER
Activity	F.T. Everard & Sons Ltd
Allurity	F.T. Everard & Sons Ltd
Aptity	F.T. Everard & Sons Ltd
Arduity	F.T. Everard & Sons Ltd
Anchorman	James Fisher (Shipping Services) Ltd
Arco Avon	Hanson Aggregates Marine Ltd
Arco Dart	Hanson Aggregates Marine Ltd
Arco Dee	Hanson Aggregates Marine Ltd
Blackfriars	Crescent Marine Services Ltd
Celtic Terrier	Campbell Maritime Ltd
Chartsman	James Fisher (Shipping Services) Ltd
City of Cardiff	United Marine Dredging Ltd
City of Chichester	United Marine Dredging Ltd
Clonlee	Dundalk Shipowners Ltd
European Highlander	P&O EF/IS Ltd
Hera	Skibsaksjeselskapet Solvang AS
Hernes	Oesterreichischer Lloyd Ship Mgmt (Cyprus) Ltd
Lord Rank	Ocean Youth Trust Northern Ireland
Lough Fisher	James Fisher (Shipping Services) Ltd
Marine Explorer	Eidesvik Shipping Ltd
Mersey Fisher	James Fisher (Shipping Services) Ltd
River Lune	Merchant Ferries Ltd
Royalist	Sea Cadet Offshore Office
Saga Moon	Merchant Ferries Ltd
Stena Caledonia	Stena Line (Stranraer) Ltd
Stena Galloway	Stena Line (Stranraer) Ltd
Stolt Avocet	Stolt-Nielsen UK Ltd
Tees Fisher	James Fisher (Shipping Services) Ltd
UKD Bluefin	UK Dredging
Union Arbo	Union Transport Group plc
Vanessa C	Carisbrooke Shipping plc
Waverley	Waverly Excursions Ltd
Wear Fisher	James Fisher (Shipping Services) Ltd
Welsh Piper	RMC Aggregates (South Wales) Ltd
Whitcrest	John H. Whitaker (Tankers) Ltd

UK fixed or mobile offshore installations

These units operate in North Sea sites and other areas of exploration in UK waters. Those shown in bold face are also fitted with TurboWin software.

UNIT	OPERATOR
AH001	Amerada Hess Ltd
Berge Hugin	Pierce Production Company Ltd
Beryl A	Mobil North Sea Ltd
Beryl B	Mobil North Sea Ltd
Buchan A	Talisman Energy (UK) Ltd
Captain WPP A	Texaco North Sea UK Co. Ltd
Drill Star	Transocean Sedco-Forex Ltd
Glomar Adriatic XI	Global Marine Drilling Co. Ltd

UK fixed or mobile offshore installations (continued)

UNIT	OPERATOR
Glomar Arctic III	Global Marine Drilling Co. Ltd
Glomar Arctic IV	Global Marine Drilling Co. Ltd
Gryphon A	Kerr-Magee Oil (UK) plc
Hewlett Arpet A	Phillips Petroleum Co. UK Ltd
Jack Bates	Transocean Sedco-Forex Ltd
Janice A	Kerr-Magee Oil (UK) plc
Maersk Endurer	Maersk Contractors
Morecambe Bay AP1	British Gas Hyrdocarbon Resource Ltd
Noble Ton van Langeveld	Noble Drilling (UK) Ltd
North Alwyn "A"	TotalFinaElf
Northern Producer	PGS Atlantic Power Ltd
Ocean Guardian	Diamond Offshore Drilling (UK) Ltd
Paul B. Loyd Jr	Transocean Sedco-Forex Ltd
Ravenspurn North	BP Amoco Ltd
Santa Fe Britannia	Santa Fe Drilling Co. Ltd
Santa Fe Galaxy 1	Santa Fe Drilling Co. Ltd
Santa Fe Galaxy III	Santa Fe Drilling Co. Ltd
Santa Fe Magellan	Santa Fe Drilling Co. Ltd
Santa Fe Monarch	Santa Fe Drilling Co. Ltd
Santa Fe Monitor	Santa Fe Drilling Co. Ltd
Santa Fe Rig 135	Santa Fe Drilling Co. Ltd
Santa Fe Rig 140	Santa Fe Drilling Co. Ltd
Sedco 706	Transocean Sedco-Forex Ltd
Sedco 711	Transocean Sedco-Forex Ltd
Sedco 712	Transocean Sedco-Forex Ltd
Sedco 714	Transocean Sedco-Forex Ltd
Sovereign Explorer	Transocean Sedco-Forex Ltd
Tartan A	Talisman Energy (UK) Ltd
Tiffany	Agip (UK) Ltd
Transocean John Shaw	Transocean Sedco-Forex Ltd
Viking B	Conoco (UK) Ltd

Listings for overseas observing fleets

(The Met Office holds no responsibility for any of the following information.)

INDIA (Information dated 1 March 2001)

Selected Ships:

Akbar
Arunachal Pradesh
BR Ambedkar
Bharatendu
Bhavabhuti
Harshavardhan
Kanpur
Lokmanya Tilak
Major Dhansingh Thapa PVC
Patliputra
Sabarimala
Sagar Kanya
Sagar Sampada
Samudra Manthan
State of Andhra Pradesh
State of Nagaland
Tirumalai

Supplementary Ships:

Abul Kalam Azad
A B Tarapore PVC
APJ Anand
APJ Angad
APJ Anjali
APJ Shalin
APJ Sushma
Aditya Vijay
Aditya Vikram
Alaknanda
Ankaleshwar
Annapurna
Arcadia Progress
Aurobindo
Bankim Chandra Chatterjee
Bharat Seema
Bharati Darsan
CHM Piru Singh PVC
C.V. Raman
Chandidas
Chennai Polivu
Chennai Veeram
Chennai Velarchi
Chettinad Glory
Chettinad Princess
Chhatrapati Shivaji
Dakshineshwar
Dweep Setu
Fonj Shekhon PVC
Gandhar
Ganga Sagar
Gem of Madras
Gem of Tuticorin
Goa
Guru Bachan Singh Salaria PVC
Guru Gobind Singh
Hardwar
Havildar Abdul Hamid PVC
Homi Bhabha
Indian Goodwill
Indira Gandhi
Jag Palak
Jag Pari
Jag Pradip
Jag Pragati
Jag Praja
Jag Prakash
Jag Prayog
Jag Preeti
Jag Rashmi
Jag Ratna
Jag Vikram
Jagat Samrat
Jagat Vijeta
Jala Doot
Jawaharlal Nehru
Jhulelal
Kabirdas
Kanchan Junga
Lal Bahadur Shastri
Lance Naik Albert Ekka PVC
Lt Arun Khetrapal PVC
Lok Kirti
Lok Kranti
Lok Maheshwari
Lok Pragati
Lok Prakash
Lok Pratap
Lok Pratima
Lok Prem
Lok Rajeshwari
Maharaja Agrasen
Maharashtra
Maharshi Dayanand
Maharshi Karve
Major Hoshiar Singh PVC
Major Shaitan Singh PVC
Major Somnath Sharma PVC
Mizoram
Motilal Nehru
Murshidabad
Mandakini
Naik Jadunath Singh PVC
Nancowry
Nand Hari
Nand Kishore
Nand Rati
Nand Smiti
Nand Srishti
Nanga Parbat
Netaji Subash Bose
Nirmal Bhushan
Nicobar
Prabhu Das
Prabhu Daya
Prabhu Puni
Prabhu Satram
Rabindranath Tagore
Raja Mahendra
Rajiv Gandhi
Rama Raghoba Rane PVC
Ramdas
Ravidas
Sagar Deep
Sagar Samrat
Sampurna Swarajya
Sanmar Pioneer
Satya Murti
Skandy Surveyor
State of Haryana
State of Manipur
State of Orissa
State of Tripura
Subhedar Jogindar Singh PVC
Suvarna Swarajya
Swaraj Dweep
Tamil Kamaraj
Tamilnadu
Tulsidas
Uttar Kashi
Varanasi
Viswa Doot
Vishva Karma
Vishva Kaumudi
Vishva Nandini
Vishva Pankaj
Vishva Parag
Vishva Parimal
Vivekananda
Yerawa

Auxiliary Ships: *Alexander, Asean GLory, Bharat, Charisma-N, Giorges, Hafez, Indian Courier, Jag Darshan, Jag Rekha, Jagat Mohini, Jagat Padmini, Janusha, Kalyani-V, Lacadive, Leelavati, Matsya Harini, Matsya Jeevan, Meena Udyog, Nitya Nayak, Pratibha Krishna, Ratnamanorama, Red Snapper, Rukamavati, Sagar Geeta, Sagar Rani, Samudra Rekha, Skipper II, Skipper III, Starlight Splendour, Varuna Yamini, Vishva Anand.*

NEW ZEALAND (Information dated 1 February 2001)

Selected Ships:
America Star
Boral Gas
Capitaine Kermadec
Capitaine Wallis
Columbus Queensland
Forum Samoa
Golden Bay
Kakariki
Kiwi Breeze
Maasmond
Melbourne Star
Nele Maersk
New Zealand Pacific
Ngamaru III
Nicolai Maersk
Nicoline Maersk
Nora Maersk
Pacific Chieftain
Pacific Gas
Pacific Onyx
PON Tauranga
Rotoiti
Rotorua
Sea Tow 22
Sea Tow 25
Soren Larsen
Spirit of Competition
Sydney Express
Sydney Star
Taiko
Tangaroa
Tasman Adventurer
Tasman Challenger
Tasman Crusader
Tasman Explorer
Wellington Express

Supplementary Ships:
Arahanga
Arahura
Aratere
Straitsman
Suilven

Auxiliary Ships:
Canterbury HMNZS
Charles Upham
Endeavour HMNZS
Manawanui HMNZS
Resolution HMNZS
Spirit of New Zealand
Takapu HMNZS
Tarapunga HMNZS
Te Kaha HMNZS
Tui HMNZS
Waikato HMNZS
Wellington HMNZS

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