

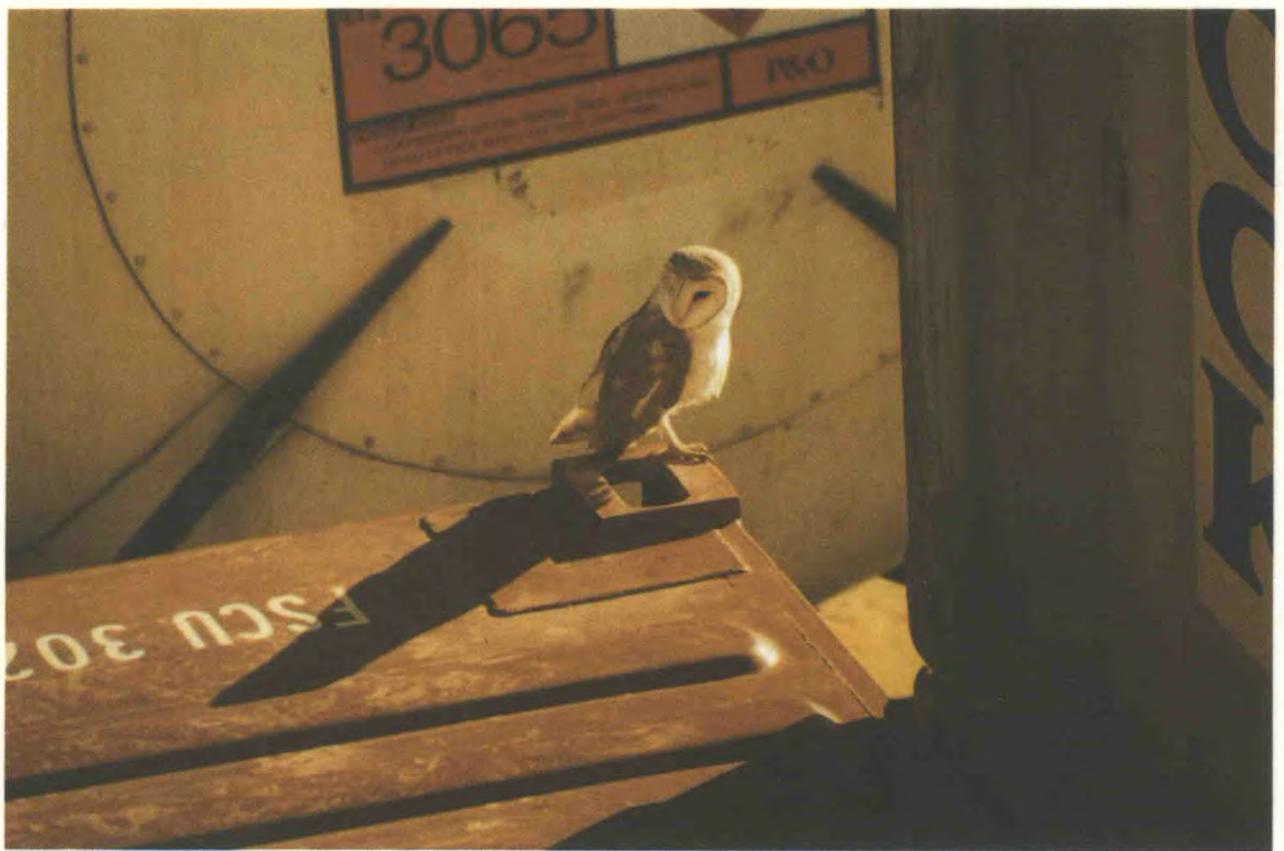
Met.O. 1025



The Met.Office

The Marine Observer

*A quarterly journal of Maritime
Meteorology*



Volume 68 No. 341
July 1998

Met. O. 1025

THE MARINE OBSERVER

A QUARTERLY JOURNAL OF MARITIME
METEOROLOGY PREPARED BY THE
OBSERVATIONS VOLUNTARY (MARINE)
BRANCH OF THE MET. OFFICE

VOL. 68

No. 341

JULY 1998

CONTENTS

	<i>Page</i>
Editorial	94
The Marine Observers' Log — July, August, September	96
The EUMETSAT Polar System. BY T. MOHR	111
Scene at Sea	118
Cook and the weather. BY E. BRENSTRUM	120
Commission for Marine Meteorology — Twelfth Session	125
Halo phenomena	127
Electrifying experiences at sea	130
Aurora Notes July to September 1997. BY R.J. LIVESEY	132
Letters to the Editor	135
Book Review	137
Personalities	138
Notices to Marine Observers	139
Fleet Lists	141

COVER PHOTOGRAPH: Barn Owl photographed on board the *Mairangi Bay* on 10 September 1997 whilst the vessel was alongside at Adelaide (see page 104). The photograph was taken by Mr S. Fish, First Officer.

Views expressed in this journal are those of authors and not necessarily those of the Editor or of The Met. Office. Copyright remains with the originator. Photographers should ensure that their work is clearly identifiable.

All correspondence regarding the journal should be addressed to: The Editor *The Marine Observer*
The Met. Office OV(M) Scott Building Eastern Road Bracknell Berkshire RG12 2PW.

LONDON: THE STATIONERY OFFICE

Editorial

With El Niño very prominent in 1997/98, the UK awaits the effects on its summer weather and, as this edition goes to press, some folk may perhaps be longing for the wet days of January, or even the warmth and sunshine of February! Such are the vagaries of the weather when El Niño, possibly enhanced by global warming, strikes, that world-wide anomalous conditions become less of a surprise — but it would still be handy to know at the time of writing whether our water-butts will be empty or overflowing this summer.

For those at sea, many of whom are almost permanently on the move, it may well be harder to appreciate whether or not conditions being experienced at any one time are anomalous. Sometimes it is not until the local knowledge of contacts in ports is called upon that the possible significance of a weather event becomes known. One phenomenon that will always remain significant, wherever it occurs, is the tropical cyclone. The July–September period often sees the most active part of the North Atlantic hurricane season with August and September often being the most productive in terms of the generation of new storms. This year El Niño has had devastating side-effects world wide, apparently, from mud slides and floods, to droughts and forest fires (although the latter may have been aided and abetted by human actions) and it remains to be seen what, if any, effects it has on this year's tropical cyclone season. Whatever the outcome, we trust that ships will be nowhere near the storms, that those ships benefitting from a ship routing service get all the necessary advice and that any ships' reports of tropical cyclones published in the next edition of this journal will be along the lines of 'storm avoidance measures' rather than of a direct encounter.

As a growing number of shipborne observers are discovering, there is a new hi-tech replacement for the Meteorological Observing System for Ships (MOSS, which will be obsolete by 2000). Known by its software name, TURBOWIN, it is a user-friendly (the programmers and designers would say that, of course) lap-top computer system which executes two hundred quality control checks on the data entered and then stores that accurate and fully coded observation for automatic transmission via Inmarsat-C. If the situation ever arose where the entire observing fleet was so equipped with this system or its successors, the need for meteorological logbooks would surely be questioned. Then, for the Editor of this journal, the spectre of the Additional Remarks pages also disappearing over the horizon would certainly loom large. However, by that time, should such a scenario even occur, there would no doubt be a hi-tech solution to the problem and observers' extra meteorological sightings and other reports would continue to reach us. In the meantime keep those observations coming because they are the stuff of which this journal is made, and we are always delighted to receive your reports whether through logbooks or by individual correspondence.

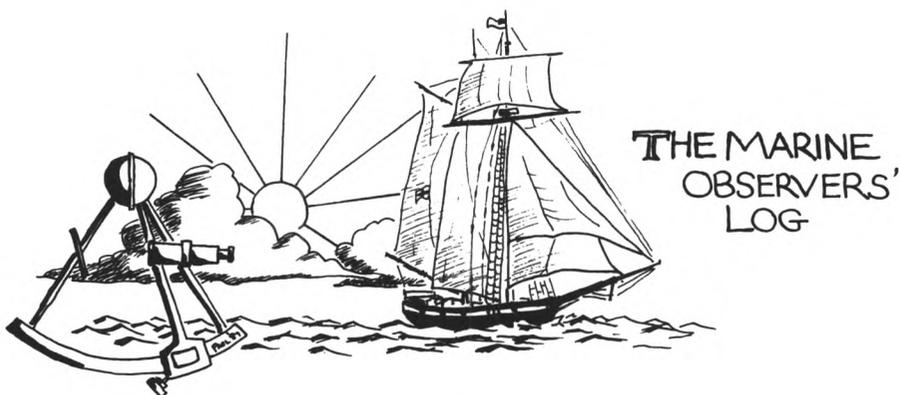
Regarding Additional Remarks, the incidents of aurora sightings by shipboard observers are greatly decreased. Three obvious thoughts come to mind: firstly, can the dearth of sightings be attributed to low levels of auroral activity in favourable viewing latitudes combined with few observing ships in those areas? Second, are opportunities to watch and record events restricted owing to navigation or other commitments? Thirdly, given that there has been little to get excited about for so long, is the aurora suffering from the 'out of sight, out of mind' situation? The British Astronomical Association has plentiful land-based aurora spotters who have seen much of what has been visible during the past year but will need

seafarers' observations to complete the picture of auroral events yet to occur, and we are assured that solar activity (the source of the aurora) is now increasing all the time. Indeed we publish in this edition the first sightings (known to us) of sunspots by a UK VOF ship since 1992, and also an account of an auroral display seen only by observers on a VOF ship.

Presumably there can be no connection, but there seems to be an increase in the frequency of the occurrence of halo phenomena, according to reports received in the Additional Remarks pages of meteorological logbooks. Again, questions arise — is it that there are greater amounts and/or an increased frequency of cirrus and cirrostratus cloud in which ice-based optical phenomena can form, or are there more opportunities by day for observers to note what is happening in the sky? Of course it could be surmised that conditions for solar halo watching are simply more congenial. After all, even we land-locked office types would concede that standing on the bridge wing to watch the sky on a sunny, and quite possibly warm, calm day has just a little more going for it than wrapping up before finding a suitable spot in which to shelter from cutting winds on a cold night in order to wait for an aurora that might not happen!

So many questions and yet so few answers! Perhaps one question that can be answered with confidence is: Who has qualified for an Excellent Award nomination for voluntary weather observing undertaken in 1997?

The final lists are now being drawn up, and one forecast that is 100 per cent certain is that the letters of notification will be going out on 3 August, so those who have been nominated will be hearing from us in the near future. In the meantime, we would urge Masters and Observing Officers to check the lists on page 139 of this edition because we still need to hear from those named in connection with the awards for 1996.



July, August, September

The Marine Observers' Log is a quarterly selection of observations of interest and value compiled from the meteorological logbooks of marine observers and from individual reports. Responsibility for each observation rests with the contributor. All temperatures are Celsius unless otherwise stated. The standard international unit for barometric pressure is the hectopascal (hPa) which is numerically equivalent to the millibar (mb).

HURRICANE 'NORA' North Pacific Ocean

m.v. *B.T. Nestor*. Captain C.J. Bland. Esmeraldas to Long Beach. Observers: the Master, Mr X.T. Colaco, 2nd Officer and ship's company.

17–22 September 1997. First indications of the development of hurricane Nora were shown by facsimile reports received on the 17th at 1900 UTC. The storm was in position 14° N, 103° W, it was stationary with wind speeds of between 45 knots and 55 knots, and had a central pressure of 1000 mb.

On the 20th conditions at the ship deteriorated with the wind blowing SE'y, force 6 while the pressure began to fall. Nora was predicted to move west-north-west at 4 knots with a central pressure of 987 mb and wind speeds of between 65 knots and 80 knots. The wind increased progressively and a predominant south-easterly swell was evident. As the vessel steered a course of 306° its closest approach to Nora was 130 n mile on the 21st. The vessel rolled to 20° and pitched to very rough and very heavy swells which had breaking crests; the wind force increased to force 8 while the sea height reached 5 m. The pressure at this time was 1002 mb.

On 22 September, Nora was in position 18.4° N, 111.1° W, with the vessel being about 170 n mile off. The sea conditions were still bad but the rolling and pitching were much reduced, and the wind changed to E×N'y, force 7. The pressure then began to rise progressively as Nora made steady progress towards the west-north-west as the vessel steamed on a course of 325°.

Position of ship on the 22nd: approximately 20° 00' N, 113° 00' W.

Editor's note. The same vessel, then under the command of Captain G. Sutherland, had previously experienced a close encounter with tropical cyclone 'Ana' on 2 July when in approximate position 32° 40' N, 70° 20' W at about 1900 UTC. The maximum wind speed was about 42 knots although the direction changed from S'ly to SSW'ly to N'ly and then to NE'ly and E'ly over about 10 hours; the vessel was assumed to have passed very close to the eye of the storm. The sky was mostly overcast and the visibility was reduced by haze and drizzle but near to the eye, the sky became clear with the winds calming down, and after the vessel's passage of the eye, the sky was again densely overcast and the wind increased to about 40 knots once more. Ana had a minimum central pressure of 1001 mb and was moving north-east at 7–9 knots while the vessel's course was 341°.

TROPICAL DEPRESSION

Caribbean Sea

m.v. *Mineral Prosperity*. Captain B. Gupta. Puerto Bolivar to Redcar. Observers: Mr S. Sablok, 3rd Officer and Mr A.M. Jiwaji, SH.

20–21 July 1997. At 1225 UTC on the 20th, on arriving for his Watch, the Third Officer noted rough weather conditions and, on looking through weather facsimile and EGC reports, came to learn of the existence of tropical depression No. 5 which was 100 n mile off on the starboard bow. Although a close watch on conditions was being maintained, at around 0100 on the 21st a sudden gust of wind was experienced at the vessel as the wind speed reached force 9 or 10. On calling the Master and checking the barometer, which showed a decrease in pressure of about 5 mb, it was concluded that the tropical depression was now at its closest point of approach with the vessel. The wind then suddenly veered considerably, by approximately 200°, from 2 points on the starboard bow to the port quarter, for a period of about 25 minutes before coming back to settle at a little before the starboard beam.

During this period the wind speed did not alter nor was there any change in the air temperature or sea temperature but the pressure continued to fall; 'white horses' were prominent and continuous spray was being experienced on the glass panes of the wheelhouse. The vessel experienced a few heavy rolls as the wind kept on veering, although at this stage the sea waves were confused while the swell remained unchanged. At about 0210 the weather conditions seemed to abate and by the morning the wind was force 4 or 5 and later died down.

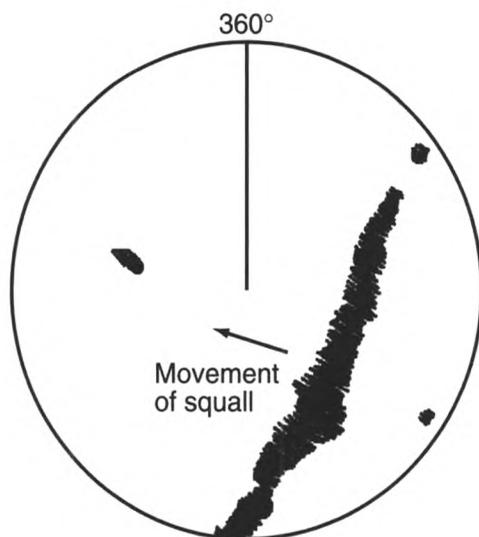
Position of ship at 1225 UTC on the 20th: 13° 31' N, 70° 21' W.

LINE SQUALL

North Atlantic Ocean

m.v. *Lima*. Captain D. Freeman. Fujairah to Rotterdam. Observers: the Master and ship's company.

30 August 1997. At 0700 UTC a line squall was observed on the 3-cm radar screen, lying from north to south and moving in a westerly direction, as shown in the sketch. There was drizzle at the ship, and lightning was visible but no thunder was heard. At a distance of four miles from the squall, light rain began at the ship and then turned to torrential rain as the visibility was reduced to 100 m as the squall approached and the wind increased.



12-n mile range

At 0720 the pressure rose 3.9 mb in five minutes as the line squall passed over the vessel. At 0735 the pressure was 1014.8 mb and steady while the wind eased to force 5; at 0800 the rain was decreasing to slight drizzle and the sky brightened.

Weather conditions at 0600 were: air temperature 27.4°, wet bulb 25.6°, pressure 1009.6 mb, wind NW'ly, force 3.

Position of ship: 11° 42.3' N, 18° 37.4' W.

CETACEA

South Atlantic Ocean

m.v. *London Glory*. Captain J.W.W. Peters. Djeno to Freeport. Observer: Mr R.S. Payne, Chief Officer.

11 September 1997. At 1300 UTC a school of approximately 50 dolphins was sighted to port, passing about one-quarter of a mile away while the ship was on a heading of 276° at 15 knots. All were moving fast, jumping clear of the water as they proceeded eastwards while the occasional individual (usually a juvenile) would leap and then spin in the air.

The dolphins were 2.5–3.0 m long, with the juveniles being as little as half that length, and their overall colour was grey, dark on top with paler sides and flanks giving a patterned effect similar to that of the Common Dolphin although not as dramatic. The belly appeared white and the dolphins had beaks and a broad dorsal fin which was only slightly recurved (falcate).

Reference to *The Sierra Club Handbook of Whales and Dolphins* concentrated on the Spotted Dolphin, a school of similar size of which was seen two days earlier, until frustration caused a few more pages to be flicked over to reveal spinner dolphins of which the Short-snouted Spinner (*Stenella clymene*) was the most like those seen, complete with 'mask' effect.

At the time of observation the wind was SE'ly, force 2–3 and there was a slight sea with low swell.

Position of ship: 02° 28' S, 10° 14' W.

South China Sea

m.v. *Jervis Bay*. Captain C.C. Woodward. Singapore to Shekou. Observers: the Master, Mr W.J. Stoker, 1st Officer, Miss L.M. Butler, 3rd Officer, Mr Z. Berry, Cadet and Mr D. McCubbin, SMS.

21 July 1997. At 0230 UTC as the vessel approached the Shekou pilot station in Urmston Road, north-west of Hong Kong, the Cadet spotted a large 'fish' close to the ship's side; the animal resurfaced and it was identified as a medium-sized pale-coloured dolphin. It reappeared again about 40 seconds later, a little further from the vessel, this time lifting more of its body above the water's surface. The dolphin was an almost iridescent white colour all over its body, the colour being so bright that it had an almost lilac 'glow' to it. As it began to surface it lifted its head out of the water, breaking the surface at an angle of about 40°, and showed a long slender beak, and it almost appeared to look over its shoulder at the vessel before diving not to reappear again. No other markings were visible and the observers were unable to clearly see the dorsal fin or flukes.

The dolphin was identified using Eyewitness Handbooks *Whales, Dolphins and Porpoises* as an Indo-Pacific Humpback Dolphin, which is found in shallow waters of this area. The animal was some 3 n mile distant from the open sea and was in water of depth 16–20 m. It seemed surprising to see a dolphin like this in such a congested and busy waterway, especially as it was only a few miles to the north of the new Hong Kong airport building site where large areas are being reclaimed. Shortly afterwards another pair were observed further away from the vessel, so it was thought that three individuals may have been seen.

Following the sighting, further snippets of information were found in a special handover [of Hong Kong to China] edition of *Time* magazine, which stated that the dolphins' natural habitat is the waters to the north of Lantau Island where the Chek Lap Kok Airport has been constructed, and that the area has been designated a dolphin sanctuary for the 80 remaining dolphins although they will have as many as 38 flights an hour roaring overhead. The observers considered themselves lucky to have seen the dolphins.

Position of ship: 22° 23' N, 113° 54' E.

Editor's note. Another report of Indo-Pacific Humpback Dolphins has been received from the *Colombo Bay*. Whilst the vessel was in the floating dry dock *United*, at Yam O, Hong Kong on 7 September 1997, Mr J. Foley (Principal Officer Navigating) first spotted a single white dolphin. Mr Foley and Third Officer J.C. Geddes later discovered that the dolphins usually came to the dry dock in the afternoon. Throughout the dry-dock period, seven more dolphins were seen feeding nearby, and another single one was seen as the vessel departed the dry dock.

TURTLES

North Atlantic Ocean

m.v. *Maersk Surrey*. Captain I. Goveas. Mississippi, SW Pass to Gibraltar. Observers: Mr C.J. Deasy, 2nd Officer and Mr A. Cross, 3rd Officer.

15 August 1997. At 1815 UTC, whilst having an after-watch 'lemonade' on the monkey island, the observers spotted a large turtle as it was passed on the ship's port side, remaining on the surface at a distance of about 10 m. The turtle's body

was dark-green in colour whilst its head and limbs were a lighter shade of green or greenish-brown. There were three ridges on the shell running from head to tail; the largest was in the middle with the smaller ones on either side of it. No other markings were noted on the shell as only a brief observation could be made as the vessel passed by. The turtle was thought to be at least 1.5 m long and 0.7 m in breadth.

As the vessel passed, the turtle raised its head and looked towards it showing a large oval-shaped head with a blunt snout.

The turtle was assumed to be a Ridgeback because of the protrusions on the shell; however, no-one on board was familiar with the description or knew whether Ridgebacks inhabit these regions of the sea.

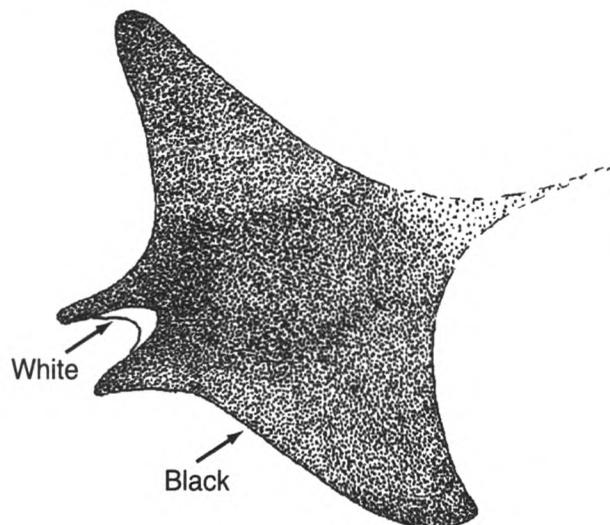
Position of ship: 32° 00' N, 35° 00' W.

FISH

North Atlantic Ocean

R.M.S. *St Helena*. Captain D.N. Robert. Tenerife to Ascension Island. Observer: Mr N. Mogg, 2nd Officer.

13 August 1997. At 1215 UTC when approximately 63 n mile off Punta Durnford on the Saharan coast of north-west Africa, a large ray was seen close to the ship. As shown in the sketch it had two projections at the front of its head, its upper surface appeared black in colour but there was a patch of white on the underside of the head.



Although it swam close to the surface and its wing tips briefly broke the surface, its tail was not clearly visible.

Weather conditions were: dry bulb 22.7°, sea temperature 21.5°, wind NE'ly, force 4–5. There was a slight to moderate following sea.

Position of ship: 23° 54' N, 17° 08' W.

Note. Dr F. Evans, of the Dove Marine Laboratory, comments:

“This clearly appears to be an example of a manta ray although no size is given. The two frontal horns are indicative. The fact that the tail was not observed is unsurprising since it is a thin, unimpressive structure. Manta rays are plankton eaters in the same way that baleen whales are. This means that they do not snap at individual fish but charge forward with their mouths open, engulfing great quantities of

their prey, be it small fish or small crustaceans. Fine gill rakers then filter off the food as the water passes out of the gills. Like whales they seem to be able to round up their quarry into tight shoals. It is worth repeating that, because of this method of feeding, they are no threat to swimmers although their size occasionally makes them dangerous to small boats. The observer was fortunate; I travelled this route for a number of years without spotting a manta.”

North Sea

m.v. *Putford Aries*. Captain I. Finlay. Great Yarmouth to drilling rig *Maersk Enhancer*. Observers: Mr P.G. McCardle, Chief Officer, Mr A. Wilson, SG1 and members of ship’s company.

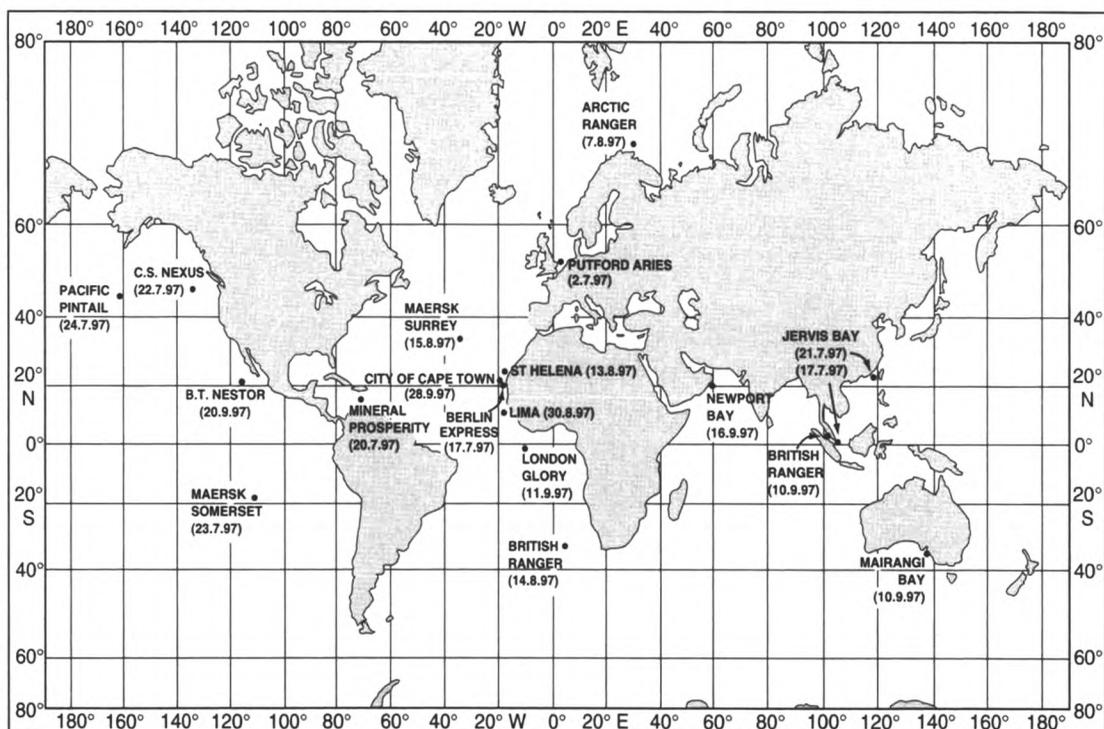
2 July 1997. At 1935 UTC whilst 0.8 n mile south-east of the Cross Sands buoy on a heading of 053° at 11 knots, small splashes were reported close to the port bow. After a few minutes of scanning the area of shoal water, what appeared to be salmon jumping on the crest of the slight swell were seen, and seven were counted an passing the Cross Sands. The conclusion reached was that the salmon were preparing for their return to rivers.

When other members of the crew were informed of the event the result was a heated debate in which the anglers among them were adamant that the fish would not be salmon but Sea Bass. Mr McCardle decided to stick with salmon.

Position of ship: 52° 36.2’ N, 02° 00’ E.

Note. Dr F. Evans comments:

“You would need the judgement of Solomon to decide what the jumping fish here described were. Salmon, possibly, as favoured by the observers. Sea Bass, possibly, as favoured by the anglers. But just to make it more complicated I will throw my hat into the ring and plump for Grey Mullet. By the way, when salmon jump they hold the body in a curve when out of the water and tend to fall to the concave side. Mullet and bass, on the other hand, keep the body rigidly in a straight line. This contribution is tentatively offered as helpful.”



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

MARINE LIFE

North Pacific Ocean

m.v. *C.S. Nexus*. Captain T. Faithfull. Portland to Batangas. Observers: the Master, Mr A. Huntington, Chief Officer, Mr J.P. Vine, 2nd Officer, Mr I. Pinney, Extra 2nd Officer, Mr I. Blair, 3rd Officer and ship's company.

22 July 1997. For approximately 48 hours the vessel passed through areas of hundreds of flower-like objects in the water. As indicated in the sketch, the centre of each object was about the size of a tennis ball and white in colour.



Variable numbers of petal-like radiating fronds were attached to each centre so that the whole assembly measured about 15 cm across. Someone described them as resembling a shuttlecock viewed 'end on'. Attempts were made to try and catch one of the objects but all failed.

Position of ship: 46° 03' N, 132° 37' W.

BIOLUMINESCENCE

South Atlantic Ocean

m.v. *British Ranger*. Captain D. Lewis. Cape Town to Angra Dos Reis. Observers: Mr L. Booth, 3rd Officer and Mr J. Davis, Extra 3rd Officer.

14–15 August 1997. Whilst on passage across the South Atlantic Ocean on a heading of 281° at 14 knots the vessel passed through an area of bioluminescence. At 0235 UTC on the 15th bioluminescence was seen in the form of a bright blue trail generated by the turbulence of the propeller, with further bioluminescence passing down the sides of the vessel in the disturbed water of the bow wave. When turned on, the echo-sounder and flood-lights had no discernible effect. The phenomenon lasted until 0415 when the wind increased slightly to force 3 and drizzle started to fall as dawn approached.

It was also noted that there was other bioluminescence activity well clear of the vessel but not to the same degree as in the turbulent areas; it was of unknown origin and formed a line 20–30 cm wide lying along 160°/340° and appeared to extend to the visible horizon in both directions. This bioluminescence occurred sporadically from about 2300 UTC on the 14th until about 0235 on the 15th when the ship's wake lit up as described.

The creatures causing the bioluminescence nearer the ship varied in size from a few centimetres long to 30 cm long, or more; although flexible enough to be bent by the wash from the vessel, they were solid enough to bob about on the surface, maintaining some shape in the air. After consulting *The Seafarer's Guide to Marine Life* they were thought to be the salp known as *Pyrosoma*.

Position of ship at 0235 UTC on the 15th: 32° 05' S, 06° 48' E.

North Atlantic Ocean

m.v. *Berlin Express*. Captain A.J. Fee. Port Chalmers to Lisbon. Observers: Mr M.P. Green, 1st Officer and Mr A. Macaskill, Watchman.

17 July 1997. At 0445 UTC bioluminescence was noted; it lasted for approximately 15 minutes during which time its intensity increased greatly within the wake of the vessel and within the 'white horses' visible for about 200 m on either side of the vessel, the greater effect being seen in the wake.

As with the *BP Adventure* report of bioluminescence in the Persian Gulf (*The Marine Observer*, April 1993), the observers reported a strong smell of fish. It was thought that the phenomenon may have been caused by upwelling as it was noted that the sea temperature had fallen by about 3°.

At the time of the observation the sea temperature was 22.2° and the wind NNE'ly, force 5–6.

Position of ship: 20° 00' N, 18° 50' W.

Note. Dr P.J. Herring, of the Southampton Oceanography Centre, comments:

"This is typical of passage though a patch of luminous dinoflagellates. The west African coast is an area of intense upwelling, as the temperature change indicates, and the nutrients from deeper water can allow dense patches of phytoplankton to develop. A fishy smell is often reported in these conditions."

North Atlantic Ocean

m.v. *City of Cape Town*. Captain P.J.H. Peaston. Le Havre to Port Elizabeth. Observers: the Master, Mr K.T. Hart, 3rd Officer and Mr R. Castle, SMS.

28 September 1997. At 2115 UTC whilst on a heading of 198° at 22 knots approximately 35 n mile off the coast of Mauretania, the observers noted lime-green bioluminescence appearing around the vessel's hull. The sea was smooth, there was a light N'ly breeze and the visibility was 25 n mile, the night being clear and starlit.

At 2200, on altering course due south when 35 n mile west of Cap Blanc, the glow of the bioluminescence began to intensify whilst the wind speed started to increase. By 2230 the intensity was at its greatest, appearing as a brilliant bright silvery-green glow around the whole hull with passing pale-green upwellings resembling cloud-like shadows most of which had smooth oval-shaped outlines.

By this time the wind had increased to force 4 and the bioluminescence was also seen in the crests of the following wind waves for a radius of about 1.5 n mile. During this period, the observing watchkeeper called the Third Officer to the port bridge wing to see dolphins in groups of three and four approach the vessel mainly beam-on, in a uniformly propelled motion, appearing almost torpedo-like through the bioluminescence. One dolphin was observed to break away from a group and pass the hull within 0.5 m before rejoining the others.

Position of ship: 20° 47' N, 17° 40' W.

Note. Dr P.J. Herring comments:

"This region is where the most intense upwelling occurs along the west African coast (providing the basis for local fisheries). I believe that this phenomenon was caused by copepod crustaceans, which I have seen producing just such an appearance in the same area some years ago. These tiny (1–5 mm)

animals squirt a greenish luminescence into the water when disturbed or tumbled about in the turbulence of the bow wave or wave crests. The copepods feed on the phytoplankton growing in the upwelled water. There were probably some dinoflagellates there too. Dolphins have a wonderful appearance in bioluminescent water, as described here.”

BIRDS

Indian Ocean

m.v. *Mairangi Bay*. Captain B.W. Nuttall. At Adelaide. Observers: Mr S. Fish, 1st Officer, Mrs Nuttall, supernumerary and ship's company.

10 September 1997. After berthing at Adelaide at approximately 0530 UTC a small owl [shown on the front cover] was seen sitting on top of a container in front of the accommodation. It stood about 20 cm tall and had a white face and chest with a grey-brown back.

The owl remained sitting contentedly on the container for about 6½ hours with work going on near it. Occasionally it preened its feathers and shifted then position to a stack of containers ahead of where it first sat, in order to get a better view. It remained in the vicinity of the accommodation until about 1200 when it flew off. A golf course is sited a few hundred metres from the berth, and it was thought that the owl probably roosted there.

Position of ship: approximately 34° 51' S, 138° 30' E.

Barents Sea

m.v. *Arctic Ranger*. Captain A.W. Walker. Steaming to fishing grounds. Observer: Mr M. Allison, Radio Officer.

7 and 9 August 1997. At 1415 UTC on the 7th three adult Puffins were seen circling the vessel for five minutes before flying off towards the east as the vessel continued on a heading of 050° for new fishing grounds. The wind was calm and there was a moderate swell. The next seabirds seen were on the 9th when the vessel was fishing and processing the catch. Hundreds of Herring Gulls and Fulmars, with a few Kittiwakes were all in the vicinity of the vessel; among them were 20 Arctic Skuas and 14 Long-tailed Skuas. The skuas chased and hassled the other birds for the fish offal they were taking from the sea.

Position of ship on the 7th: 72° 50.75' N, 30° 00.08' E.

Position of ship on the 9th: 73° 26.66' N, 34° 35.18' E.

Note. Captain P.W. Chilman, of the Royal Naval Birdwatching Society, comments:

“Arctic Skua (*Stercorarius parasiticus*) and Long-tailed skua (*Stercorarius longicaudus*). Both breed circumpolar in the high Arctic, the Arctic Skua rather more southerly than the Long-tailed, and leave the breeding area in August to spend the winter out at sea in the Southern Hemisphere. Both are piratical, as observed, though quite capable of fending for themselves. Gulls, Fulmars and Kittiwakes are common in large numbers.”

FOG BOW

North Pacific Ocean

m.v. *Pacific Pintail*. Captain D. Marr. Tsuruga to Balboa. Observers: Mr P. Goodchild, Chief Officer, Mr R. Newitt, SG1A and Mr J. Cooper, SG1A.

24 July 1997. At 0400 UTC a white 'halo' was observed in a shallow bank of fog about 50 m deep that the vessel was steaming through. It appeared to be

around the focsle or just ahead of the vessel, reaching down to the sea on both sides and extending to the top of the fog bank. The sun was low in the sky, directly astern at the time, and the sky was mostly clear above.

To the observers, the phenomenon had the appearance of a white rainbow; it remained visible for about 30 minutes until the sun was obscured by thin cloud.

Weather conditions were: air temperature 13.9°, wet bulb 13.6°, sea temperature 16.2°, pressure 1030.0 mb, wind SE'ly, force 2.

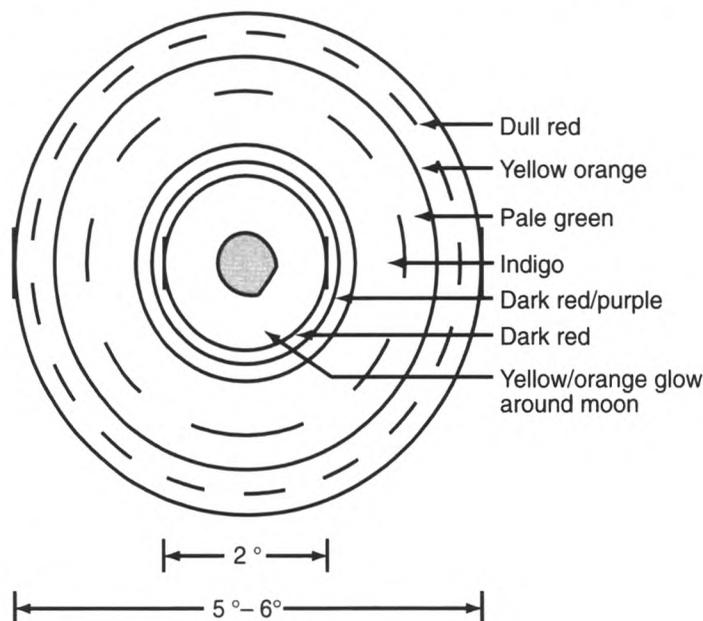
Position of ship: 44° 26' N, 161° 01' W.

CORONA

Strait of Singapore

m.v. *Jervis Bay*. Captain C.C. Woodward. At Singapore anchorage. Observers: Miss L.M. Butler, 3rd Officer and Mr R. Barnsley, Cadet.

17 July 1997. At 1200 UTC whilst the observers were on the focsle waiting to weigh anchor, the aureole and corona were observed around the moon despite the presence of bright mooring lights. The moon (its full phase was four days away) could be seen through a semi-transparent layer of altocumulus based at about 10,000 feet. Initially, the corona was circular in shape but gradually changed to become more oval before the effect faded. The colours were initially very clear and bright. As shown in the sketch, around the moon was a yellow-orange glow followed by the red-coloured ring which completed the aureole.



Beyond this could be seen the other colours of the rainbow ending with the outermost ring of brownish red. The diameter of the whole effect was approximately 5°–6° with the aureole measuring about 2°, and the duration of the complete colouration was about 10 minutes although the whole event was visible for another 20 minutes.

Position of ship: 01° 13' N, 103° 55' E.

Editor's note. The aureole and corona were also observed on 25 July 1997 by Mr J. Greig, 2nd Officer and Mr K. Taylor, 3rd Officer on board the *Exemplar* in the North Atlantic Ocean; their sighting was centred on the sun and was visible within a dense area of cumulus and cumulonimbus clouds. The aureole was yellowish white with a ring of blue and white while the outer edge was a red to brownish colour, this sequence being repeated in the next set of rings.

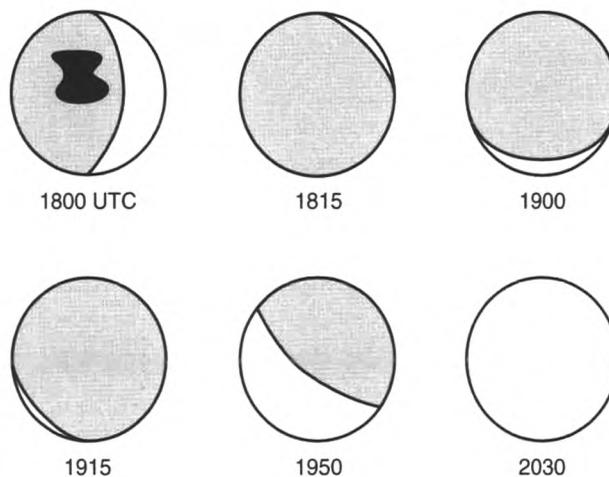
ECLIPSE

Arabian Sea

m.v. *Newport Bay*. Captain R.B. Gurney. Jeddah to Jebel Ali. Observers: Mrs C.L. Hickin, 3rd Officer and Mr E. Robson, SMS.

16 September 1997. At approximately 1800 UTC it was noticed that the night had suddenly gone very dark; there had been a full moon shining brightly over the ship, and there was no cloud. Upon investigation, it was realized that an eclipse of the moon was taking place, and this was confirmed by the nautical almanac.

When first noticed, only one-quarter of the moon was of normal light intensity, the rest appeared shaded with a dark patch near the centre, as shown in the diagram.



By 1815 a fraction of the north-east corner was a slightly more dull-white than normal, almost creamy in colour, whilst the rest of the moon was a rusty-orange colour. Gradually, the brighter area appeared to 'rotate' in a clockwise direction and, at 1900 was at the bottom, appearing to lighten the lower half of the moon while the top remained the rusty-orange colour.

At 1915 the creamy colour started to fade having rotated further to the south-west, and the full 'white' brightness started to return. The rusty colour also started to fade, leaving a dull, shaded moon except for the brighter area.

By 1950 half the moon had returned to its normal appearance and the eclipse had ended by 2030. With no cloud present and weather conditions generally being very clear, this eclipse was observed very clearly — it was just a pity the beginning was missed!

Position of ship: 19° 47' N, 58° 40' E.

SCINTILLATION

South Pacific Ocean

m.v. *Maersk Somerset*. Captain N.A. Vause. Panama to Geelong. Observers: Mr S.J. Fant, Chief Officer, Mr A.P. Hodeson, 2nd Officer, Mr M. O'Sullivan, Cadet and Mr C. Suaybaevio, GP1.

23 July 1997. The ship was on a heading of 242° at 17.1 knots when, at 0100 UTC a lighted object bearing 300° was sighted at the change-over of the watch. There being a clear night sky with a few small cumulus clouds, this was

the brightest object in the sky, elevated at approximately 7° above the horizon. No target was detected on radar.

It was first thought to be an aircraft owing to the alternating colours of the light (red, white and green) or a navigation light. As the vessel was about 800 n mile from the nearest land, it was then thought that the effect may have been a result of super-refraction of the atmosphere. Other stars were visible at this time but none appeared so vivid and clear. The observers agreed that they had never seen anything quite like it.

Position of ship: $17^\circ 58.5' \text{ S}$, $112^\circ 31.6' \text{ W}$.

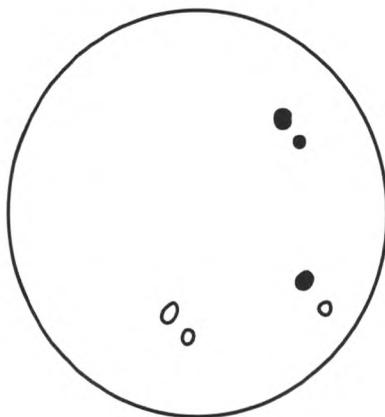
Editor's note. This appears to be a case of scintillation or twinkling which results, as the observers have supposed, from changes in the refractive power of the atmosphere. The apparent change of brightness of a star is accompanied, in lower altitudes, by colour changes often noted in combinations of red, white, green and blue. When the changes of brightness are small, the colour fluctuations are slower, as the changes become more marked, the colour fluctuations become more rapid.

SUNSPOTS

Strait of Malacca

m.v. *British Resource*. Captain A. MacLeod. Ash Shihr to Map Ta Phut. Observers: Mr S. Moss, 2nd Officer and Mr S. Dew, Cadet.

10 September 1997. At 1145 UTC in hazy conditions with the sky covered by light cloud and with the visibility at about 5 n mile, the sun became visible through the cloud to reveal what were believed to be sunspots. As shown in the sketch, three very dark spots were noted first but further inspection revealed another three spots which were lighter.



The sunspots were visible for about six minutes before the cloud began to dissipate and the brightness of the sun prevented further observations. The sun's altitude was 10° .

Position of ship: $01^\circ 59.6' \text{ N}$, $102^\circ 04.0' \text{ E}$.

Editor's note. Observers should not need reminding that direct observation of the sun can severely damage the eyes, and binoculars should not be used in such a way at any time. Sunspots can still be safely observed, however, by projecting the sun's image through binoculars onto a sheet of white card supported at the appropriate angle. Use of the focusing rings can then enlarge and sharpen the image to reveal any sunspots present.

MISCELLANY ...

An additional mélange of maritime sightings

Abbey. 9 September 1997. At 1900 UTC whilst approaching the Straits of Florida Captain R.A. Whistler, Second Officer C. Jackson, Deck Cadets D. O'Donovan and I. Moriarty, and Mrs Whistler, supernumerary, watched a waterspout form below strongly-developed cumulus clouds. It increased in length, finally reaching the surface where a great deal of disturbance could clearly be seen. The waterspout stayed in contact with the surface for about 5 minutes before withdrawing into the base of the cloud, being visible for about 12 minutes in total.

Appleby. 11 August 1997. At 1730 UTC Captain A. Crofts and Second Officer D. Bridgeman watched a Killer whale near the ship (in position 41° 04' N, 54° 22' W). It surfaced every 20–30 seconds before disappearing. Two distant sightings also proved to be of the same species.

Discovery Bay. 16 September 1997. At 1815 UTC as the total phase of a lunar eclipse commenced, conditions became dark enough to enable faint bioluminescence to be seen which would not have been visible otherwise. Although the total phase lasted for just over an hour, the bioluminescence was only seen for a few minutes, passing down either side of the ship. The ship's position was 12° 43' N, 49° 35' E.

Durrington. 21/22 September 1997. At 0245 UTC whilst between Husnes and Murmansk, in position 67° 00' N, 10° 49' E, an auroral display of infrequent rayed bands with rapid movement, moving from south-west to north-east, was observed at the beginning of twilight by Chief Officer R.M. Maclure. Each part of the display lasted for about five minutes while the whole event lasted for 30 minutes and reached an elevation of roughly 45°. Several bands were quite bright but no colour was seen.

(Editor's note. Mr Ron Livesey, Director of the Aurora Section of the British Astronomical Association said: "This is a particularly interesting observation as no other observers have reported seeing the aurora that night. However, the Earth's magnetic field experienced the impact of a shock wave in the wind of particles coming from the sun which was followed by a short-lived magnetic storm that would have been associated with the aurora observed.")

English Star. 17 August 1997. At 1610 UTC whilst on passage from Puerto Cortez to Waterford, a whale was sighted in position 50° 02' N, 17° 14' W. It appeared to be basking on the surface, blowing, and was apparently indifferent to the vessel passing about 200 m away. Its head was large and square, and it had a triangular-shaped hump on its back; the distance from head to hump was five or six metres. The blow was singular and bushy. The whale was identified as a Sperm whale after consulting *The Natural History of Whales and Dolphins* by Peter G.H. Evans.

Maersk Gannet. 2 September 1997. At 1115 UTC in position 12° 48' N, 17° 54' W a waterspout formed under a cumulonimbus cloud based at 600 feet. It persisted for about five minutes and was a tube-like structure spinning rapidly but which did not reach the sea. Viewed from about 0.5 n mile, the diameter of the vortex was estimated to be 10–15 m. It was at its most intense in the final moments before it was noted to be 'blowing itself apart'.

Maersk Surrey. 23 July 1997. Whilst on passage from Antwerp to Houston a lunar rainbow was observed at 0010 UTC when it first appeared as a faint arc of white light during a period of slight drizzle. Captain I. Goveas, Third Officer A. Cross and Cadet R. Forrest watched it gradually intensify to become a complete rainbow at about 0017 and show a green tinge at the inner edge of the left-hand end, close to the horizon. Only an arc on the right-hand side remained by 0021 and the rainbow disappeared a minute later.

Peninsular Bay. 27 July 1997. Whilst the ship was passing between the islands of Amami Gunto and Tokara Gunto *en route* from Hong Kong to Tokyo, First Officer R. Gurney, Second Officer D. Winter and Third Officer J. Cross noted a swarm of thousands of dragonflies, each 4–6 cm long, moving along with the vessel on its leeward side. As the ship neared land and the temperature increased (and the wind decreased), the dragonflies started to die off, scattering the deck with bodies. It was thought that they might have been blown off course by hurricane 'Rosie' which passed over the islands a few days earlier.

Sachem. 26 August 1997. Whilst at anchor at Fremantle Gage Roads, Chief Officer T. Kelly and Cadet K.C. Taylor spotted a group of four or five Bottlenose dolphins swimming around the vessel between 1130 UTC and 1400. They seemed to be playing and remained in the area illuminated by the vessel's deck lighting.

Sulisker. 28 August 1997. Whilst on station in position 61° 51' N, 00° 37' E, a male Kestrel and a Garden warbler were observed on board by Captain J.P. Laycock, following several days of fresh SE'ly winds.

Teignbank. 4 August 1997. At 0930 UTC when in the Indian Ocean, on passage from Singapore to Suez, the vessel passed through a series of rain showers. Whilst passing through one of them, Third Officer V. Ustinovich and Cadet K. Fletcher noted a substantial disturbance at the surface about a mile off the starboard bow. It became more violent after two or three minutes and precipitation in a tornado-like shape emerged from the base of the lowest cloud, coming down to 5–10 m above the surface. This continued for 7–10 minutes and then quite suddenly, it just stopped. The waterspout's direction of rotation could not be determined.

(*Note*. Mr M. Rowe, of the Tornado and Storm Research Organisation, said, "An interesting observation of a waterspout (a tornado would be over land). The direction of rotation was most probably anticlockwise which is the usual direction in the Northern Hemisphere).

Vine. 27 September 1997. At 1650 UTC in position 24° 15' N, 17° 03' W two whales heading north-north-east were sighted by Captain J.H. Lacey, Chief Engineer W. Duffy and Second Engineer T. Sheridan. The whales did not surface or dive, so there was no sight of the head or flukes but the blow did seem to project forward as if from Sperm whales. There was no pronounced dorsal fin, only a stumpy protrusion, and the head could have been buoy-like, although it was difficult to be certain. (About a month earlier the vessel had come across the body of a dead whale 35 n mile east-south-east of Port Elizabeth, it was thought to be a Humpback and was providing 'a veritable feast to the seabird colony'. The observers were Captain Lacey and Chief Engineer R.V. Edwards.)

... and finally

Wherever possible we endeavour to print observers' sightings together with full expert comment and analysis. Should our production schedule preclude this, then we will publish comments retrospectively, referring readers to the appropriate edition of *The Marine Observer*.

ISSUE	PAGE	SHIP	COMMENTS
April 1998	55	<i>London Glory</i>	Mr M. Rowe, of the Tornado and Storm Research Organisation said, "A clear description of a classic waterspout. It is useful to know the height of the spout and the accompanying weather conditions. We appear to have few sightings of spouts from west Africa, so this is a very useful observation."
April 1998	56	<i>Toisa Sentinel</i>	Mr Rowe said, "This is a most interesting observation of a waterspout, the vortex of which was invisible except where it touched the sea surface. This was probably more like a fair-weather whirlwind or land devil (despite the 8 oktas cloud cover) than a maritime version of a tornado. This variety of spout is rarely reported, doubtless because of its small size and invisible funnel. The calm area in the centre of the vortex is of great interest, and very few observers have been close enough to see this. The clockwise rotation is correct for the Southern Hemisphere."
October 1997	170	<i>Shenzhen Bay</i>	Mr H. Miles, Director of the Artificial Satellite Section of the British Astronomical Association said, "The objects seen were typical fireballs produced when interplanetary fragments enter the atmosphere. The duration of the events excludes the objects being space junk. Although not common by any means, the seeing of two objects travelling together is not a rare event. It certainly gives an added interest to the sighting."

The EUMETSAT Polar System *

BY TILLMANN MOHR

(Director, EUMETSAT)

A historical perspective

EUMETSAT, the European Organisation for the Exploitation of Meteorological Satellites, was created in 1986 and now has 17 European Member States (Austria, Belgium, Denmark, Germany, Finland, France, Greece, Ireland, Italy, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom). The primary objective of EUMETSAT, as set out in its Convention, is to establish, maintain and exploit European systems of meteorological satellites, taking into account, as far as possible, the recommendations of the World Meteorological Organization. A revised Convention, nearing full ratification, adds a further objective that is to contribute to the operational monitoring of climate and the detection of global climate change. Through this charter, EUMETSAT has the additional mandate to provide operational services for Europe concerned with the long-term monitoring of the Earth, its atmosphere and the oceans.

In achieving its objectives, EUMETSAT has been responsible, since January 1987, for the constant provision of half-hourly image data in three spectral bands from its geostationary METEOSAT satellites. To ensure continuity of the service, a new satellite system, the METEOSAT Second Generation (MSG) is being developed for launch in the year 2000. MSG will provide data in 12 spectral channels at intervals of 15 minutes. The system will include the launch of three satellites and the development of a new ground system. The current METEOSAT system will provide coverage until MSG is operational.

Since the launch in 1960 by the USA of the first meteorological satellite, there have been considerable advances in observing systems and in the models that use the data so provided. Although meteorological satellites have had a relatively short existence, the volume of their data with global coverage is making a significant contribution to operational meteorology, land use, ocean studies and climate monitoring.

The USA has maintained two civilian operational meteorological satellites in complementary polar orbits since 1977. These have provided a valuable source of global data at intervals of approximately six hours. This period of observation is a well-established requirement for both meteorology and climatology. The detailed atmospheric profiles provided by polar-orbiting systems are complemented by a series of meteorological satellites in geostationary orbit. A global system of these geostationary satellites is supported by EUMETSAT, India, Japan, the Russian Federation and the USA. China plans to launch a geostationary system in the near future as well. Both the polar-orbiting and the geostationary satellites provide the space-based component of the Global Observing System of WMO's World Weather Watch. The provision of data from all meteorological satellite systems is well coordinated through the auspices of the WMO and the Coordination Group for Meteorological Satellites.

Reproduced from *WMO Bulletin*, 46 (3) by kind permission of the Editor.

The future

Assuming that Europe would take its share of the future observing system, the USA has given notice that, from early in the next century, the National Oceanic and Atmospheric Administration (NOAA) will provide coverage from only one polar-orbiting satellite passing over the Equator in the afternoon. In 1992, EUMETSAT implemented a preparatory programme that established the formal framework for initial activities aimed at developing a EUMETSAT Polar System (EPS). The EPS will be a component of a joint European/US satellite system, known as the Initial Joint Polar System, ensuring data compatibility through exchange of instruments. Later, the USA plans to merge its civilian and military meteorological satellite systems and will then provide a second morning orbit. By this, the final Joint Polar System will be formed, based on one EUMETSAT and two USA satellites.

The EPS programme

The current status of EPS

The development of a meteorological satellite system is complex and has involved well over five years of carefully coordinated study, investment and planning by EUMETSAT and the European Space Agency (ESA). During the preparatory phase of the programme, many refinements were made to the instrument payload and, in 1996, the financial ceiling for the EPS programme was set at ECU 1.569 billion (US\$1.779 billion), with an additional finance contribution from ESA.

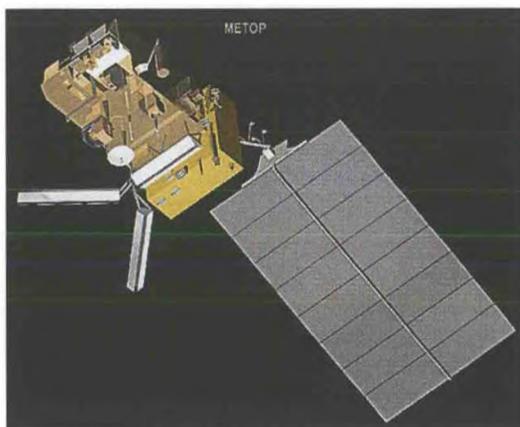
The EPS Resolution, defining all aspects of the Programme, was opened for voting by the EUMETSAT Council in December 1996 and Member States are expected to approve it in the coming months. Until full approval of the programme is attained, essential preparatory activities are taking place within special bridging arrangements authorized by the EUMETSAT Council.

The EPS programme content

The EPS programme includes provision for the construction and launch of three METOP satellites (the first launch being planned for the end of the year 2002), the development of the corresponding ground infrastructure and provision for routine operations over a period of 14 years from the date of the first launch.

The METOP satellites

The three METOP satellites of the EPS programme will be adapted from existing technology developed by ESA and will have an overall mass of about 4.4 tonnes. Successive satellites will be available within 18 months of the normal



An artist's impression of the METOP satellite.

launch of their predecessors, normally scheduled at intervals of 4.5 years. The satellites will fly in Sun-synchronous polar orbit at a mean altitude of 840 km, circling the Earth every 102 minutes and crossing the Equator at 09h30 local time.

The instrument payload

Each METOP satellite will carry a comprehensive payload of 11 instruments (see table overleaf) together with various communications systems. These will support normal satellite telemetry and satellite command functions, as well as the downloading of global data to a EUMETSAT ground station and the continuous broadcast of data to local user stations.

EPS will address international requirements and is established within the framework of several key agreements:

- EUMETSAT and ESA will jointly develop the METOP spacecraft, together with the wind scatterometer (ASCAT), ozone monitoring instrument (Global Monitoring Experiment (GOME)) and the GPS-based limb sounder (GRAS).
- EUMETSAT will procure the microwave humidity sounder (MHS) for the METOP and NOAA satellites; will develop the ground segment and take full responsibility for the overall system and its operation; and will procure the launch services.
- The National Centre for Space Studies (France) will provide the DCS-Argos facility and the infra-red atmospheric sounding interferometer (IASI) instrument developed in cooperation with EUMETSAT.
- NOAA will provide a microwave temperature sounder (AMSU-A), an infra-red sounder of the current generation (HIRS), a visible/infra-red imager (AVHRR), the Space Environment Monitor and the Search and Rescue facility (the latter humanitarian mission in cooperation with France and Canada).

The EPS ground infrastructure

Global data stored on board METOP will be downloaded as it passes close to the EUMETSAT Polar Command and Data Acquisition Station. The data will then be transmitted by high-speed links to the EUMETSAT central facilities in Darmstadt, Germany, for processing and distribution. Data from blind orbits, if any, will be acquired through a NOAA station in Fairbanks, Alaska, which will also serve as a back-up. This is through a bilateral agreement which will ensure access to data from both the EUMETSAT and NOAA polar orbiting satellites.

The EUMETSAT central facilities will pre-process the global data and have certain functions related to long-term quality control. Meteorological products will be generated, not only in the central processing facility, but also in Satellite Application Facilities located at various centres across Europe. These EUMETSAT facilities will be complemented by user-owned stations designed to receive either of the two direct broadcast channels transmitted continuously by METOP. By receiving either the low-resolution picture transmissions or the high-resolution picture transmissions, the user will gain access several times each day to much of the METOP and NOAA data over an area extending more than 1,000 km around the local station.

Payload of the METOP satellites of the EPS Polar System
 (* Updated instruments planned for METOP-3)

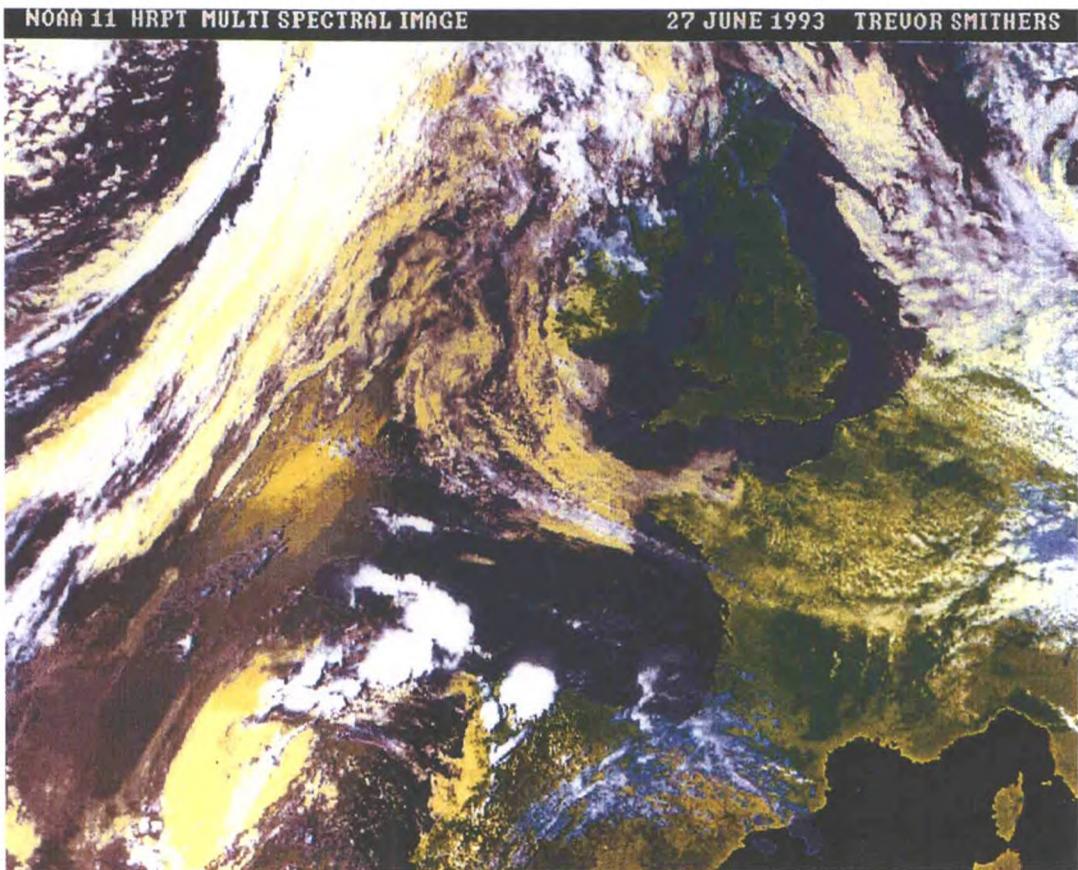
<i>Instrument</i>	<i>Full name</i>	<i>Function</i>
AMSU-A*	Advanced Microwave Sounding Unit-A	Measuring the temperature of the global atmosphere in all weather conditions.
MHS	Microwave Humidity Sounder	Measuring the humidity of the global atmosphere.
HIRS	High Resolution InfraRed Sounder	Operational measurement of the temperature of the global atmosphere in cloud-free conditions.
IASI	Infrared Atmospheric Sounding Interferometer	Enhanced sounding of the global atmosphere.
GRAS	Global Navigation Satellite System Receiver for Atmospheric Sounding upper	Measuring the temperatures of the atmosphere with high vertical resolution.
AVHRR *	Advanced Very High Resolution Radiometer	Global imagery of clouds, the ocean and land surfaces with 1.1 km resolution.
DCS-Argos	Data Collection System – Argos	Locating platforms on the surface or in the atmosphere and relaying environmental data.
GOME-2*	Global Ozone Monitoring Experiment – 2	Measuring profiles of ozone and other constituents in the upper atmosphere.
ASCAT	Advanced Scatterometer	Measuring the near-surface wind speeds over the global oceans.
SEM	Space Environment Monitor	Sensing the flux of charged particles from the solar plasma.
S&R	Search and Rescue	Alerting emergency services and helping to locate source.

Applications of EPS

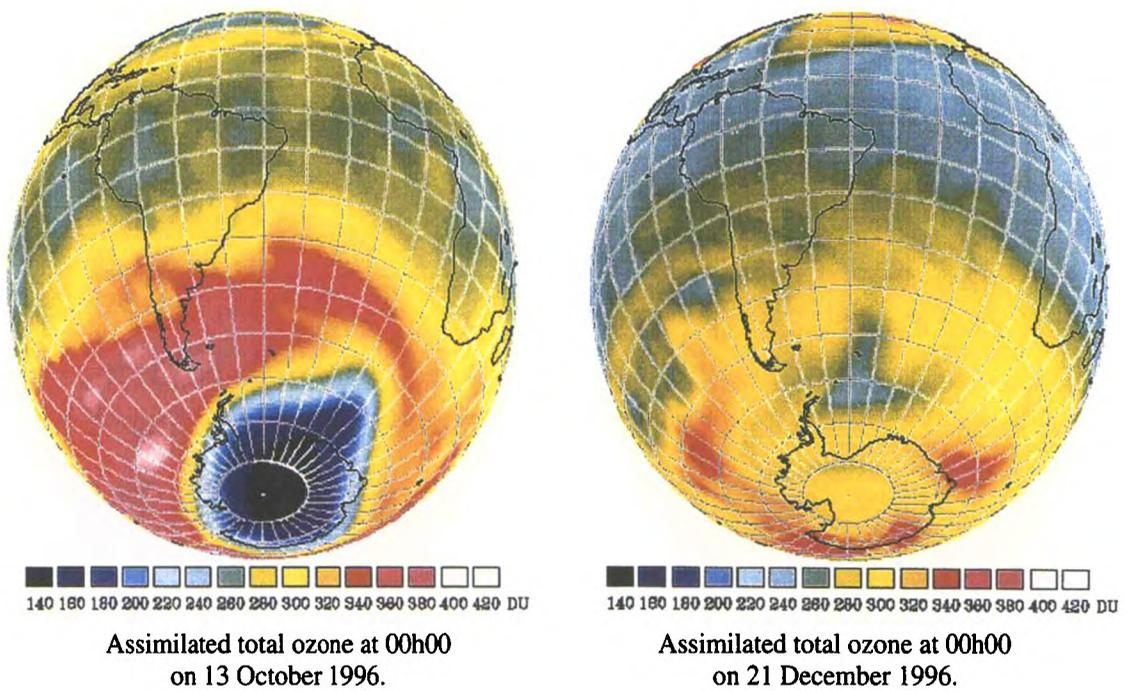
The atmosphere

A primary function of EPS is to monitor the global atmosphere. Through its operational sounding capability and two new instruments (MHS and IASI), EPS will supply global temperature and humidity data with unprecedented accuracy throughout the entire depth of the atmosphere. These improved data are an absolute requirement for further improvements in numerical weather prediction (NWP). Through its imaging mission, EPS will provide global maps of cloud cover, vital for both meteorology and climate monitoring and for the detection and tracking of severe storms anywhere in the world. Details of such storms will be further enhanced by EPS through the ability to measure surface winds even in the presence of clouds. Imagery products such as the multispectral image on the page opposite will be available from the EPS.

Concern about the destruction of ozone in the upper atmosphere has prompted intergovernmental action because of the increase in ultraviolet radiation reaching the Earth and the impact on global warming. EPS will continuously monitor the distribution of ozone (and other trace elements) in the upper atmosphere and provide an independent check on the success of control measures. The imaging mission will also enable the detection and monitoring of volcanic activity anywhere in the world to provide warnings for aviation (volcanic dust can stop jet engines) and also because major eruptions are one cause of climate change.



Multispectral image derived from NOAA AVHRR data (from Trevor Smithers).



The huge seasonal variations in ozone will be monitored by EPS: images from the GOME instrument flown on ESA's ERS-2 (Courtesy A. Piters).

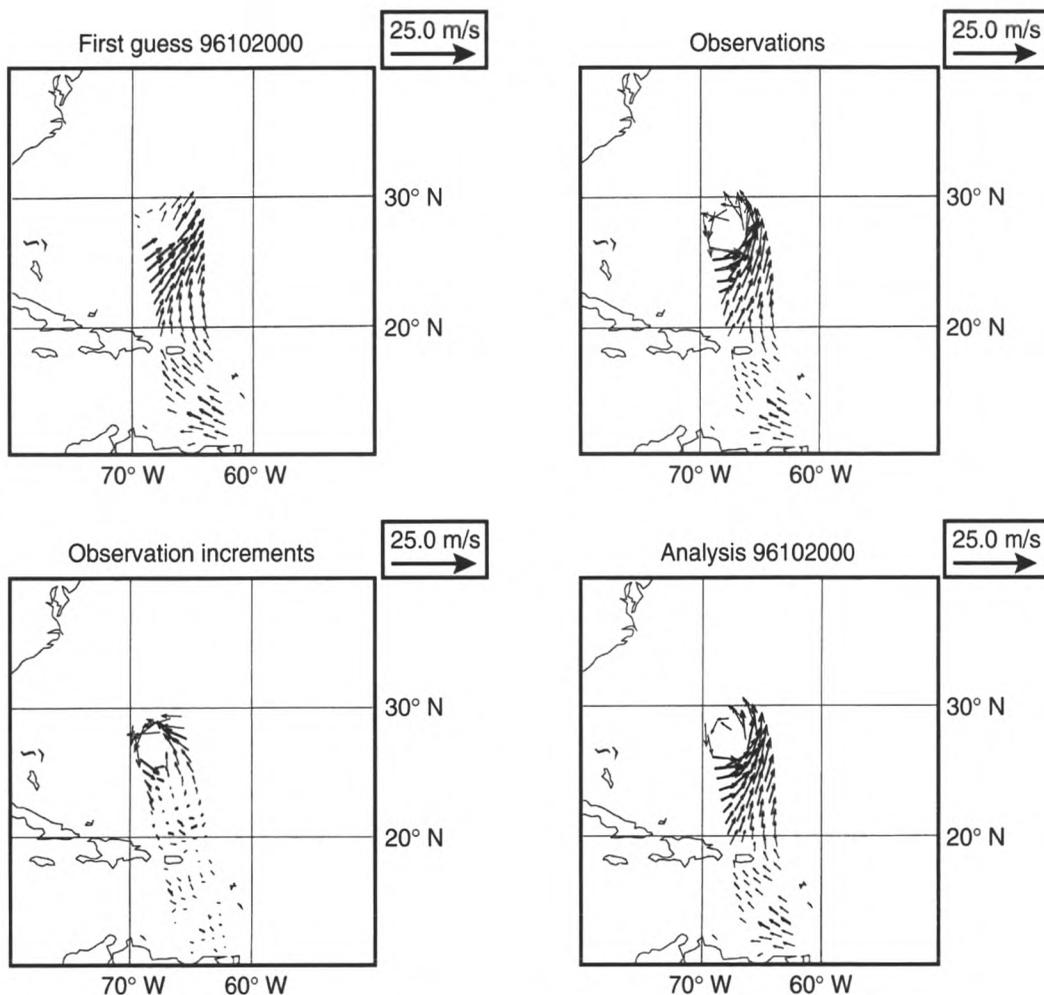
The land surface

Besides cloud and storm images, the imaging mission to be carried on the EPS METOP satellites has a wide range of additional applications. In the forefront of these is the ability to monitor vegetation growth, in particular, during the active growing season. Through this capability, crop yields will be estimated, with important economic and humanitarian implications.

The ocean surface

By virtue of their vast capacity and heat transport through deep currents, the oceans are an integral and important component of the global climate and weather systems. The *El Niño*/Southern Oscillation is an important example of the way in which changes in ocean circulation have a profound impact on the inter-seasonal climate in near and distant parts of the world. EPS will contribute to the monitoring of such effects by measuring sea-surface temperatures and low-level wind vectors over the oceans. As well as the application to climate monitoring, the sea-surface temperature and low-level wind data are a significant input to global NWP models. In addition, the EPS missions will have other capabilities, including the mapping of ocean ice cover (important for shipping and climate monitoring).

The considerable value of low-level winds derived from satellite data over the oceans is well demonstrated by the four figures below.



Low-level winds over the oceans derived from ERS-2 scatterometer data (*illustration courtesy ECMWF*).

The first shows the ECMWF model first-guess winds for 00h00 on 20 October 1996 in which the circulation of tropical storm *Lili* was not well identified. The following two illustrations show the corresponding wind observations and observation increments obtained from the scatterometer instrument on ESA's ERS-2 satellite. The resulting analysis, shown in the final figure, was much more precise and enabled the ECMWF model to predict with more accuracy the development of *Lili*. The EPS ASCAT instrument will provide similar data for use in NWP.

Data collection and location

The observational capabilities of the METOP satellites will be complementary to surface-based measurements, often obtained from data platforms in remote locations or free to drift with the currents. EPS provides communications support for such platforms through DCS-Argos, which is also able to determine the location to within less than 150 m. Miniature transmitters of 20 g are also used to track a wide variety of wildlife, helping us to learn how animals solve complex navigation problems during migration and helping the conservation of endangered species.

The benefits of EPS

The main benefit of EPS is that, with the polar-orbiting meteorological satellites of the USA, it will help ensure the continuity, enhance the quality, and improve the availability of, global data needed for meteorology, climatology, environmental monitoring and many related disciplines. Much of the benefit of EPS will arise indirectly through improved weather forecasts and increased data for climate monitoring and the prediction of climate change. Improvements within these disciplines can have enormous economic consequences. At the European level, this arises from the industrial implications of weather and climate change whereas, at the global level, the benefits are more fundamental, affecting the survival of populations from the effects of severe storms, droughts or change in climate. EPS will therefore provide a resource of great economic value, both to the Member States of EUMETSAT and to the many developing countries and other States around the world which will receive, and benefit from, the data.

SCENE AT SEA



W.A.E. Smith

Poor visibility caused by fog. Photographed from the *Putford Ajax* on station at the Ravenspurn installation in the North Sea, on 19 May 1997. The crew of a helicopter hovering overhead at 500 feet were unable to see anything and aborted the intended landing. The pictures were taken between 1800 and 1845 UTC.

(a) Mast at 300 feet above MSL lost to view.



W.A.E. Smith

(b) Fog at 100 feet above MSL, distance 400 m.



W.A.E. Smith

(c) Fog at 80 feet above MSL, distance 600 m.



W.A.E. Smith

(d) Fog at 20 feet above MSL, distance 750 m.

SCENE AT SEA (contd)

Poor visibility (1-2 n mile) caused by forest fires burning out of control in Sumatra in late 1997. The photographs were taken on (a) 27 September and (b) 24 October, when the *British Wye* was north-east of One Fathom Bank (Strait of Malacca), and at the Sultan Shoal Petroleum Anchorage, Singapore respectively. In the first instance there was a heavy acrid smell in the air which caused coughing and watering eyes, and bridge lookouts were issued with face masks. Eye wash was also made available. In (b) the smoke pollution was still present although the visibility had improved but still varied between 1 and 8 n mile. The small vessel with the boom was skimming oil from the surface following a collision of vessels in the poor visibility.



T.J. Blyth

(a) 27 September 1997. Strait of Malacca, north-east of One Fathom Bank.



T.J. Blyth

(b) 24 October 1997. Sultan Shoal Petroleum Anchorage, Singapore.

Cook and the weather *

BY E. BRENSTRUM

(Meteorological Service of New Zealand Ltd)

Sailing ships of the eighteenth century, such as Cook's *Endeavour*, depended on the weather for their movement but were at the mercy of its extreme behaviour. One of the greatest dangers for a sailing ship was to be trapped on a lee shore when wind and waves drove the ship onto the land.

Cook was caught in this situation off Australia's Barrier Reef in August 1770 and the *Endeavour* was very nearly destroyed. Two months before, when sailing inside the reef, the *Endeavour* had run aground on a coral outcrop and had been badly damaged. Superb seamanship had saved the ship then, but after a lengthy period of repairs Cook was anxious to escape the dangerous shoaling waters inside the reef for the safety of the deep water outside.

On the 14th of August Cook navigated the *Endeavour* through a gap in the Barrier Reef into the open ocean to the relief of all on board. However, less than a day out of sight of land, Cook was anxious that he would miss the passage he believed existed between Australia and New Guinea and so steered the ship back towards the reef. No sooner were they in sight of land than the wind shifted from east-southeast to northeast, blowing straight towards the reef and taking the ship with it. During the night the wind died but the waves kept pushing the *Endeavour* towards the roaring breakers on the reef.

By dawn they were less than a mile off and in extreme danger as the waves were quickly carrying them in. The water was too deep for anchoring so the only hope lay in towing the ship away using the row-boats. The Yawl and the Long-boat were hoisted out followed by the Pinnace, once it had been repaired. These were assisted by two long sweep oars pulling through the gunroom ports. By this stage the ship was within about 50 yards of the reef when miraculously a small air of wind sprang up for ten minutes helping to carry the *Endeavour* 200 yards off. After a further calm, the wind returned briefly and they were able to work the ship northwards towards a gap in the reef. Through this an ebb-tide was gushing like a mill stream, and the *Endeavour* was quickly carried a quarter of a mile off.

Eventually the row-boats and the tide took them nearly two miles away from the reef. However, the situation was still extremely dangerous, especially as the reef curved around and partially encircled the *Endeavour*. Fortunately, another gap in the reef, investigated by one of the small boats, was found to be both wide and deep enough to take the *Endeavour*. When the tide turned, and the wind got up from the east-northeast, the ship was manoeuvred into the gap and shot through on the flood tide.

Thereafter Cook resolved to put up with the hazards of the shallow water and proceeded to the northern tip of the continent within the confines of the reef.

Ironically, one of the other times Cook was endangered by lack of wind was when he first sailed into Cook Strait. Then, when the wind fell calm, the tide threatened to drive the *Endeavour* into the cliffs of The Brothers Islands. However, he was able to anchor in 75 fathoms, two cable lengths from the rocks.

* Reproduced from the journal of the Meteorological Society of New Zealand, *Weather and Climate* (1996) 16, by permission of the Editor.

The weather not only provided the occasional threat of death and destruction to the *Endeavour*, it also regulated the day-to-day activity. Cook's urgent need was for fresh water. Thwarted in this by a combination of conflict with Maori and a difficult coastline, Cook finally obtained a plentiful supply at Tolaga Bay, but only because contrary winds had frustrated his attempts to sail on towards the north.

Although Cook generally had to suffer whatever the weather threw at him, he did make at least one attempt to change the weather. When passing Stephens Island, his ship was suddenly surrounded by a number of waterspouts. Cook had been told that firing a gun into a waterspout would dissipate it. Eager to try this, Cook ordered a small cannon to be loaded and aimed, but his people were "very dilatory about it, and the danger was passed before we could try this experiment." A debate among the officers as to which direction the waterspouts were rotating was resolved when a seagull was caught by one and whirled around as it was taken up.

Cook had read some of Benjamin Franklin's theories about lightning so that when the *Endeavour* was caught in a thunderstorm in Batavia (Jakarta) on his first voyage, an "Electrical Chain" was put up the mast to protect the ship. When lightning struck the mast, the ship was unharmed, although shaken by the shock of the explosion. A Dutch ship nearby had its main mast shattered when it was struck by lightning about the same time.

At times Cook was also able to use his knowledge of the weather and its effects to infer the nature of the world around him. When approaching New Zealand for the first time there were a number of signs that land was close over the horizon. The sea changed colour, increasing amounts of seaweed and driftwood were sighted, several seals were passed, floating on their backs, asleep, and numerous birds were seen and shot. Also, three days before Nick Young sighted the headland that Cook subsequently named after him, the *Endeavour* experienced a sudden brief wind squall of a type that was considered a sure sign of nearby land.

When the *Endeavour* rounded the southern tip of New Zealand, Cook knew from the long southwest swell that there was no large land mass nearby in that direction. Therefore New Zealand must be a collection of islands and not part of a mythical southern continent.

When searching for that continent on his second voyage, Cook sailed as far south as the ice pack, and inferred from the presence of icebergs that there must indeed be land further south, because ice thick enough to form icebergs can only accumulate over land.

Sailing amongst the icebergs was of course very dangerous and this combined with their beauty gave rise to some of Cook's most eloquent writing:

"... great as these dangers are, they now become so very familiar to us that the apprehensions they cause are never of long duration and are in some measure compensated by the very curious and romantick Views many of these Islands exhibit and which are greatly heightned by the foaming and dashing of the waves against them and into the several holes and caverns which are formed in the most of them, in short the whole exhibits a View which can only be described by the pencil of an able painter and at once fills the mind with admiration and horror, the first occasioned by the beautifullness of the Picture and the latter by the danger attending it, for was a ship to fall aboard one of these large pieces of ice she would be dashed to pieces in a moment."

The ice also provided a valuable source of fresh water for the expedition. Loose floating ice was broken up with axes then taken into the rowing boats using baskets. Left standing on deck for a short while the salt water drained away, the ice was then melted down in coppers. In six hours Cook obtained about 15 tons of fresh water by this method.

For the second voyage, Cook, sailing on the *Resolution*, was accompanied by the *Adventure*, commanded by Tobias Furneaux. Twice these ships were separated, both times by the weather. Fog was the cause on the first occasion when the ships were near Kerguelen Island.

Once he had lost contact with the *Resolution*, Furneaux went northeast to Tasmania before proceeding to the agreed place of rendezvous in Queen Charlotte Sound. Cook, however, turned southeast and stayed in touch with the ice for another six weeks until he swung north for Dusky Sound in Fiordland.

The weather observations taken along the ships' separate tracks led to an important discovery about the wind patterns of the Southern Hemisphere. Once together again, in Queen Charlotte Sound, Cook was able to compare the ships' logs, and found that the *Adventure* had experienced westerly gales near 50 south, at the same time that Cook, near 60 south, had easterly breezes. Before this it had been thought that the westerly winds continued all the way to the pole. This pattern of easterly and westerly winds delineates the circumpolar trough, where most Southern Hemisphere cyclones go to die.

The second time the ships were parted was during a prolonged period of northwest gales at the mouth of Cook Strait in October and November 1773. Cook's descriptions of bad weather are usually somewhat laconic, as befits a professional mariner, but a vivid account of these gales survives in the work of the German naturalist Forster who published a book two years after the voyage:

"To complete this catalogue of horrors, we heard the voices of sailors from time to time louder than the blustering winds or the raging ocean itself, uttering horrible volleys of curses and oaths. Without any provocation to serve as an excuse, they execrated every limb in varied terms, piercing and complicated beyond the power of description. Inured to the danger from their infancy, they were insensible to its threats, and not a single reflection bridled their blasphemous tongues."

The German edition of his book was a great success and is regarded as a classic of German travel literature. Forster's descriptions of exotic locations and stormy weather had a strong influence on the beginning of the Sturm and Drang movement in German literature which included the poet Goethe, who became a personal friend of Forster, and also dabbled in science, discovering, among other things, a new bone in the human jaw.

The November gales of 1773 also gave Cook his closest encounter with Wellington Harbour. He almost slipped through the Strait with a brief southerly on the 2nd of November, but when it died he sheltered from the renewed northwest gale by sailing across to the North Island.

He saw the entrance to Wellington Harbour and tried to sail in on the 3rd, but the tide turned against him and he was forced to anchor one mile southwest of Barret's Reef. Although tempted to try again, Cook was anxious to reach the rendezvous in Queen Charlotte Sound and took advantage of a southerly change

the next day to do so. By the time he reached safe anchorage all the *Resolution's* sails were in need of repair from the damage sustained beating into the northwesterlies.

Nor was the *Adventure* there, as Furneaux had retreated north to Tolaga Bay and did not reach the Sounds until early December, a week after Cook had left for the southern ocean.

Furneaux's visit to the Sounds ended tragically when eleven of his people, sent to gather wild greens, were killed in a fight with Maori. It is unlikely that this fracas would have developed had Cook been there, as he maintained better control over his people.

The discovery of new lands often entailed the discovery of new weathers. When Cook's Journals of his voyages were published they constituted the first guide to the weather of the Pacific around New Zealand, as well as a guide to the lands and peoples. This was achieved partly through the chronicles of day-to-day weather in the Journals and partly through the occasional observations of a more general nature.

For example, Cook documented the occurrence of hurricane force winds in New Zealand waters, when he encountered what must have been an ex-tropical cyclone near the top of the North Island at the end of December 1769. Following a day of easterly gales on the 28th he recorded that, after the wind turned southwest, it "began to blow very hard and increased in such a manner that by 8 o'clock it was a meer hurricane attended with rain and the Sea run prodigious high".

By a curious coincidence, at the same time the French ship *Saint Jean Baptiste*, that had reached New Zealand a couple of months after Cook, was sheltering nearby in Doubtless Bay. She suffered considerable damage in the storm including the loss of several anchors, one of which is now in the National Museum.

In this passage Cook is using the word 'meer' in its sense as 'pure or indiluted'. It is interesting to note that Cook described the wind strength in terms later laid down in the famous Beaufort Scale that became mandatory in the Royal Navy after a memorandum dated 69 years later, to the day. This shows that the introduction of the Beaufort Scale was in fact standardising a long established practice.

One of Cook's most astute observations on the weather concerned his explanation for the difference between the trade winds in the Southern Hemisphere and those of the Northern Hemisphere. In the years immediately before Cook's first voyage, H.M.S. *Dolphin* had twice been in the Pacific. Once under Byron (grandfather of the poet) in 1765, and again under Wallis in 1767 when Tahiti was discovered. They had observed that the Southern Hemisphere trades did not extend as far away from the Equator as the Northern Hemisphere trades. Cook also found this, but drew a different conclusion from it:

"The meeting with Westerly winds within the general limets of the easterly trade is a little extraordinary, and has induced former navigators when they met with them to think that they were caused by the nearness of some large track of land but I rather think that they are owing to another cause; it hath been found both by the dolphin and us that the trade wind in those parts of this sea doth not extend further to the South than 20 degrees and without which we generally met with a wind from the westward; now is it not reasonable to suppose that when these winds blow strong they must incroach

upon and drive back the easterly winds and so cause the variable winds and swterly Swell I have been speaking of; it is well know that the trade winds blow but faint for some distance within their limets and are therefore easily stop'd by a wind from the contrary direction. It is likewise known that these limets are subject to vary several degrees not only at different seasons of the year but at one and the same season; another reason why I think that these sw winds are not caused by the nearness of any large track of land is their being always accompanied with a large swell from the same quarter, and we find a much greater surf beating upon the shores of the sw sides of the Islands just within the limets of the trade winds than upon any other part of them."

The nature of the trade winds in the Southern Hemisphere was of particular interest given the importance of the Northern Hemisphere trades for voyaging under sail.

There is also some buried weather history in the place names Cook has left us for different parts of New Zealand. For example, Hawke Bay is named after Admiral Edward Hawke who had the distinction of being the only Naval Commander in the age of sail to initiate a major battle in a full gale, thereby achieving an overwhelming victory over the French fleet at Quiberon Bay in November 1759.

The weather also played a key role in the circumstances leading up to Cook's untimely death in 1779. Several days after leaving Kealakekua Bay on the island of Hawaii, Cook sailed into an area of violent wind squalls caused by the volcanic peaks of Hawaii disrupting the trade winds. The *Resolution* was so badly damaged that Cook was compelled to return to the bay for repairs.

This he was reluctant to do because he felt that he had overstayed his welcome there. Although Cook seems to have been treated by the Hawaiians almost as a god, the visit of his two ships had imposed a considerable strain on the local food supply. On their return Cook and his people were treated with far less respect than before. Theft increased dramatically, culminating in a cutter being stolen from its moorings overnight. Cook then attempted to kidnap a chief to force the return of the boat. This led to the fight on the beach in which Cook was killed, along with four marines and 17 Hawaiians, including four chiefs.

Nor had the weather finished with Cook's family. Less than two years later, Cook's 15-year old son, Nathaniel, was drowned when his ship *Thunderer*, went down with all hands off the coast of Jamaica in a hurricane that sank 13 Royal Navy ships.

Fourteen years later, 30-year old James, the only surviving child, was hurrying to take command of H.M.S. *Spitfire* at Portsmouth when the open boat he was travelling in was caught in strong winds and swamped. His body was found washed up on the Isle of Wight near the wreckage of the boat, with a large head wound and his pockets turned out.

Cook's widow survived another forty years after the death of her last child. Late in her life a cousin wrote of her, "Like many widows of sailors, she could never sleep in high wind for thinking of the men at sea."

Of all the places in New Zealand that are named after James Cook, perhaps the most appropriate are the windy and dangerous waters of Cook Strait.

Note: The spelling and punctuation in the quotes from Cook's journals are his own, as rendered by Beaglehole.

This article was based on a talk to the Wellington Branch of the Meteorological Society in March 1996, which in turn was based on a shorter article published in the *Evening Post* to coincide with the visit to Wellington of the replica of Cook's *Endeavour* early in February 1996.

REFERENCES

- Bade, J.N. (Ed.), 1993. *The German Connection*, Oxford University Press.
Beaglehole, J.C. (Ed.), 1955. *The Journals of Captain James Cook Vols I and II*. Cambridge University Press.
Beaglehole, J.C., 1874. *The Life of Captain James Cook*. Adam & Charles Black.
Hough, R. 1994. *Captain James Cook*. Hodder and Stoughton.
O'Brian, P., 1987. *Joseph Banks: A Life*. Collins Harvill.
Smith, R.B. and V. Grubisic, 1993. Aerial Observations of Hawaii's Wake. *Journal of Atmospheric Sciences*, **15**, November 1993.
Wheeler, D., 1995. A climatic reconstruction of the Battle of Quiberon Bay, 20 November 1759, *Weather*, **50**, pp. 230–238.

Commission for Marine Meteorology — Twelfth Session (CMM–XII) 10–20 March 1997

The following are extracts taken from the report on the twelfth session of CMM:

The World Meteorological Organization Commission for Marine Meteorology held its twelfth session (CMM–XII) in the International Conference Centre, Havana, Cuba, from 10–20 March 1997. The Commission currently comprises 198 members from 112 Members of WMO, and the session was attended by 83 participants from 39 Members of WMO.

In his opening report the president, Mr R. Shearman, recognized that the past intersessional period had largely been one of consolidation of the major decisions taken and projects initiated at CMM–XI (in 1993), including, in particular, those relating to the Global Maritime Distress and Safety System (GMDSS), the Marine Pollution Emergency Response Support System (MPERSS), the Marine Climatological Summaries Scheme (MCSS) and the Global Digital Sea Ice Data Bank (GDSIDB). He also noted the advances made in the quantity and quality of data collected from a variety of marine observing systems.

Marine meteorological services

The new WMO marine broadcast system for the GMDSS of the International Maritime Organization (IMO) is now virtually fully implemented and operational. The Commission adopted some small amendments to the *Manual on Marine Meteorological Services* in order to refine the system further. It also reviewed and supported the proposals of the rapporteur concerning the international coordination of NAVTEX services in the Baltic Sea region and adopted a small addition to the *Manual* regarding the international coordination of NAVTEX services in general. The MPERSS, adopted at CMM–XI for implementation on a trial basis, is a

worthwhile but complex concept, and the Commission therefore agreed to continue the trials for another four years. It also supported the idea of convening a major seminar/workshop on MPERSS in 1998.

Marine observing systems

A number of techniques and platforms are now available for observing the marine atmosphere, the air-sea interface and the upper ocean, in support of the provision of marine services, operational meteorology and global climate studies in particular. These include the traditional voluntary observing ships (VOS), drifting and moored buoys, the Integrated Global Observing Services System (IGOSS) ship-of-opportunity programmes, the Automated Shipboard Aerological Programme (ASAP) and, increasingly, both ground and satellite-based remote sensing. The Commission acknowledged the important work being undertaken by the Data Buoy Cooperation Panel (DBCP), IGOSS and the ASAP Coordinating Committee in coordinating and managing specific components of the overall network, and congratulated these bodies on their achievements. It also recognized the continuing vital role played by the VOS in support of both services and research, as well as the importance of the Port Meteorological Officers in managing and servicing the VOS. It therefore agreed to establish a special subgroup to coordinate the operations of the VOS network, effect enhancements to data quantity, quality and timeliness and liaise with user groups. The group would also provide the liaison with INMARSAT on improving the use of its facilities for the collection of meteorological and oceanographic data from ships at sea. The Commission appointed a rapporteur on ocean satellites to liaise with the Commission for Basic Systems (CBS), the Global Ocean Observing System (GOOS) and the Global Climate Observing System (GCOS) on requirements for satellite-derived ocean data and to advise Members on the applications of such data to the provision of marine services. Further, it adopted a subgroup on radar ocean sensing to develop operational applications for ground-based ocean radars.

Ocean affairs

In addition to the long-standing, close and expanding cooperation with the UNESCO Intergovernmental Oceanographic Commission, the Commission recognized the value to WMO and to the marine programme of the collaboration which already occurs with other international organizations such as IMO, the International Hydrographic Organization, the International Association of Lighthouse Authorities, INMARSAT, UNEP, etc., and thanked those organizations for their support and cooperation.

The Commission noted with satisfaction the action already proposed within WMO and by individual Members to contribute to the celebrations of the International Year of the Ocean (IYO) 1998, including the designation by the Executive Council of the theme for World Meteorological Day 1998 as 'Weather, oceans and human activity'. It supported the initiative within the UN system to prepare a UN Atlas of the Oceans, to publicize the work of UN agencies in the marine field as a contribution to the IYO, recommended WMO's participation in the project and urged Members to make every effort to provide suitable products for inclusion in the Atlas, if requested to do so.

Acknowledgement

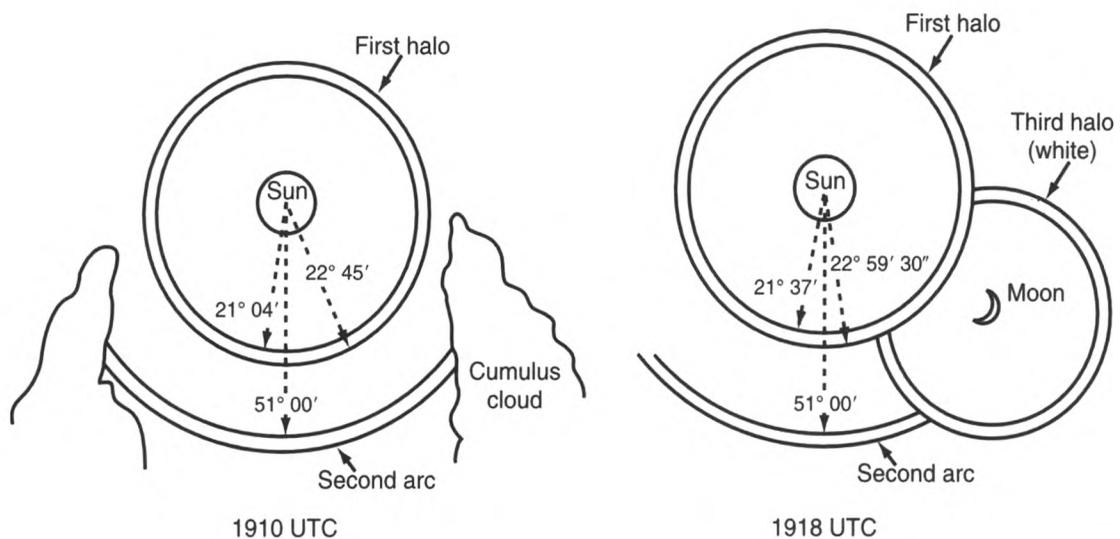
This item has been prepared from the *WMO Bulletin*, 46 (3), by kind permission of the Editor.

Halo complex

Recent reports from ships of halo phenomena have described displays of greater complexity than just a simple halo of 22° . The accounts which follow detail two events.

Case 1 — 11 May 1997.

The *Merchant Principal* (V. Ships (UK) Ltd) was in the Gulf of Mexico *en route* towards New Orleans from Cristobal. With very thin cirrostratus clouds present, a halo was formed around the sun at 1910 UTC and showed 'rainbow colours'. The altitude of the sun was $66^\circ 11'$ and the inner radius of the halo measured $21^\circ 04'$ while the outer radius was $22^\circ 45'$. At the same time, a second arc was formed below the halo and may or may not have been a section of a further halo; it was not fully formed or observed owing to three oktas of towering cumulus clouds also present, as indicated in the first sketch (not to scale). The radius of this arc from the sun was $51^\circ 00'$.

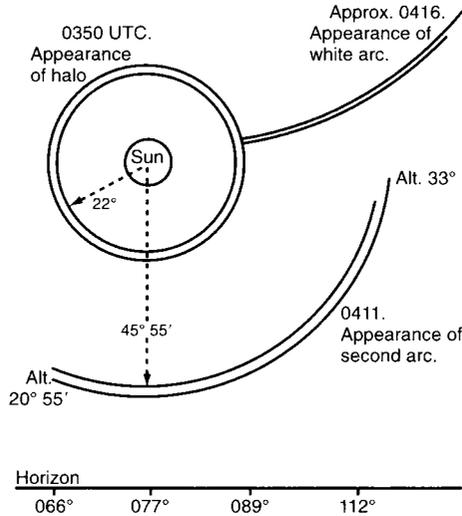


At 1918 a third halo formed which overlapped the first one, as indicated in the second sketch; this one was white in colour. Further measurements were taken at this point and the inner radius of the first halo was found to be $21^\circ 37'$, its outer radius was $22^\circ 59' 30''$ while the inner radius of the second arc was $54^\circ 18'$. No measurement of the third halo could be taken as it was quite faint but the moon could be seen inside it. All measurements taken may not have been wholly accurate because the edges of the haloes were not very well defined. The phenomenon lasted for about 45 minutes.

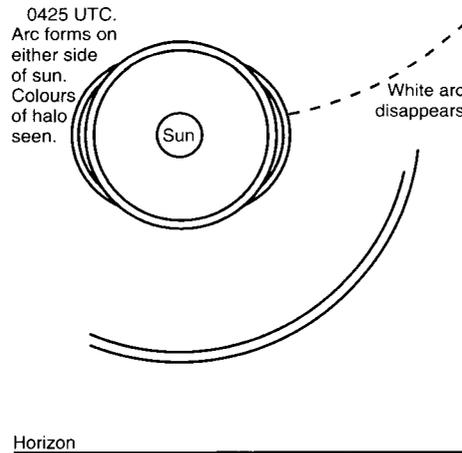
Case 2 — 23 August 1997.

The *Saudi Splendour* (Mobil Shipping Co. Ltd) was in the Indian Ocean ($06^\circ 01.4' N$, $90^\circ 58.4' E$) whilst on passage from Halul to Singapore. The halo of 22° was first seen at 0350 UTC. Its ring was clearly visible and showed vivid colouration of red nearest the sun, followed by yellow, pale-green and a bluish-white fringe at the outer edge. At 0411 another halo was observed in the form of an arc below the sun at an angular distance of $45^\circ 55'$. The lower end of the arc bore 066° at an altitude of $20^\circ 55'$ while the upper end bore 112° at an altitude of 33° . This arc, believed to be part of the halo of 46° , showed well-defined colours of red nearest the sun, and then orange, yellow, green and blue. The sun's altitude

was measured by sextant as $60^{\circ} 46' 40''$, bearing 077° . About five minutes after the appearance of the arc, a whitish arc was seen extending from the halo of 22° , leading upwards and to the right. If traced back towards the sun, it would have emanated from there. No colouration was observed. The first sketch shows the development of the complex at this stage.



At 0425 the white arc disappeared and the halo of 22° was observed to have another spectrum formed at its left- and right-hand sides level with the sun, and these spectra showed similar colouration to the small halo. The appearance is shown in the second sketch.



The phenomenon persisted almost until midday when developing cumulus clouds started to cover the sky overhead. The initial cloud cover was 6 oktas comprising cirrostratus, dense cirrus and a small amount of cirrocumulus with altocumulus also present.

Analysis

These reports were forwarded to Dr R. White, of the Institute for Research in Meteorological Optics, who commented:

“In both cases we have a halo of 22° , which requires no comment, and another arc below the sun. Such an arc could, as the *Saudi Splendour*'s observers note (Case 2), be a part of a 46-degree halo. However, the fact that only a part, below the sun, was seen, whereas the 22-degree halo was complete, suggests that it may have been tending towards the condition of an infralateral tangential arc of 46° , that is, the hexagonal prismatic ice crystals rather than being fully randomly oriented, were tending to keep their hexagonal faces vertical.

“Indeed, in the *Saudi Splendour* case, the additional coloured bands seen at the sides of the 22-degree halo form the ‘circumscribed halo’ (the form taken by the superior and inferior tangential arcs of 22° for high sun) which is produced by crystals in that orientation.

“The corresponding arc in the *Merchant Principal* (Case 1) is probably the same, although the measurements of it are not quite right; there is a hint in the account of some difficulty in the observation of this halo, which may perhaps have been productive of some error.

“The ‘white arc’ in Case 2 is clearly a part of the parhelic circle. The white halo in Case 1 I at first thought might be a halo produced by the moon, but such would, as far as I can recall, be unprecedented with the sun high in the sky, and seems unlikely for such a thin crescent moon as seems to be involved here. Nor is it clear why such a halo should be invisible inside the solar 22° degree halo; only in a very dusty atmosphere would the background brightness there outweigh that of the ‘tail’ outside the solar halo, so reducing the contrast.

“Therefore, allowing for the difficulties in determination of the vertical through the sun at the elevation in question, I suspect that what we have here is another observation of the parhelic circle. That the observer has not recalled every orientation precisely is shown by his drawing the crescent moon concave to the sun. The non-observability of the parhelic circle within the 22-degree halo is more usually associated with lower sun [altitudes] when the parhelia are visible (they are usually the actual bounds) but we may again compare with Case 2. (It occurs to me that the rather excessive measurements of the lower arc in the *Merchant Principal* case may be the result of their not having been taken vertically below the sun, if it was truly a lateral tangential arc of 46° rather than the 46-degree halo itself.)”

Acknowledgment

Our thanks to Mr A. Dutt, Second Officer on the *Merchant Principal*, to Captain I.D. McKenzie, Mr A. Balaguer, Third Officer, Mr R. Saludez, Third Officer, Mr C. Sanz, Second Officer and Mr K. Meyer, Electrician on the *Saudi Splendour* for their observations, and to Dr White for his analysis of the sightings.

Electrifying experiences at sea

A definition

Lightning is defined as simply a visible electric discharge associated with a thunderstorm, while St Elmo's fire is described by WMO as a more or less continuous, luminous electrical discharge of weak or moderate intensity in the atmosphere, emanating from elevated objects at the Earth's surface (lightning conductors, wind vanes, masts of ships) or from aircraft in flight (wing tips, propellers, etc.).

The complexity of form within these bland definitions is not even hinted at, and it remains for the human senses to appreciate aspects of colour, brightness, sound, motion and even the feel of a discharge.

They say that if one should be caught in open space when a thunderstorm is close by, then the safest thing to do is to find a ditch (a dry one at that) and lie in it, thereby removing a potential lightning conductor, in the form of a human body, from being found overwhelmingly attractive by the surrounding highly-charged atmosphere. In the absence of ditches most of our observers — most of them, take shelter in the wheelhouse when there is a storm nearby. By coincidence, several of P&O Nedlloyd's container vessels had first-hand experience of a variety of electrical activity between July and September 1997; numerous other observers will have experienced similar events, although few would probably want to share in a repeat of the following account.

Storm meets ship — shock tactics

If you happen to be engaged in forward mooring operations and are concentrating on the job in hand when lightning strikes the bulwark just to your rear, checking whether you still possess all the equipment with which you entered the world would seem of paramount importance, with the search for shelter being rather like locking the stable door after the horse has bolted. On 2 July 1997 in extremely heavy rain, the *Oriental Bay* was making fast alongside MTL Berth 13A, Stonecutters Island (Hong Kong) when a bolt of lightning, accompanied by a tremendous clap of thunder, struck the focsle bulwark on the stem, leaving the guard rails surrounding the winch levers glowing blue (Figure 1).

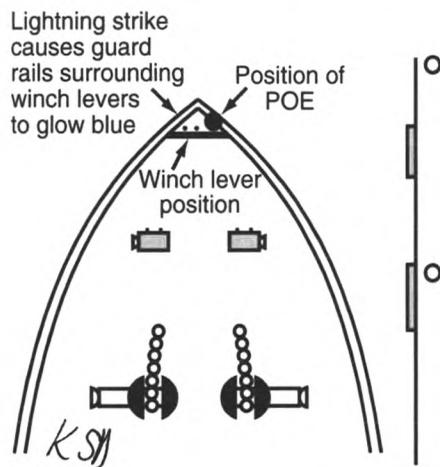


Figure 1

The POE, who was leaning on the rails at the time, experienced an electric shock up his left arm, while the Chief Officer who was on the bridge, reported a 'static tingle' through the VHF radio in his hand, and high levels of static charge

were felt throughout the vessel. Another crack of thunder shortly afterwards, not surprisingly, had everyone diving for cover although the lightning strike, if there was one, was not visited upon the ship.

Ship meets storm — a hair-raising experience

In the previous event, it was the storm that approached the vessel; in other cases it is the vessel's course which takes it close to or through electrical activity, sometimes with spectacular sights resulting. The *Colombo Bay* was in the Mediterranean Sea, north of Tunisia, on 7 August 1997 when it entered an electrical storm. At 1855 UTC the nature of the activity was almost continual sheet-lightning illuminating the night sky like a strobe-light. The culprit causing the display was a cumulonimbus cloud (Cb) with a base at about 2,000 feet, below which, displayed in stark relief by the lightning, was a roll of cumulus cloud based at 450 feet, and reaching a height of 1,000 feet. Small bolts of forked lightning apparently about 15 m long appeared from the Cb base but did not 'ground' although they sometimes arced across a distance of about 60 m to re-enter the cloud (Figure 2).

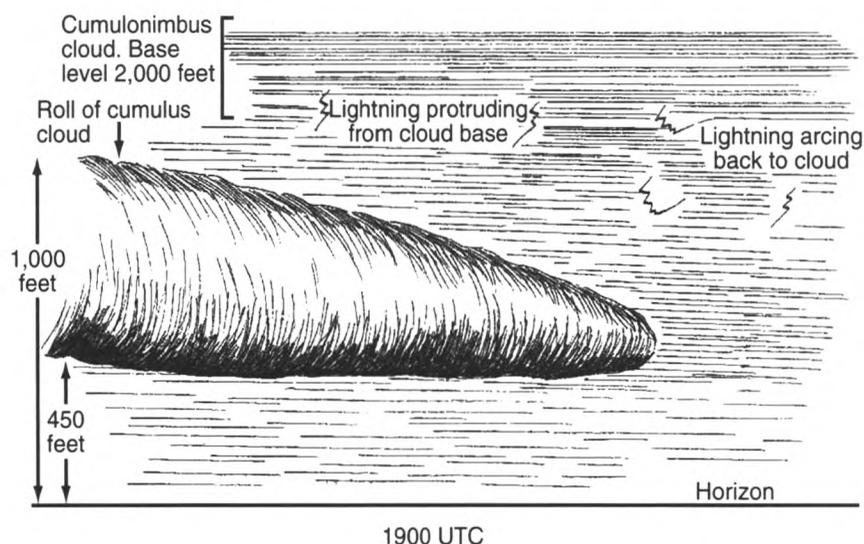


Figure 2.

On passing beneath the roll cloud, the vessel also experienced a sharp increase in wind for a brief time although no rain fell. Beyond the roll cloud, the lightning changed mainly to the forked form and arced between various parts of the Cb cloud, now stretched across the whole sky. As the vessel passed to clear skies on the other side of the storm, the lightning was almost continuous; additionally, the highly-charged atmosphere caused corpusants (St Elmo's fire) to emanate from the corner of the bridge-wing taffrail and aerial tips although, unusually, radio reception was not affected. A crackling noise, originating outside, could be heard from the wheelhouse and then some bright 'sparks', in a manner of which Benjamin Franklin would have approved, went outside to conduct their own experiments. The watchkeeper's grey hair was first to react, like that of the proverbial 'Mad Professor', standing on end, and then hands were held in the air-flow to the side of the ship, resulting in finger tips which were duly decorated with St Elmo's fire. Third Officer C. Robins, on the *Singapore Bay*, also had first-hand experience of electrostatics on 10 August 1997 when south-east of Kyushu, his hair too stood on end.

Fingers in the 'fire'

The action of holding arms either aloft or in the air-flow to the side of a ship, in a highly-charged atmosphere, is a party-piece favoured by the corposants observer. Third Officer C.W. Longmuir and E.R. Robson, SMS, took the latter option on 7 July 1997 when the *Colombo Bay* was nearing the northern end of the Strait of Malacca, and static crackle was heard on the MF/VHF radio when near a large Cb cloud. With St Elmo's fire already visible on the aerials and bridge taffrails, they made the phenomenon appear on the finger tips of their outstretched hands. Second Officer R. Noble and S. Lynn, SMS on the *Oriental Bay* in the Mediterranean on 22 September 1997, also felt a curiously irresistible urge to direct their arms upwards and outwards into the ether and delivered an effect to their hands similar in appearance to the old British Gas adverts in which thumb and finger-tips seemingly 'ignited'. Their flaming finger tips were each adorned with a short shaft (12 mm) of intense blue light which then fanned out for the same distance but with a far less intense light. Indeed, St Elmo's fire may even induce culinary hallucinations, since we hear that its sound, when audible, can be likened to frying bacon — smoked of course, with an egg and hash-browns!.

'Disneyesque' effects

The majority of instances of St Elmo's fire reported to us concern flame-like 'tufts' or streamers of blue or violet light but the phenomenon can produce other effects. If golf balls chasing up and down an aerial seems rather 'Disneyesque' and fanciful, it is nevertheless quite possible. On 2 August 1997, the *Cardigan Bay* was in a heavy monsoon downpour between Singapore and Colombo when it was noted that the port bridge-wing aerial had developed a glowing ball 'electric-blue' in colour, about the size of a golf ball. A few minutes later, the aerial had developed a glow that stretched about 2 m down from the tip while other smaller ball shapes were chasing up and down the aerial in a disco-light way. When the rain receded and the bridge wing was once more accessible, it was noted from there that the foremast was also experiencing similar effects while all the main mast aerials and insulators were glowing blue.

Acknowledgment

Our thanks to the Masters and Observing Officers of the *Colombo Bay*, *Oriental Bay*, *Cardigan Bay* and *Singapore Bay* who contributed the observations on which this item was based.

AURORA NOTES JULY TO SEPTEMBER 1997

BY R.J. LIVESEY

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

The months of July and August were quiet magnetically and aurorally in the mid-latitudes. Minor activity comprising quiet glows or homogeneous arcs was noted by land observers in the Forth and Clyde areas of Scotland on 28/29 July, 27/28 and 29/30 August. Magnetic disturbances on 30 and 31 July correlated with glows and rays observed from Halifax, Nova Scotia.

On 29 August there was an event in the Sun's outer atmosphere called a coronal mass ejection when a large cloud of electrified particles was ejected into space. This encountered the Earth to produce magnetic and auroral storms on 3/4 September. Active auroral forms were observed all over Scotland, Northern England and Northern Ireland to an altitude of 50 degrees, and to 90 degrees in Orkney. Activity began at around 2100 UTC and was noted until about 0200.

In September further auroral activity was seen from the UK comprising quiet light in the Moray Firth on 6/7, a glow in the Clyde Estuary on 9/10, rays at the Moray Firth on 10/11 and at Leith on 12/13. A glow was seen from Leith on 13/14 and a quiet arc from the Moray Firth on 20/21. There was a marine sighting on 21/22 September from the *Durrington* in position 67° 00' N, 10° 49' E; this was the only report from ships during the quarter, and was very interesting for it was not reported by any other observers. [This report is covered on page 108].

The photographs were taken at intervals on 13/14 September by Terry Ashton, an amateur aurora observer living just west of Reykjavik; they show the difference in form and colour between the polar auroral type of activity and that of the storm aurora when it has expanded into the lower latitudes.



13/14 September 1997 at 2227 UTC. The aurora photographed from position 64° 09' N, 22° 00' W, with the centre of field-of-view bearing 058°. The Seven Sisters, or Pleiades, star cluster is centred on azimuth 063°, elevation 14°.



T. Ashton



T. Ashton

Left (top): 13/14 September 1997 at 2228 UTC. Centre of field-of-view bearing 038°. The brightest star is Capella (alpha Auriga) at azimuth 036°, elevation 27°.

Left (below): 13/14 September 1997 at 2230 UTC. Centre of field-of-view bearing 279°. The bright star immersed in auroral light is Arcturus (alpha Boötis) at azimuth 283°, elevation 15°.

In the last two years auroral and magnetic activity has been very low in the mid-summer months. Activity has been more evident in the spring and autumn periods, and this is a pattern discernible in the records over the years. The new sunspot cycle has begun but as yet auroral and magnetic activity is generally very low. However, a number of significant events are taking place of which that of 3/4 September is typical. It is hoped that as the sunspot cycle develops there will be more interesting auroral events to observe.

Letters to the Editor

Turtle watch

17 August 1997, position 33° 58' N, 20° 20.5' W. It was one of those Sunday afternoons that we all come away to sea for! Smooth sea, blue skies, no wind and nice comfortable temperatures [air temperature 24.6°]. I arrived on the bridge at about 1500 UTC to find that Dave [McNicoll, Gas Engineer] and Bob [Burn, Electrical Superintendent] were on the starboard bridge wing peering intently over the side through binoculars. When I quizzed Conor [Deasy, Second Officer] about what was the object of their undivided attention, I was told, "Turtles!"

At intervals of about a minute, a turtle, basking on the sea surface, was sighted drifting down the starboard side at anything between 20 m and 100 m from the ship. During the watch handover, it became apparent that recumbent turtles were passing down the port side as well.

The turtles were 50–60 cm long and were all giving the appearance of sunning themselves. In each case the top of the carapace was well clear of the water and looked as if it was bleached a tan/white colour, although it could have been baked-on salt. The carapace that was immersed was the rich tortoise-shell (turtle shell?) colour familiar to us all. The underside of the flippers, as we were to see shortly, was very pale as compared to the upper surfaces.

Most of the turtles barely acknowledged our passage, others merely flicked a lazy flipper to re-orientate themselves to get a good look at us as we passed. However, one, obviously feeling that its virtue was under threat, dived and could clearly be seen heading for the deep using its powerful front flippers. Our last sighting of what must surely have been a widespread group, was at 1610 when a pair were sighted drifting about a metre apart and about 30 m off the ship's side. Both turtles flipped themselves round to peer back up at us all.

Our turtle watchers, obviously having a low boredom threshold, were about to stand down having seen nothing for about five minutes when, suddenly, more binocular activity ensued! Two sharks, each about 1.2 m long, were spotted just

below the surface of the sea. At our approach and during our passing, they slowly headed away south, fins not breaking the surface but still leaving 'V-shaped' ripples. As Dave remarked, it looked as if they were working their way along the food chain!

Single turtles were spotted at 1730 and again at 1820. Then, at 1920, at a distance of about 8 cables to starboard, a lot of surface activity was seen. Closer observation with binoculars revealed, at the very least, two jet-black whales (pilot whales?) rising and blowing at regular intervals of about ten seconds. They appeared to be accompanied by a group of what we took to be large dolphins which were doing much the same thing, though the more energetic among them were managing a fair amount of splashing. The 'whales', which seemed to be staying within a particular area were, at a guess, about 4 m long, had a very rounded head, a short 'beak' and the dorsal fin looked as if it had been cropped of square. They were visible for about five minutes before distance rendered them invisible.

Finally, at 1938, six small dolphins, each only about 1 m long, could be seen clearly below the surface, riding the front slope of one of the waves generated by the ship. They played like this for about three minutes before moving off to the south.

Mr S. Gallaway, Chief Officer on the *Maersk Surrey* (The Maersk Co. Ltd)

'Sea cucumbers'

On 18 September 1997 at 2055 UTC Mr B. Tasker (Second Officer) states that he was listening to the frequency of 12095 kHz in H3E mode when he heard 'voices' — similar to the BBC World Service announcers — advising that 5,000 cucumbers with coloured ping-pong balls attached, had been sea-launched at five separate locations around the Irish Sea. The voices further stated that the project was Government-funded to the tune of £500,000 and was intended to determine current flow. Two additional personnel, Chief Officer S. Cole and GP1 Lookout G. Crawforth, are also said to have been listening but now say they are humouring the Second Officer.

All 14 personnel on board are willing to submit names for allocation to the 'cucumber watch' position, perhaps obviating the need for advertising the post and thereby reducing costs. Certainly, the Master is desirous of a long-term 'watch' in Grand Cayman. On the other hand, the majority view on board is that the 'voices' have been 'interpreted' from spurious interference by a crew member wishing to participate in a vegetarian diet.

(If there is any truth in this item, we look forward to an article in *The Marine Observer* in the future.)

Ship's company of the *Seki Pine*. (Denholm Ship Management UK Ltd)

Editor's note. We come down on the side of Mr Tasker. Although unable now to confirm the exact details, at the time we were aware of UK regional television reports of cucumbers being used to help identify currents in the Irish Sea. Evidently there was radio coverage as well. Apparently the cucumber floats well until it disintegrates and does not harm the marine environment but it is very difficult to spot, hence the attachment of highly visible ping-pong balls. Precisely what happened to the ping-pong balls is not known but it would be nice to think that they were somehow collected up after the experiment.

Giant squid

On page 39 of the January edition of this journal we published a letter from Captain C.A. McDowall referring to past sightings of giant squid. Dr Frank Evans, of the Dove Marine Laboratory, has since commented that:

“The reference is undoubtedly to a giant squid, of which there may be only one true species worldwide, *Architeuthis dux*, although fifteen nominated species have been described. Part of the difficulty is that the distribution of *Architeuthis* is antitropical. It is found in boreal waters of the Atlantic and Pacific and circumglobally in the Southern Ocean. No mention of the Arabian Sea. However, the sheer size of the creatures reported and illustrated [not shown] precludes other species. *Architeuthis* grows to 5 m in body length, with a total length including tentacles, of 18 m. The next in line, which appears to be *Dosidicus* (= *Ommastrephes*) *gigas*, the giant squid of Peru and Chile, with a body length of 1.2 m, is ruled out by location.

“The bright-red colour is less of a problem. Although less chameleon-like than octopuses and cuttlefish, oceanic squid still have great powers of altering their appearance, sometimes as camouflage, sometimes betraying emotion. The picture that the writer refers to in Russell and Yonge’s book *The Seas*, is one of the small common squid of European waters and so does not apply.

“I cannot say why animals of such disparate size, from ‘bucket-size’ upwards, should appear together. If they were a breeding group then some were destined to die at a much smaller size than others, for all squid (and octopuses) breed only once before expiring. So it is more likely that they were swarming for some other purpose. More I cannot say.

“The supposition mentioned, that giant squid have never been seen alive, is no longer correct. Of course, there are old reports of ‘kraken’ attacking fishing boats, and some are doubtless accurate, but in recent years some giant squid have been caught by large fishing trawls.”

Book Review

Maritime Education and Training, a practical guide. 298 mm × 215 mm, 332 pp, illus. ISBN 1 870077 41 5. Published by The Nautical Institute 202 Lambeth Road London SE1 7LQ (in conjunction with the World Maritime University). Price: £60.00 (£42.00 for members of The Nautical Institute) plus postage.

This book is a complete and authoritative manual divided into five sections. Starting with the fundamentals and theory of education it progresses naturally and logically through ‘Concepts’, ‘Resources and Technology’, ‘Organisation’, ‘Assessment and Evaluation’, and finalises on ‘Specialisation’ at the more advanced and specialist ends of the spectrum. There is emphasis on the need to continue ‘on the job’ training at sea in specialist and general areas in order to consolidate and expand the theoretical knowledge already acquired.

The sections of the manual are further sub-divided into chapters written by a variety of eminent and distinguished experts gathered from shipping, educational establishments and management. Whilst it may be unfair to single out any individuals among the writers, the chapters by Captain Piet Pols on ‘Simulators’, Captain Nigel Hunt on ‘Shiphandling on the Marchwood Lake’, Glyn Cunnah’s

'Training of Trainers' and Captain James Simone's 'Training Ship Training' were amongst those found to be most interesting. The combined knowledge and skills of all the contributors to the book are lucid, well presented and awesome.

It is a little 'dry' in places and, at £60.00, the book is expensive. However, bearing in mind its probable limited circulation and the amount of knowledge it contains, a publication of this stature is seldom available and should be accessible on every maritime bookshelf, and studied and practised by all connected with training in the nautical industry, being of immense value to both tutor and pupil alike.

Captain J. Roe
Port Met. Officer (South-west England)

Personalities

RETIREMENT — CAPTAIN J.A. WILLIAMSON retired from the post of UK Port Met. Officer for North-west England in May, having succeeded Captain A. Britain in 1993.

James Alfred Williamson was born in April 1935 in Bradford (Yorkshire) commencing pre-sea training at T.S. *Seacroft*, Marine School South Shields in 1950, joining Manchester Liners in 1951 to "serve his time", and obtaining his 2nd and 1st Mates Certificates in 1955 and 1957 respectively.

He joined Atlantic Steam Navigation Company 'Transport Ferry Service' in 1957, serving in L.S.T. ships (World War II designed landing craft) and later in the m.v. *Bardic Ferry* and *Ionic Ferry* which were probably the first two custom-built ro-ro ships operating in Britain and Europe. This new experience came to a premature end in 1959 when his qualifying sea service for his Masters Foreign-going Certificate, while serving in home-trade ships, came into question, resulting in a return to Manchester Liners to gain a further month of sea time. Later, this was proved to have been unnecessary owing to wrong interpretation of the rules by an Examiner of Masters and Mates.

On passing his Masters Certificate in 1961 he remained with Manchester Liners, being promoted Chief Officer in 1963 and Master in 1974. After a period of ill health in 1978 he continued to serve as Superintendent for the company at Manchester, Liverpool and Greenock container terminals until the company's demise and mass redundancy when taken over by C.Y. Tung of Hong Kong, in 1981.

The increasing decline in British shipping during this period resulted in Captain Williamson serving in a foreign flag company, Hanseatic Shipping, and latterly in North British Shipping prior to a period of self-employment.

He joined The Met. Office Headquarters in Bracknell in 1986 as specialist Sea Ice Officer, transferring to the Office's ship routing division, Metroute, in 1987 where he was soon to become its senior member until 1993. During this seven-year period he commuted from his home in Longton, Lancashire as he and his wife were unable to reside nearer The Met. Office owing to a commitment to their youngest daughter's severely brain injured eldest son, Daniel.

His new appointment to Liverpool in 1993 was, in his own words, "very much appreciated and it goes without saying, thanks to all who helped make this possible".

Asked if there were any high points and memorable events during his varied career he said there were many, certainly too numerous to mention but one of them was the opportunity to serve in the nautical division of The Met. Office; it was a profound and challenging experience, particularly when working in Metroute situated in what was then known as the Central Forecasting Office, and which he saw as the “hub” of The Met. Office. He said light-heartedly that, “we were only on the ‘rim’ and ‘down by the head’ with Captains”. He hopes The Met. Office and seafarers will continue to be closely linked.

He and his wife Anne celebrate their 40th (Ruby) wedding anniversary this year and plan a few days in Paris. Presently, their future plans are to remain living close to their two daughters and six grandchildren, also hoping to be able to follow their many interests together, with the exception of sailing. Anne has been everything to him except a good sailor, which was unfortunate as, unlike many of his colleagues he was unable to know the joy of having her with him at sea during the period that this became a ‘perk’ of the job; nevertheless, she has always appreciated his commitment and love for ships and anything to do with the sea.

We would like to take this opportunity to thank Captain Williamson for all his valuable work over the years and wish him a long and happy retirement.

Notices to Marine Observers

Unclaimed Excellent Awards for 1996

A significant number of Masters and Observing Officers have yet to claim their Excellent Awards for 1996. The following lists contain the names of those who, in August 1997, were sent letters of notification that they had been so awarded but who have not responded to date (according to our records). These awards should be claimed as soon as possible by contacting us either direct at the Editor’s address at the front of this journal, or through any UK Port Met. Officer.

Captain:

J.H. Birchenough, R.A.C. Bourne, P.J. Brown, C. Bunt, W.A.J. Cameron, A.J. Clarke, R.N. Cumbers, G.M. Gray, W.J. Harwood, R. Kararia, S.J. Kembery, M.L. Kinnear, M.R. Lovibond, C.I. MacKillop, D. Marr, P.G. Pinkerton.

Observing Officers:

M.A. Adams, L.G. Alayon, E. Almeida, J.H. Ansari, R.B. Arenal, L. Attri, T.A. Badawi, R.D. Basilio, A.C. Beltran, R.J. Camara, R.M. Canete, T. Catchpole, M. Crofts, M.F. D’Silva, A.M. Diana, N.D. Dalangin, E. Espera, C.J. Etherington, T.R. Falk, F.C. Favillaran, A. Firman, F.P. Flores, F. Girado, R. Gozon, D.E. Grief, I.L. Guinoo, J.S. Hallam, R.A. Ibasco, S. Ilisan, R.V. Inserto, S. James, M. Jarecki, J.A. Josue, H.J.M. Katindoy, J. Kazi, P. Kochhar, V. Koothur, P. Kuruvilla, T.T. Latto, M. Light, P.M. Lontoc, G. Mallick, P.T. Martinez, F.O. Momongan, L.O. Moreno, B. Nalam, R.G. Nemmara, F.P. Nidoy, R.A. Nieto, A.I. Osman, R.B. Patil, C. Pritchard, H. Rameshwar, R.M.C. Ramos, R.L. Reazo, H.I. Salarzon, R.T. Santos, S. Singh, A.K. Singhanian, E.L. Sumbillo, C. Thomas (MARID), L.P. Tipo.

The Shipping Forecast — BBC Radio 4

In the April edition of this journal we published new times for the Shipping Forecast on BBC Radio 4, correct at the time of going to press and which would be in force from 6 April. However, a further amendment was made and mariners are now probably aware of the finalised times for the broadcasts, which are:

0048 0535 1201 1754

The broadcast at 0535, on both LW and FM, ends with the Inshore Waters report (the broadcast at 0048 is unchanged). The broadcasts at 1201 and 1754 are on LW only, except for Saturdays and Sundays when the 1754 is also available on FM. They consist of the general synopsis and area forecasts.

Fleet Lists

Fleet Lists

UNITED KINGDOM — Information dated 15 March 1998

The names of Masters, Observing Officers and Radio Officers (where carried) are as given in the latest meteorological logbooks received to 15 March 1998.
KEY: **Bold** face indicates a Radio Officer.

* denotes a recently recruited ship from which a logbook has not yet been received.

† denotes a ship from which no logbook has been received during the last 12 months prior to the above date.

All logbooks received will be acknowledged by the Observations Voluntary (Marine) branch of The Met. Office. Port Met. Officers will call on vessels as opportunity permits or upon request. **Masters or operators of ships are particularly requested to advise the Marine Superintendent or a Port Met. Officer of any circumstances which may call for the removal from the ship of equipment loaned by The Met. Office.**

Selected and Supplementary Ships

NAME OF VESSEL	LAST RETURN RECEIVED	MASTER	OBSERVING OFFICERS and RADIO OFFICERS	OWNER/MANAGER
<i>Abbey</i>	2.2.98	R. Whistler	T. Aherne, J. McCorquadae, C. Jackson	Furness Withy (Shipping) Ltd
<i>Aberdeen</i>	†	—	—	Northern Marine Management Ltd
<i>African Ruby</i>	†	—	—	MOL Tankship Management Ltd
<i>Al Awdah</i>	13.11.97	A.R. Wilkinson	Al Alemi, Al Sulaihem, C. Dixit, J.M. Aupala	Kuwait Oil Tanker Co.
<i>Al Funtas</i>	19.6.97	A.R. Wilkinson	A.A. Mohammad, A. Khela, S. Rajeev, A.S.J. Valencia	Kuwait Oil Tanker Co.
<i>Al Samidoon</i>	†	—	—	Kuwait Oil Tanker Co.
<i>Al Shuhadaa</i>	18.11.97	M.L.J. Aranha	H.M.D. Motohar, W. F. Hamadith	Kuwait Oil Tanker Co.
<i>Al Tahreer</i>	†	—	—	Kuwait Oil Tanker Co.
<i>Al Wajiba</i>	23.12.97	F.M. Khazragy	P.M. Zookhar, I. Ul Haq, A.F. Papa	United Arab Shipping Co. (S.A.G.)
<i>Alam Selaras</i>	†	—	—	Pacific Carriers Pte Ltd
<i>Alexis</i>	†	—	—	Seaplan Shipping Ltd
<i>Alkman</i>	1.12.97	C.P. Subramanian	M. Mesbahuddin, S. Partha, I. Vsiezkin, S.O. Nyamekye	Wallem Shipmanagement Ltd
<i>Alliance</i>	2.10.97	L. Holschmidt	J. Constable, D. Wood, W.M. Terry, G. Jones	Denholm Ship Management (UK) Ltd
<i>Alpha Centauri</i>	24.2.98	A.K. Khot	B. Zaman, R. Ahmed, D.S. Gomez	Wallem Shipmanagement Ltd
<i>Ambon</i>	15.12.97	R.J. Paes	J. Joseph, M. Zubair, A. Babar, C.J. D'Souza	Wallem Shipmanagement Ltd
<i>Amfirititi</i>	*	—	—	Acomarit (UK) Ltd
<i>Anja C</i>	14.10.97	J.W. Jackson	W.E. Danby, C.B. Feierabend	Carisbrooke Shipping plc
<i>Appleby</i>	1.12.97	B. Middleton	D. Bridgeman, H.M. Herath	Ropner Ship Management Ltd
<i>Arcadia</i>	*	—	—	P&O Cruises Ltd

<i>Arctic Goose</i>	11.9.97	D. Subotic	R. Sobrepena, R. Brummitt, D. Kovacevic, B. Miksic	Holy House Shipping AB
<i>Arctic Ranger</i>	14.10.97	A.W. Walker	M. Allison, M. Allison	Boyd Line Management Services Ltd
<i>Arctic Spirit</i>	30.10.97	T.R. Burke	S.Q. Europa, R.C. Cubilo, J.K. Cadiente, D.A.P. Dias	London Ship Managers Ltd
<i>Arctic Swan</i>	†	—	—	Holy House Shipping AB
<i>Argentina Star</i>	16.2.98	J.F. Dobson	V. Crismando, D. Cometa, D. Pablo	Blue Star Ship Management Ltd
<i>Arktis Vision</i>	†	—	—	Elite Shipping A/S
<i>Arunbank</i>	26.11.97	J.P. Warren	F.J. Rogers	Andrew Weir Shipping Ltd
<i>Astrid</i>	6.10.97	C.M. Tower	P. Compton, D.T. Stinson, A. Smith	J. Fooks
<i>Atlantic Liberty</i>	†	—	—	MOL Tankship Management Ltd
<i>Auckland Star</i>	28.10.97	S.G. Mortimer	P.F. Senador, F.N. Alcazar, C.J. Jimenez	Blue Star Ship Management Ltd
<i>Auk Arrow</i>	22.4.97	J. Misra	V. Cedric, S.V. Chandran, J. Shambhu	Gearbulk (UK) Ltd
<i>Author</i>	19.1.98	N. Brewer	P. Doyle, R. Mallo, R. Ducanes	Safmarine Ship Management
<i>Aya II</i>	13.10.97	V.G. Cruz	J.De.J.H. Dominguez, J.B.R. Garcia, J.M. Ravell, J.R. Prieto	Transportacion Maritima Mexicana
<i>BT Nautilus</i>	†	—	—	BT Shipping (London) Ltd
<i>BT Navarin</i>	†	—	—	BT Shipping (London) Ltd
<i>BT Navigator</i>	17.6.97	M.J. Bromwich	I.B. Pinto, N. Puneet, P.T. Reddy, L. Murlidhar	BT Shipping (London) Ltd
<i>BT Neptune</i>	†	—	—	BT Shipping (London) Ltd
<i>BT Nestor</i>	26.1.98	C.J. Bland	X.T. Colaco, M.K. Budania, A.K. Thakur, Nabullah	BT Shipping (London) Ltd
<i>BT Nimrod</i>	†	—	—	BT Shipping (London) Ltd
<i>BT Siream</i>	†	—	—	BT Shipping (London) Ltd
<i>Baltic Breeze</i>	22.9.97	D. Markisic	—	Wallenius Lines (Japan) Ltd
<i>Baltic Eagle</i>	†	—	—	Andrew Weir Shipping Ltd
<i>Baltic Eider</i>	†	—	—	Andrew Weir Shipping Ltd
<i>Baltic Spirit</i>	1.12.97	P.M. Frost	P.B.N. Gunbroma, J.M. Marisrela, N.V. Lanante	London Ship Managers Ltd
<i>Baltic Tern</i>	3.11.97	K.F. Steven	R.E. Parker, M. Causon, A. Thomson	Andrew Weir Shipping Ltd
<i>Belo Oriente</i>	29.9.97	C.P. Deshpounde	J.A. Singh, A. Williams, J.J. Alphonso, N. Reys	Eurasia Ship Mgmt. Co. (HK) Ltd
<i>Berlin Express</i>	23.2.98	A.J. Fee	J.C. Geddes, R.J. Hughes, W.D. Hope	P&O Nedlloyd Ltd
<i>Blue Flame I</i>	9.2.98	F.J. Powderill	F.J. Powderill	Boston-Putford Offshore Safety Ltd
<i>Botary Bay</i>	5.9.97	S.G. Millar	M.K. Hill, C.K. Urwin, M.G. Lamb, T.B. Bayley	P&O Nedlloyd Ltd
<i>Bow Tribute</i>	*	—	—	MOL Tankship Management Ltd
<i>Bransfield</i>	12.5.97	J.B. Marshall	R. Kilroy, G. Morgan, N.J. Bailey, C. Waddicor	British Antarctic Survey
<i>Brenda</i>	17.2.98	R.G. Murch	D. Larry, P. Freddie, P. Giles	Great White Fleet Ltd
<i>British Admiral</i>	14.2.97	C.R. Shoolbraid	L.M. McEwan, P.N.W. Collins, L. Campbell, R.M. Lucas	BP Shipping Ltd
<i>British Adventure</i>	14.11.97	J.O. Bailey	M.J. Walker, M. Murphy, P.M. Thompson	BP Shipping Ltd
<i>British Argosy</i>	28.10.97	M. Pocklington	J.G. Preston, M.P. Radochonski, R.K. Harding	BP Shipping Ltd
<i>British Esk</i>	†	—	—	BP Shipping Ltd
<i>British Harrier</i>	*	—	—	BP Shipping Ltd
<i>British Hawk</i>	5.3.98	K.E. Peacock	P. Cavagan, S.D. Ware, J.G. Preston, K. Smith	BP Shipping Ltd
<i>British Ranger</i>	23.12.97	D. Lewis	M.A. Cumpstey, L. Booth, J.M. Davis	BP Shipping Ltd

Selected and Supplementary Ships (contd)

NAME OF VESSEL	LAST RETURN RECEIVED	MASTER	OBSERVING OFFICERS and RADIO OFFICERS	OWNER/MANAGER
<i>British Reliance</i>	8.12.97	C. Rowdon	T. Ruth, C.G. Vernon, N. Hall	BP Shipping Ltd
<i>British Resolution</i>	2.12.97	J.Y. MacAlpine	P.M. Belcher, M.M. Robinson, A. Chruscinski	BP Shipping Ltd
<i>British Resource</i>	20.11.97	A. Macleod	A.C. Clark, S.P. Moss, M. Rickaby	BP Shipping Ltd
<i>British Skill</i>	3.3.98	J.P. Dunne	A.C. Paterson, R.D. Holt, A.J. Short	BP Shipping Ltd
<i>British Spirit</i>	27.10.97	B. Wardman	M. Gubala, P. Bartlott, D.P. Lee	BP Shipping Ltd
<i>British Steel</i>	†	—	—	Furness Withy (Shipping) Ltd
<i>British Success</i>	†	—	—	BP Shipping Ltd
<i>British Tamar</i>	8.8.97	T.L. Cullen	D. Lavery, D.P. Lee, R.K. Harding	BP Shipping Ltd
<i>British Valour</i>	*	—	—	BP Shipping Ltd
<i>Buenaventura</i>	†	—	—	Jardine Ship Management (UK) Ltd
<i>Buffalo</i>	18.4.97	J.D. McCann	J.F. Barkley, A.G.K. Hamilton, A. Scales	P&O Ship Management (Irish) Ltd
<i>C.S. Iris</i>	†	—	—	Cable & Wireless (Marine) Ltd
<i>C.S. Monarch</i>	†	—	—	Cable & Wireless (Marine) Ltd
<i>C.S. Nexus</i>	13.1.98	T.D. Faithfull	J.P. Vine, P.G. Lloyd, I. Pinney	James Fisher & Sons (Liverpool) Ltd
<i>C.S. Sovereign</i>	†	—	—	Cable & Wireless (Marine) Ltd
<i>CSAV Los Angeles</i>	†	—	—	Cable & Wireless (Marine) Ltd
<i>Cableman</i>	†	—	—	Jardine Ship Management (UK) Ltd
<i>Cable Innovator</i>	†	—	—	James Fisher & Sons (Liverpool) Ltd
<i>Cable Installer</i>	†	—	—	Cable & Wireless (Marine) Ltd
<i>Cable Retriever</i>	†	—	—	Cable & Wireless (Marine) Ltd
<i>Cabo Negro</i>	13.10.97	J.P. Stallaert	E. Gonzales, R. Darko, M. Hingpit, U. Lucis	MOL Tankship Management Ltd
<i>Caledonian Isles</i>	19.1.98	I. Beggs	D. MacNeil, G. Gellatly, S. Wright	Caledonian MacBrayne Ltd
<i>CanMar Conquest</i>	†	—	—	Canada Maritime Agencies (Montreal)
<i>CanMar Courage</i>	10.11.97	R. Kumar	W. Ferandes, A.K. Sarma, S. Bakshi	OOCL Agency Ltd
<i>CanMar Endeavour</i>	*	—	—	Canada Maritime Agencies (Montreal)
<i>CanMar Fortune</i>	29.1.98	J.P. Simcox	M.H. Surve, C.C. Fernandes, D.M. Das	OOCL Agency Ltd
<i>CanMar Glory</i>	3.11.97	J.M. Mistry	S.M. Prabhakar, S. Jinly, V. Khurana, P. Raina	Canada Maritime Agencies (Montreal)
<i>CanMar Success</i>	†	—	—	Canada Maritime Agencies (Montreal)
<i>CanMar Triumph</i>	25.4.97	A. Van Heels	S.S. Marathé, R. Mathur, R. Pouliot	Canada Maritime Agencies (Montreal)
<i>CanMar Victory</i>	†	—	—	Canada Maritime Agencies (Montreal)
<i>Canterbury Star</i>	22.1.98	P.C. French	A.B. Sabud, R.L. Cuaresma, J.D. Amo	Blue Star Ship Management Ltd
<i>Cap Blanco</i>	21.8.97	R. Gibbons	A. Queally, M.A. Clarey, J.R. Hollamby, K. Changezi	Furness Withy (Shipping) Ltd
<i>Cape Horn</i>	29.10.97	J.C. Kraan	S. Jones, M.R. Esguerra	MOL Tankship Management Ltd

<i>Cardigan Bay</i>	24.10.97	A.E. Spencer	D.R. Cromptley, M.C. Sutcliffe, J. Holmshaw, P.A. Whyley	P&O Nedlloyd Ltd
<i>Caribbean Reef</i>	17.11.97	H. Jones	B.L. Arguelles, R.B. Lavictoria, E. Seneviratne, D.S. Dhammika	London Ship Managers Ltd
<i>Cartagena</i>	†	—	—	Enterprises Shipping & Trading S.A.
<i>Cast Bear</i>	26.2.98	W. Schwerin	N.A. Aterrado, B. Agnir, T.G. Juanillo, D. Penaredondo	Cast Line (Liverpool)
<i>Cast Elk</i>	26.8.97	Y.T.H. William	U.T. Myint, S. Htay, B.M. Roziz, V.T. Hlaing	Cast Line (Liverpool)
<i>Cast Lynx</i>	9.2.98	W. Schwerin	E. Malfort, E. Solon, S. Macatiag, R. Vigor	Cast Line (Liverpool)
<i>Cast Wolf</i>	7.7.97	H.K. Quai	K.K. Thet, A.J. Ahad, U.T. Myint, U.T. Htut	Cast Line (Liverpool)
<i>Celtic Ambassador</i>	†	—	—	C.M. Willie & Co. (Shipping) Ltd
<i>Celtic Horizon</i>	1.12.97	A.W. Barkworth	J.W. Wilson, C. Duff, A. Somerton	Marr Vessel Management Ltd
<i>Challenger</i>	30.12.97	G.M. Long	J.C. Holmes, P. Burridge, J.D. Noden	NERC Research Vessel Services
<i>Charles Darwin</i>	22.1.98	R.A. Bourne	R.A. Warner, J.C. Holmes, A.V. Mackay, J. Baker	NERC Research Vessel Services
<i>Cheshire</i>	31.10.97	P.S. Bytheway	C. Coite, B. Cowell, R.P. MacSweeney	Bibby Line Ltd
<i>Chilham Castle</i>	†	—	—	Kuwait Oil Tanker Co.
<i>Chiquita Belgie</i>	†	—	—	Great White Fleet Ltd
<i>Chiquita Bremen</i>	26.8.97	E. Lyon	B. De Guzman, E.L. Francia, R. Piroth	Great White Fleet Ltd
<i>Chiquita Deutschland</i>	14.10.97	G.A.W. Fink	R.B. Arenal, S.M.W. Davidson, D. Orcales	Great White Fleet Ltd
<i>Chiquita Italia</i>	†	—	—	Great White Fleet Ltd
<i>Chiquita Nederland</i>	10.11.97	J.F. Badham	A.B. Velasquez, A.S. Jueco, S.S. Catayang	Great White Fleet Ltd
<i>Chiquita Rostock</i>	6.10.97	G.W. Weaver	F.V. Burgos, M.O. Roux, R.A. Ibasco	Great White Fleet Ltd
<i>Chiquita Scandinavia</i>	1.9.97	C.M. Meiklejohn	M.D. Cherry, R. Brummitt, E.C. Saballa	Great White Fleet Ltd
<i>Chiquita Schweiz</i>	7.7.97	M. Light	B. De Celis, H.S. Wright, R. Rafa	Great White Fleet Ltd
<i>Chismir</i>	29.1.98	J.M. Bullard	G. Taylor, R. Elliott, M.J. Samus	Souter Shipping Ltd
<i>Cirolana</i>	13.11.97	J.R. French	R.O. Jolliffe	CEFAS
<i>City of Barcelona</i>	20.2.98	A.F. Hamilton	B.R. Tasker, E.L. Dzameh, S. Ding, I.D. Tranter	Denholm Ship Management (UK) Ltd
<i>City of Cape Town</i>	10.11.97	G.J.H. Peaston	M.P. Kelly, K.T. Hart, J.G. Townsend	P&O Nedlloyd Ltd
<i>City of Lisbon</i>	†	—	—	Andrew Weir Shipping Ltd
<i>City of New Westminster</i>	26.1.98	M.M. Grass	N.C. Nagu, F.S. Soriano, L.M. Ladores	Northern Navigation Ship Mgmt. Inc.
<i>City of Sunderland</i>	†	—	—	Denholm Ship Management (UK) Ltd
<i>Claymore</i>	†	—	—	P&O Nedlloyd Ltd
<i>Clydebank</i>	†	—	—	Andrew Weir Shipping Ltd
<i>Colombo Bay</i>	23.1.98	B.V. Chipperfield	M.C. Wise, C.D. Hall, H.F. Radha	Northern Navigation Ship Mgmt. Inc.
<i>Columbus</i>	†	—	—	Denholm Ship Management (UK) Ltd
<i>Columbus Valparaiso</i>	†	—	—	Caledonian MacBrayne Ltd
<i>Condor Arrow</i>	2.12.97	U.M. Thanawala	P.H. Shamras, A.A. Indurkar	Andrew Weir Shipping Ltd
<i>Copiapo</i>	17.9.97	C.M. Turner	B.M. Barbarich, I.Z. Rahman, R. Pigeowski, R. Stannard	P&O Nedlloyd Ltd
<i>Coppename</i>	17.2.98	D.W. Bunyan	J. Clemente, D.C. Teodoro, J. Hammond	V. Ships Marine Ltd
<i>Coral Reef</i>	12.1.98	J.M. Collis	C. Samaranyake, E.C. Macoral, A. Aliviado	Jardine Ship Management (UK) Ltd
<i>Cordella</i>	16.2.98	J. Harvey	K. Walksham, N. Wilcock, S. Waterman	Gearbulk (UK) Ltd
<i>Cormorant Arrow</i>	†	—	—	London Ship Managers Ltd

Selected and Supplementary Ships (contd)

NAME OF VESSEL	LAST RETURN RECEIVED	MASTER	OBSERVING OFFICERS and RADIO OFFICERS	OWNER/MANAGER
<i>Corytes</i>	29.1.98	B. Chapman	A.J.L. Morgan, R.F. Graham	CEFAS
<i>Cotinga</i>	†	—	—	F.T. Everard & Sons Ltd
<i>Cotswold</i>	23.2.98	R.J. Gains	S.P. Thottam, S. Singh, N. Kumar, J.D. Crasto	P&O Bulk Shipping Ltd
<i>Cotica</i>	10.3.98	D.J. Robinson	C. Falculan, S. Magboo	Celtic Marine Ltd
<i>Crisilla</i>	†	—	—	Marr Vessel Management Ltd
<i>Curico</i>	27.8.97	I. Cuthbertson	D.P. Du Toit, R.N. Elikewela, W.U.C. Mendis, P. Keen	London Ship Managers Ltd
<i>Dallington</i>	16.4.97	E. Gaffney	A. Maxwell, P. Dawson, D. Gray	Stephenson Clarke Shipping Ltd
<i>Discovery</i>	22.1.98	M.A. Harding	P.C.T. Reynolds, C.M. Leather	NERC Research Vessel Services
<i>Discovery</i>	18.12.97	R.A. Appleby	W.M. Axon, T.T. Latto, R.A. Walters, D.C. Bullard	Stolt Comex Seaway Ltd
<i>Discovery Bay</i>	6.10.97	T.K. Whittaker	M.W. Jamieson, R.J. Neale, I. Macleod, K.S. O'Sullivan	P&O Nedlloyd Ltd
<i>Dominica</i>	21.11.97	G. de Ferry Foster	M. Korzuch	Interocean Ugland Management Ltd
<i>Donnington</i>	5.1.98	C.D.G. Grahame	M. Arden, T.F. Hill, P.J. English	Stephenson Clarke Shipping Ltd
<i>Duhallow</i>	30.12.97	J.E. Sinnott	M. Joshi, E.M. Holmyard, M.J. Shaikh, K. Sridhar	P&O Bulk Shipping Ltd
<i>Durrington</i>	21.11.97	M. McKinnon	D.H. Shaw, I.J. Roemmele, J. Bore	Stephenson Clarke Shipping Ltd
<i>Eagle</i>	17.11.97	C.J. Graham	R. Hood, D.R. Moth, G.L. Luis	Mobil Shipping Co. Ltd
<i>Eagle Arrow</i>	15.12.97	M. Sobol	D.C. Ferraris, M. Madzarac, J. Sarmiento, A. Baria	Gearbulk (UK) Ltd
<i>Eagle Orion</i>	†	—	—	Neptune Ship Mgmt. Services (Pte) Ltd
<i>Eastern Bridge</i>	26.1.98	I.C. Gravatt	K. Henderson, N. Jerrum, N. Alwis	Ropner Ship Management Ltd
<i>Ebalina</i>	†	—	—	Shell Marine Personnel (IOM) Ltd
<i>Eburna</i>	†	—	—	Shell Marine Personnel (IOM) Ltd
<i>Elk</i>	4.2.98	N. Hardy	P.A. Marcon, J.A. Robbie, D.L. Shields, M. Sheldon	POETS Fleet Management Ltd
<i>Elke</i>	22.1.98	A.W. Tebbutt	R.P. Echin, J. Mabatan, R. Cornolis	Great White Fleet Ltd
<i>Emily C</i>	†	—	—	Carisbrooke Shipping plc
<i>Encounter Bay</i>	22.9.97	R. Moxon	M. Shahadah, D.R. Lewis, R.H. Ellison, C.K. Thornalley	P&O Nedlloyd Ltd
<i>English Star</i>	15.12.97	N.J. Barr	F.C. Laroco, B.B. Garing, C.S. Abadicio	Blue Star Ship Management Ltd
<i>Enterprise</i>	†	—	—	Denholm Ship Management (UK) Ltd
<i>Equinox</i>	21.10.97	N.D. Riley	S.J. Alder, M. Sioan, A. Hannah	Souter Shipping Ltd
<i>Eridge</i>	7.8.97	J.W. Connor	W.R. Howell, K.M. Mathew, T.N.V. Rao, P.A.J. D'Souza	P&O Bulk Shipping Ltd
<i>Erradale</i>	30.6.97	G.R. Proud	G.D. Polestico, N. McNee, S.H. Rapley	The China Navigation Co. Ltd
<i>Ervilia</i>	†	—	—	Shell Marine Personnel (IOM) Ltd
<i>Esplanade</i>	†	—	—	Souter Shipping Ltd
<i>Euplecta</i>	†	—	—	Shell Marine Personnel (IOM) Ltd
<i>European Envoy</i>	†	—	—	P&O Ship Management (Irish) Ltd

<i>European Pioneer</i>	†	—	—	—	P&O Ship Management (Irish) Ltd
<i>European Seafarer</i>	†	—	—	—	P&O Ship Management (Irish) Ltd
<i>European Shearwater</i>	17.6.97	M. Stares	B. Worthington, J. Appleby, D. Hadfield	—	James Fisher & Sons plc
<i>European Trader</i>	†	—	—	—	P&O European Ferries Ltd
<i>Exelsior</i>	6.1.98	R.W. Taylor	S.J. Hocknull, P.G. Mount, J.M. Towler	—	Souter Shipping Ltd
<i>Eye of the Wind</i>	8.1.98	J. Barrett	E.W. Kirkbride, P.V. Curran, J.O. Greig	—	Souter Shipping Ltd
<i>Faki III</i>	†	—	—	—	Crediton Country Courier
<i>Falcon Arrow</i>	†	—	—	—	Sea Falcon Fishing Co. Ltd
<i>Federal Bergen</i>	†	—	—	—	Gearbulk (UK) Ltd
<i>Fernie</i>	*	—	—	—	Anglo-Eastern Ship Management Ltd
<i>Finch Arrow</i>	6.5.97	J. Boben	D.D. Bedi, S. Dutl, S. Sundaravellu	—	P&O Bulk Shipping Ltd
<i>Flinders</i>	30.12.97	R. Smedley	J. Tilley, M. Ashby, A. Hodson	—	Gearbulk (UK) Ltd
<i>Forthbank</i>	†	—	—	—	ASP Ship Management
<i>Foylebank</i>	4.2.98	J.J. Miller	D.S. Sime, V. Mantul, K. Klyucharev	—	Andrew Weir Shipping Ltd
<i>France</i>	2.2.98	A.W. Barr	L.S. Delfin, E. White, A.P. Rocha	—	Andrew Weir Shipping Ltd
<i>Francis Drake</i>	†	—	—	—	Great White Fleet Ltd
<i>Fremantle Star</i>	16.9.97	T.J. Burtleton	E.L. Sumbillo, A.C. Groom, C.E. Sanchez	—	Ocean Youth Club
<i>Frines</i>	†	—	—	—	Blue Star Ship Management Ltd
<i>Front Guider</i>	†	—	—	—	Intership Navigation Co. Ltd
<i>Front Rider</i>	†	—	—	—	Nordic Oriental Shipmanagement Pte Ltd
<i>General Delgado</i>	†	—	—	—	Nordic Oriental Shipmanagement Pte Ltd
<i>General Tirona</i>	†	—	—	—	Jebsens Ship Management (Bergen) AS
<i>General Villa</i>	†	—	—	—	Jebsens Ship Management (Bergen) AS
<i>Glen Maye</i>	†	—	—	—	Jebsens Ship Management (Bergen) AS
<i>Glen Roy</i>	6.10.97	J. Walmsley	R. Flores, R. Villafior, T. Laude	—	MOL Tankship Management Ltd
<i>Golden Duke</i>	27.11.97	H.I. Byrne	B.H. Aradillos, Y.E. Roque, Baghdadi	—	MOL Tankship Management Ltd
<i>Greater Manchester Challenge</i>	†	—	—	—	Jardine Ship Management Ltd
<i>Gull Arrow</i>	4.8.97	K. Laciak	B.R. Judito, R. Belleza	—	Ocean Youth Club
<i>Hadiyah</i>	29.9.97	S. Kowalewski	K. Shahadah, M. Latch, O. Moussa, H.D. Magbanua	—	Gearbulk (UK) Ltd
<i>Harmac Dawn</i>	3.11.97	Y. Sharma	A. Saitandes, M. Philicorala, I.P. Sushil, A. Onasis	—	Kuwait Oil Tanker Co.
<i>Harrier</i>	7.8.97	K.L. McCrory	S.A. Zahir, Y. Rodrigues, D. Middlemass	—	Barber Ship Management AS
<i>Hato Arrow</i>	5.1.98	B. Saban	L. Puchero, P. Akeron, K. Miroslaw	—	Mobil Shipping Co. Ltd
<i>Havdrott</i>	7.7.97	C.M.J. Payton	D.A. McCracken, S. Harvey, A. Thomson	—	Gearbulk (UK) Ltd
<i>Havjarl</i>	27.8.97	G.R. Phillips	R.S. Plaza, M.F. Coyoca, A.T. Aportadero, R. Sim	—	Bergesen d.y. ASA
<i>Havkong</i>	†	—	—	—	Bergesen d.y. ASA
<i>Hawk</i>	†	—	—	—	Bergesen d.y. ASA
<i>Hebridean Isles</i>	27.3.97	A. Morrison	F. Miller, D. Shepherd, S. Wright	—	Mobil Shipping Co. Ltd
					Caledonian MacBrayne Ltd

Selected and Supplementary Ships (contd)

NAME OF VESSEL	LAST RETURN RECEIVED	MASTER	OBSERVING OFFICERS and RADIO OFFICERS	OWNER/MANAGER
<i>Hekabe</i>	†	—	—	Bergesen d.y. ASA
<i>Helene Maersk</i>	†	—	—	A.P. Moller
<i>Helios</i>	11.7.97	G.J. Pearson	M.A. Pagente, E. Tapia, R. Tan	Bergesen d.y. ASA
<i>Hemera</i>	2.3.98	T.N. Ferguson	L. Larruza, A. Dawson, N. Carreoz	Bergesen d.y. ASA
<i>Hemina</i>	†	—	—	Bergesen d.y. ASA
<i>Hesiod</i>	22.5.97	A.S. Tennant	A.A. Cabrillas, A. Gray, E. Diack, F.C. Agena	Bergesen d.y. ASA
<i>Hoegh Duke</i>	†	—	—	Leif Hoegh & Co. A/S
<i>Hoi Siang No.1</i>	23.12.97	L.C. Rowse	L.C. Rowse	IKS Fishing Co. Ltd
<i>Hoo Kestrel</i>	†	—	—	R. Laphorn & Co. Ltd
<i>Hornbeck Integrity</i>	†	—	—	Hornbeck Offshore Ltd
<i>Hornbeck Invincible</i>	26.11.97	A.J. Hughes	J.A. MacKinnon, R.V. Lovie	Hornbeck Offshore Ltd
<i>Ibis Arrow</i>	10.12.97	S. Vitlov	I.J. Lagutin	Gearbulk (UK) Ltd
<i>Ibn Abdoun</i>	†	—	—	United Arab Shipping Co. (S.A.G.)
<i>Iolair</i>	23.1.98	M. Ramsbottom	A.J. Milne	Reading & Bates (UK) Ltd
<i>Ironbridge</i>	16.2.98	I.B. Middleton	R.G. Adorable, P.M. Newman, A.M. Tayo	Furness Withy (Shipping) Ltd
<i>Island Princess</i>	3.9.97	M. Reed	A. Willard, R. Stannard	P&O Cruises Ltd
<i>Isle of Arran</i>	18.4.97	N.W. Martin	C.D. McCurdy, D. McDonald	Caledonian MacBrayne Ltd
<i>Isle of Lewis</i>	23.12.97	M. Kennedy	G.S. Robertson, I.F. Scarr	Caledonian MacBrayne Ltd
<i>Isle of Mull</i>	7.1.98	C.W. Billimore	T.G. Moore	Caledonian MacBrayne Ltd
<i>Isocardia</i>	24.12.97	P.N. Bowden	F.J. Ollerhead, M.S. Greenwood, J.G. Horan	Shell Marine Personnel (IOM) Ltd
<i>Isomeria</i>	†	—	—	Shell Marine Personnel (IOM) Ltd
<i>Ivybank</i>	28.10.97	C.C. Baines	G.R. Henderson	Andrew Weir Shipping Ltd
<i>Jahre Spirit</i>	†	—	—	Wallem Shipmanagement Ltd
<i>Jahre Spray</i>	†	—	—	Wallem Shipmanagement Ltd
<i>James Clark Ross</i>	9.6.97	C.R. Elliott	A.P. Wallis, J.R. Harper, B.K. McLury, M.E.P. Gloistein	British Antarctic Survey
<i>Jarikaba</i>	22.1.98	P. Brown	J.R. Mitra, C. Falcuian, P. Coles	Celtic Marine Ltd
<i>Jean</i>	2.2.98	M.D. Nash	W.D. Cortazar, P.J. Milton, R.M. Labial	Great White Fleet Ltd
<i>Jervis Bay</i>	10.12.97	C.C. Woodward	M.K. Hill, W.J. Stoker, S.C. Holding	P&O Nedlloyd Ltd
<i>Joy</i>	3.12.97	N.W. Mauger	S.D. Gelmo, D. Marinkovic, A.V. Batchar	Great White Fleet Ltd
<i>Judith Borchard</i>	9.5.97	A. Raczkowski	J. Jabtofiski, T. Filipczyk	C.M. Willie & Co. (Shipping) Ltd
<i>Kagoro</i>	25.11.97	M.C. Alan	I. Osei-Amdako, J.A. Attoh, O. Oblea	Acomarit (UK) Ltd
<i>Kalahari</i>	†	—	—	Safmarine Ship Management
<i>Karoo</i>	*	—	—	Safmarine Ship Management

<i>Kazimah</i>	3.7.97	P.J. Ward	H.S.M. Loutfi, E.E. Edwards, M. Atta, R. Dela Rosa	Kuwait Oil Tanker Co.
<i>Kedah</i>	†	—	—	Kapal Management (Pte) Ltd
<i>Kestrel Arrow</i>	*	—	—	Gearbulk (UK) Ltd
<i>Kiwi Arrow</i>	†	—	—	Gearbulk (UK) Ltd
<i>Knock Allan</i>	18.11.97	R.I. Keys	B. Wikter	Red Band AS
<i>Knock Stocks</i>	21.10.97	J. Masny	J. Jeppesen, B. Nilssen, J.V. David	Red Band AS
<i>Koningin Beatrix</i>	*	—	—	Stena Line Holland B.V.
<i>Kukawa</i>	21.11.97	B.N. Jones	S.K. Hagen, E. Kusi-Parker, K. Torto-Rockson, P.V. Peralta	Acomarit (UK) Ltd
<i>Kumasi</i>	11.3.98	W.E.L. Godsell	S.J. Gyasi, J.R. Acquah, E.S. Boye, E.G. Borre	Acomarit (UK) Ltd
<i>Lackenby</i>	23.12.97	C.R. Bamford	R.M.S. Ratnayake, D. Bridgeman, S.Y. Wasantha	Ropner Ship Management Ltd
<i>Lady Barbara</i>	8.12.97	S. Ganguly	T. Anoop, S. Gaitam, R. Sainath	Pacific Navigation Ltd
<i>Lady Rebecca</i>	†	—	—	John McRink & Co. Ltd
<i>Lady Stephanie</i>	*	—	—	Pacific Navigation Ltd
<i>Lampas</i>	†	—	—	Shell Marine Personnel (IOM) Ltd
<i>Larkfield</i>	18.6.97	A.D. Chapman	E.R. Sarigumba, R.V. Salazar	Gearbulk (UK) Ltd
<i>Leonia</i>	†	—	—	Shell Marine Personnel (IOM) Ltd
<i>Leopard</i>	†	—	—	Shell Marine Personnel (IOM) Ltd
<i>Leopardi</i>	†	—	—	P&O Ship Management (Irish) Ltd
<i>Lepeta</i>	16.2.98	V.L. de Vicente	J. Bosco, A.J. Marcelo, G. Inaki	Souter Shipping Ltd
<i>Licorne Pacifique</i>	†	—	—	Shell Marine Personnel (IOM) Ltd
<i>Lima</i>	26.8.97	B. Winter	S.M. Garcia, W.H. Banta, S.N. Abundo III, W.F. Kalagayan	Sosena S.A.
<i>Linares</i>	14.10.97	A.F. Devanney	J. Currie, B. Komljenovic, R.K. Dimaculangan	Shell Marine Personnel (IOM) Ltd
<i>Lincolnshire</i>	6.1.98	I. Cuthbertson	A. Kossinne	London Ship Managers Ltd
<i>Lincoln Spirit</i>	30.9.97	R.A.F. Edwards	M.J. Byrne, D.F. Morton, A. Davidson, B.J. Foley	Bibby Line Ltd
<i>Linderos</i>	27.1.98	G.C. Hatcher	D. Hemaka, E. Santos, J.R. Pesudas	London Ship Managers Ltd
<i>Lord Nelson</i>	2.3.98	B.R. Richmond	K.D. Sedrick, J.B. Hangsitang, M.M. Hemasuri	London Ship Managers Ltd
<i>Lord of the Isles</i>	21.4.97	G.R. Mills	B. Campbell, M. Smith, C.L. Cupples	Jubilee Sailing Trust Ltd
<i>Lough Foyle</i>	24.4.97	I. Dewar	J.A. Macleod, C.S. Macleod, T. Patterson	Caledonian MacBrayne Ltd
<i>Lucky Bulker</i>	†	—	—	Heyn Engineering & Shipping Services
<i>Maersk Gannet</i>	23.12.97	W.T. Wilmott	M. Bedi, A. Sanyal, G. Pais, P. Sharma	Valles Steamship Co. Ltd
<i>Maersk Shetland</i>	26.11.97	S.J. McCollin	A.R. Langford, G.S. Miller, R. Beattie	Maersk Co. (IOM) Ltd
<i>Maersk Somerses</i>	22.4.97	W.T. Munro	S.M. Williams, R. Orange, J.A. Strothers	The Maersk Co. Ltd
<i>Maersk Stafford</i>	2.2.98	N. Vause	S. Melvin, S. Fant, A.P. Hodgson	The Maersk Co. Ltd
<i>Maersk Suffolk</i>	30.9.97	R.M. Banton	M.P. McShane, M.J. Young, S.K. Moller	The Maersk Co. Ltd
<i>Maersk Surrey</i>	*	—	—	The Maersk Co. Ltd
<i>Maersk Sussex</i>	15.9.97	K.E. Hammerman	P.I. Preston, A. Cross, P.A. Gilbert	The Maersk Co. Ltd
<i>Magnolia</i>	2.12.97	S.A. Cresswell	P.O. Shen, A.J. Boyd, N. Fagan	The Maersk Co. Ltd
<i>Mairangi Bay</i>	11.6.97	J.H. Birchenough	C.A. Caldwell, R. Arthur, T.R. Bray	Mobil Shipping Co. Ltd
<i>Mark C</i>	28.1.98	A.W. Ellis	B.K. Quayson, D.J. Hinson, R. Ellison	P&O Nedlloyd Ltd
	†	—	—	Carisbrooke Shipping plc

Selected and Supplementary Ships (contd)

NAME OF VESSEL	LAST RETURN RECEIVED	MASTER	OBSERVING OFFICERS and RADIO OFFICERS	OWNER/MANAGER
<i>Mary C</i>	†	J.M. Evans	—	Carisbrooke Shipping plc
<i>Maico Clyde</i>	9.12.97	—	A.D. Newman, M. McKenna, A. Fleming	Mobil Shipping Co. Ltd
<i>Maico Thames</i>	†	—	—	Mobil Shipping Co. Ltd
<i>Matilde</i>	5.3.98	I. Beetham	—	Souter Shipping Ltd
<i>Mbashi</i>	†	—	A. Charlton, R. Flintham, M.H. Williams	Target Marine S.A.
<i>Melfi Force</i>	16.2.98	L. Sorenson	P.M. Villarín, J.C. Balayon, M. Sanchez	Elite Shipping A/S
<i>Merchant Paramount</i>	12.6.97	S. Narang	R. Dogra, B. Kumar, O. Noronha	V. Ships (UK) Ltd
<i>Merchant Patriot</i>	†	—	—	V. Ships (UK) Ltd
<i>Merchant Premier</i>	5.1.98	R. Avenin	V. Padmanabhan, M.K. Chauhan, I. Banerji, S.G. Kulkarni	V. Ships (UK) Ltd
<i>Merchant Prestige</i>	†	—	—	V. Ships (UK) Ltd
<i>Merchant Prince</i>	10.3.98	M. Sahling	K. Zafaryllah, P.B. Singh, A. Boudulin, N.P. Venugopalan	V. Ships (UK) Ltd
<i>Merchant Princess</i>	†	—	—	V. Ships (UK) Ltd
<i>Merchant Principal</i>	5.12.97	C.W. Harvey	P.A. Gordon, D.H. Wijendra, P.S. Hans	V. Ships (UK) Ltd
<i>Mineral Century</i>	16.2.98	N.S. Sadhi	K. Fadra, R. Narayanaswamy, A.R. Syed	V. Ships (UK) Ltd
<i>Mineral Colombia</i>	*	—	—	V. Ships (UK) Ltd
<i>Mineral Europe</i>	*	—	—	Anglo-Eastern Ship Management Ltd
<i>Mineral Prosperity</i>	21.10.97	S.K. Sharotri	—	Anglo-Eastern Ship Management Ltd
<i>Mineral Venture</i>	3.7.97	A.A. Kadkol	S. Sablok, P. Kumar, M. Ajay	Anglo-Eastern Ship Management Ltd
<i>Mineral Zulu</i>	7.8.97	G.S. Lobo	J.A. Cuenca, W.H. Ching, A. Iqbal, S. Menon	Anglo-Eastern Ship Management Ltd
<i>Moraybank</i>	3.12.97	S.R. Allaker	N. Gupta, Y.R. Jesia, P. Hudekar	Wah Kwong Shipping Agency Co. Ltd
<i>Moreton Bay</i>	2.2.98	C.J.A. Hughes	S.J. Wallace, D.J. Creamer, A.G. Stammers	Anglo-Eastern Ship Management Ltd
<i>Mountain Cloud</i>	†	—	P. Foster, M. Green, M. Stewart	Andrew Weir Shipping Ltd
<i>Murex</i>	9.12.97	J.T. Little	—	P&O Nedlloyd Ltd
<i>Myrina</i>	9.1.98	K.A.G. Biscoe	D.E. Taylor, S.J. Banton, N. Desai	Norbulk Shipping (UK) Ltd
<i>Nand Nidhi</i>	23.9.97	P.G. Michael	D.J. Harrison, A. Bluneta	Shell Marine Personnel (IOM) Ltd
<i>Nandu Arrow</i>	†	—	D.S. Sandhu, G. Ajit, M.J. SatyaRaju, D.N. Ramchandani	Shell Marine Personnel (IOM) Ltd
<i>New Generation</i>	†	—	—	Essar Sisco Ship Mgmt. Co. Ltd
<i>Newport Bay</i>	5.1.98	A.C. McCulloch	—	Gearbulk (UK) Ltd
<i>Newton</i>	5.3.98	R. Mills	C.W. Longmuir, A.R. Farthing, M.G. Fennell	James Fisher & Sons plc
<i>Nivaga II</i>	†	—	R. Cutting, A. Clements, D. Whitaker	P&O Nedlloyd Ltd
<i>NOL Lagano</i>	3.3.98	P.D. Davies	L.A. Jenkins, G. Collier, T. Oliver, C.S. Carver	Royal Maritime Auxiliary Service
<i>Nolizwe</i>	†	—	—	Government of Tuvalu
<i>Nordstrand</i>	*	—	—	P&O Nedlloyd Ltd
				Safmarine Ship Management
				Carisbrooke Shipping plc

<i>Norra</i>	26.2.98	D.L. Rattray	J. Ebdy, D.A. Smith, J.J. Coyle	Scottish Office, Agr. & Fisheries Dept
<i>Norquest</i>	26.11.97	W.H. Walker	W.H. Walker	Phoenocan Ltd
<i>Norrtsia</i>	†	—	—	Shell Marine Personnel (IOM) Ltd
<i>Norsea</i>	†	—	—	North Sea Ferries Ltd
<i>Northella</i>	†	—	—	Marr Vessel Management Ltd
<i>Northern Horizon</i>	30.6.97	K.T. Herron	T.A. Ellsum, C. Johnstone	Marr Vessel Management Ltd
<i>Northern Light</i>	*	—	—	Souter Shipping Ltd
<i>Northern Prince</i>	23.2.98	M. Patterson	P. Taylor	Marr Vessel Management Ltd
<i>Northis</i>	29.5.97	R.N. Richards	C.J. Wing, S. Emms, M.D. Hasan	Shell Marine Personnel (IOM) Ltd
<i>North Pacific</i>	*	—	—	Wallem Shipmanagement Ltd
<i>Ocean Defender</i>	†	—	—	EarthKind
<i>Ocean Goose</i>	†	—	—	Captain D.A. Church
<i>Olivebank</i>	†	—	—	Andrew Weir Shipping Ltd
<i>OOCL Bravery</i>	1.9.97	D.J. Prichard	E. Godolphin, J.N. Balkwill, P.G. Ivory, G.S. Wilson	OOCL Agency Ltd
<i>OOCL Britain</i>	20.2.98	J.E. Huddleston	H.C. Lau, I. Chan, E.Y. Lee	OOCL Agency Ltd
<i>OOCL Canada</i>	3.12.97	P.T.A. Galea	D.C. Duffy, P.R. O'Regan, B.C. Dunleavy	OOCL Agency Ltd
<i>Oriana</i>	21.10.97	C.P. Campbell	H.T. Howe, W. Passfield, I.P. Grubb	P&O Cruises Ltd
<i>Oriental Bay</i>	9.2.98	A.P. Talbot	P.E. Gardner-Richards, C.I. Macleod, R.G. Noble	P&O Nedlloyd Ltd
<i>Oriental Venture</i>	8.5.97	R.D. Mead	E.M. Morrice, K.C. Tullock, J.H.P. Burgoyne	BP Shipping Ltd
<i>Orion Reefer</i>	17.6.97	F.R.D'Souza	G.L. Sarile, G. Tirol, F.H. Patel, A.K. Pramanic	Wallem Shipmanagement Ltd
<i>Ormond</i>	28.10.97	J.H. Brierley	R.G. Ughade, L.T. Cusiter, J.R. Brooks, D.C. Coutinho	P&O Bulk Shipping Ltd
<i>P&O Nedlloyd Liverpool</i>	27.8.97	B.J. Argent	S.L. Rayson, A.R. Farthing, M.N. Messenger, R.C. Masters	P&O Nedlloyd Ltd
<i>P&O Nedlloyd Texas</i>	4.2.98	L.H.M. Johnson	J. Cross, M. Trafford, W. Coxon	P&O Nedlloyd Ltd
<i>P&O Nedlloyd Tokyo</i>	5.9.97	K.D. Campbell	B. Griffiths, J.B. Harbord, D. Joustra, G.H. Roe	P&O Nedlloyd Ltd
<i>Pacific Crane</i>	†	—	—	James Fisher & Sons plc
<i>Pacific Guardian</i>	†	—	—	Cable & Wireless (Marine) Ltd
<i>Pacific Pintail</i>	3.9.97	D. Marr	R.G. Barry, J.G. Worthington, P.F. Goodchild, T. McMahon	James Fisher & Sons plc
<i>Pacific Princess</i>	†	—	—	P&O Cruises Ltd
<i>Pacific Sandpiper</i>	30.12.97	M.J. Stares	S.D. Palmer, N. Patterson, A. Howlett, C.P. Brockbank	James Fisher & Sons plc
<i>Pacific Swan</i>	†	—	—	James Fisher & Sons plc
<i>Pacific Teal</i>	19.6.97	A.G. Lacey	J.S. Ward, N.S. Patterson, T. Bannister, A.P. Austen	James Fisher & Sons plc
<i>Pacific Venture</i>	†	—	—	MOL Tankship Management Ltd
<i>Pacific Wave</i>	15.9.97	C. Tomlinson	N. Tripathi, B. Skopac, S. Mitra, R.V. Balaquit	MOL Tankship Management Ltd
<i>Palliser Bay</i>	12.1.98	S.D. Smith	G.J. Culkun, J.E. Nuttall, C. Hallam	P&O Nedlloyd Ltd
<i>Panther</i>	9.12.97	K.P. Riley	A. Facey, D. Gale, M. Barrington	P&O Ship Management (Irish) Ltd
<i>Pegasus Bay</i>	10.3.98	D.A.K. Bamford	T.J. Mead, B.P. Murphy, K.F. Kelleher	P&O Nedlloyd Ltd
<i>Pelican Arrow</i>	27.3.97	S. Behl	I.D.S. Duggal, R.K. Sharma, S. Mathew	Gearbulk (UK) Ltd
<i>Peninsular Bay</i>	13.11.97	P.J.R. Manson	J. Cross, R.B. Gurney, D.C. Winter	P&O Nedlloyd Ltd
<i>Petro Fife</i>	26.1.98	A. Hodgson	D.E. Doyle, P.J. Kelly	Petroleum Shipping Ltd

Selected and Supplementary Ships (contd)

NAME OF VESSEL	LAST RETURN RECEIVED	MASTER	OBSERVING OFFICERS and RADIO OFFICERS	OWNER/MANAGER
<i>Petro Tyne</i>	†	—	—	Petroleum Shipping Ltd
<i>Pharos</i>	*	—	—	Northern Lighthouse Board
<i>Pioneer Leader</i>	†	—	—	Wallem Shipmanagement Ltd
<i>Pisces Pioneer</i>	†	—	—	T. & J. Harrison Ltd
<i>Pisces Trader</i>	—	—	—	T. & J. Harrison Ltd
<i>Pride of Bilbao</i>	10.11.97	M.S. Babu	A. Ahmad, Y. Satyad, P.K. Gupta, A. D'Silva	P&O European Ferries (Portsmouth) Ltd
<i>Pride of Cherbourg</i>	23.12.97	R.J. Ross	P.N. Hill, R.D. Kevan, J.E. Hutchens	P&O European Ferries (Portsmouth) Ltd
<i>Pride of Hampshire</i>	20.6.97	C.E. Banks	D.E. Percy, A. Soward, P. Eastwood	P&O European Ferries (Portsmouth) Ltd
<i>Pride of Le Havre</i>	23.12.97	A.F. Bonehill	D.C. Ray, D. Worrin	P&O European Ferries (Portsmouth) Ltd
<i>Pride of Portsmouth</i>	18.4.97	P.I. Hillman	C.S. Bull, C. Illidge, J. Stevens	P&O European Ferries (Portsmouth) Ltd
<i>Pride of Suffolk</i>	21.1.98	R.A. Shopland	N. Carter, R.T. Harding, D.R. Hilton	P&O European Ferries (Portsmouth) Ltd
<i>Primo</i>	12.1.98	D. Strange	A.W. Robertson, A.M. Smith, S.M. Davidson	Souter Shipping Ltd
<i>Providence Bay</i>	24.11.97	J.J. Azcorra	J.A. Roman, N. Auteneche, J.M. Ruiz	P&O Nedlloyd Ltd
<i>Pudahuel</i>	12.1.98	D.L. Batchelor	S.N. Foster, S.J. Young, R. Wood	Dockendale Shipping Company
<i>Puerto Cortes</i>	*	—	—	Unileasing A/S
<i>Pufford Achilles</i>	9.1.98	E.S. Fowler	L.J. Rodrigues, E.M. Limbo, S.B. Thomas	Boston-Putford Offshore Safety Ltd
<i>Pufford Ajax</i>	28.10.97	P. Corbett	R.W. Cartwright, D.J. Tebbutt, J.M. Banks	Boston-Putford Offshore Safety Ltd
<i>Pufford Aries</i>	26.1.98	G.A. Cubbison	I.R. Buley, G. Veitch, G. Collins	Boston-Putford Offshore Safety Ltd
<i>Pufford Shore</i>	17.2.98	R.A. Stockley	P.G. McCardle, M.A. Chapman, D. Riches	Boston-Putford Offshore Safety Ltd
<i>Pufford Skua</i>	3.11.97	C.H. Pearce	D.G. Cook, K.D. Edmunds, C.A. Barnard	Boston-Putford Offshore Safety Ltd
<i>Queen Elizabeth 2</i>	28.1.98	N. Buckley	G. Smith, D.J. Geddes, J.M. Banks	Boston-Putford Offshore Safety Ltd
<i>Queensland Star</i>	10.3.98	R.W. Warwick	R. Irvine, J. Heylen, H.F. Elliott	Cunard Line Ltd
<i>Raven Arrow</i>	8.12.97	M.J. McGilvray	I.O. Bagalay, R.A. Pogoy, E.F. Gumera	Blue Star Ship Management Ltd
<i>Ravenscraig</i>	†	—	—	Gearbulk (UK) Ltd
<i>Regent Rose</i>	23.2.98	B.F. Middleton	A. Jayasooriya, B. Laing	Ropner Ship Management Ltd
<i>Regina Oldendorff</i>	†	—	—	Agencia N.S.
<i>Repulse Bay</i>	†	—	—	Egon Oldendorff
<i>Resolution Bay</i>	23.12.97	K.S. Hardy	A.M. Jamieson, M.K. Hands, L.S. Mahdi	P&O Nedlloyd Ltd
<i>Rhone</i>	17.2.98	A.M. Tweedie	M. Shahadah, M.C. Sutcliffe, A. Aluskandari, C. Thornalley	P&O Nedlloyd Ltd
<i>Rixta Oldendorff</i>	27.5.97	A. Jairaj	R.K. Sultana, C.K. Sen, C.N. Jegadeesh, S.D. Pillai	United Ship Management Ltd
<i>Rothnie</i>	9.12.97	J. Mathew	M.B. Manugas, K. Chernyshev, N. Villaluz, S.K. Das	Egon Oldendorff
<i>Royal Princess</i>	†	—	—	Sandford Ship Management Ltd
<i>Royal Star</i>	1.9.97	M.B.F. Moulin	R.B. Robson, M.I. Ward, M. Lomas	P&O Cruises Ltd
	3.11.97	A. Ray	J. Almeida, N. Kumar, G. Medherar, J. Hyde	Blue Star Ship Management Ltd

<i>St Clair</i>	3.11.97	H. Mouat	G. Gove, E. Smith, J. Strathearn	P&O Scottish Ferries Ltd
<i>St Helena</i>	2.3.98	M. Smith	R.J. Murray, J. Burns, R. Leaford, N. Abbott	Curnow Shipping Ltd
<i>St Lucia</i>	14.1.98	G. de Ferry Foster	C. Miaskowski, Z. Tyszko, J. Chimielecki	Interocean Ugland Management Ltd
<i>St Sunniva</i>	9.2.98	W.J. Duncan	I.W. Easton, W.B. MacKay, J.S. Gunn	P&O Scottish Ferries Ltd
<i>Sachem</i>	25.11.97	R.B.N. Stuart	A.D. Newman, K.C. Taylor, S.P. Milbourne	Mobil Shipping Co. Ltd
<i>Sagacity</i>	30.12.97	T. Hatalski	Z.W. Fiszer, J. Bielawski	F.T. Everard & Sons Ltd
<i>Saga Horizon</i>	9.2.98	T. Haxell	T. Smith, A.D. Dimalalata, C. Lumbaca	Patt Manfield & Co. Ltd
<i>Saga Wind</i>	22.9.97	P.R.T. Williams	D.P. Apellido, N.P. Sirilan, D.M. Jacobs	Patt Manfield & Co. Ltd
<i>Saldanha</i>	16.9.97	N. Cooper	P. Vibar, W. Europa, V. Solatorio	Safmarine Ship Management
<i>Saudi Splendour</i>	15.12.97	I.D. McKenzie	A.N. Balaguer, S. Reidy, C.A. Sanz	Mobil Shipping Co. Ltd
<i>Scillonian III</i>	25.3.97	P. Row	P. Crawford	Isles of Scilly Steamship Co. Ltd
<i>Scotia</i>	†	—	—	Marr Vessel Management Ltd
<i>Scott Guardian</i>	19.1.98	J.A. Mackenzie	L.D. Pettitt, M. Bradley, J. Cowie	Hornbeck Offshore Ltd
<i>Scottish Star</i>	2.2.98	P. Buckley	R.M. De Castro, P.R. Gepilano, R.S. Pineda	Blue Star Ship Management Ltd
<i>Sea Amethyst</i>	12.9.97	W. Venning	B. Standerline, J. Bore, E. Dodds	Stephenson Clarke Shipping Ltd
<i>Searcher</i>	13.1.98	I.G. Ferguson	M. Rainey, J.A. Wood	Tidewater Marine (UK) Ltd
<i>Seillean</i>	12.1.98	D. Tobin	J. Byrne, I. Danskin, A. Baker	Reading & Bates (UK) Ltd
<i>Seki Cedar</i>	22.12.97	P.W. Jackson	M.K. Judson, B.R. Tasker, J.C. Hague	Denholm Ship Management (UK) Ltd
<i>Seki Pine</i>	12.1.98	G.M. Railson	B.R. Tasker, I.D. Tranter, C.C.W. Eager	Denholm Ship Management (UK) Ltd
<i>Selectivity</i>	†	—	—	F.T. Everard & Sons Ltd
<i>Semac I</i>	†	—	—	European Marine Contractors Ltd
<i>Sentority</i>	21.8.97	R. Parsons	E.K. Andoh-Wilson, P. Branagan, D. Murray	F.T. Everard & Sons Ltd
<i>Shabonee</i>	†	—	—	Mobil Shipping Co. Ltd
<i>Shenzhen Bay</i>	22.1.98	M. Watts	C.L. Hickin, A.W. Lewington, J.A. Weber	P&O Nedlloyd Ltd
<i>Shetland Service</i>	22.12.97	A.J. Clarke	N. Sheard, R. Brown, J.D. Thompson	Tidewater Marine (UK) Ltd
<i>Silitqua</i>	8.1.98	J.S. Mercer	T.B. Valmores, P. Courtney, D. Tomlinson	Shell Marine Personnel (IOM) Ltd
<i>Singapore Bay</i>	12.11.97	J.G.W. Dixon	S. Azim, S.J. McNeill, M.P. Willis	P&O Nedlloyd Ltd
<i>Singapore Star</i>	19.1.98	C.I. MacKillop	B.T. Apao, K. Watt	Blue Star Ship Management Ltd
<i>Siratus</i>	†	—	—	Shell Marine Personnel (IOM) Ltd
<i>Sir Eric Sharp</i>	†	—	—	Cable & Wireless (Marine) Ltd
<i>Siskin Arrow</i>	2.3.98	J. Mishra	H. Singh, M. Bayaj, C.K. Dhas	Gearbulk (UK) Ltd
<i>Snow Cape</i>	21.1.98	L.M. Colam	R.M. Canete, R.A. Morrison, R.D. Husain	Blue Star Ship Management Ltd
<i>Snow Crystal</i>	18.9.97	Z. Juretic	O. Isidro, R. Sayomac, M. Jardiel	Holy House Shipping AB
<i>Snow Delta</i>	19.5.97	S.M. Ross	J.Z. Aquilino, D.R. Johnston, D.H. Hermogino, E.L. Espera	Blue Star Ship Management Ltd
<i>Snow Drift</i>	2.3.98	B. Yelland	E.Y. Lao, M.N. Rosas, W.R. Corteza	Holy House Shipping AB
<i>Snow Flower</i>	†	—	—	Holy House Shipping AB
<i>Snow Land</i>	*	—	—	Holy House Shipping AB
<i>Sociality</i>	†	—	—	F.T. Everard & Sons Ltd
<i>Solena</i>	29.10.97	E. Bachor	E. Lumberio, S. Ardimir, N. Tameta	Shell International Trading & Shipping Co. Ltd

Selected and Supplementary Ships (contd)

NAME OF VESSEL	LAST RETURN RECEIVED	MASTER	OBSERVING OFFICERS and RADIO OFFICERS	OWNER/MANAGER
<i>Spear</i>	†	—	—	Archon Maritime S.A.
<i>Speciality</i>	26.9.97	A.J.A. Richards	E.K. Andoh-Wilson, L.J. Patten, R. McNab	F.T. Everard & Sons Ltd
<i>Speybank</i>	28.10.97	W. Campbell	A.D. MacPherson, A. Siyukhov, A. Plisenko	Andrew Weir Shipping Ltd
<i>Staffordshire</i>	20.5.97	C.H. Marsh	M.L. Forgenie, G.W. Williams, A.S. McCarlie	Bibby Line Ltd
<i>Storrington</i>	27.10.97	C.D.G. Grahame	D.C. Davies, H. Shaw, R.H. Ginger	Stephenson Clarke Shipping Ltd
<i>Stresa</i>	†	—	—	Wallem Shipmanagement Ltd
<i>SubSea Mayo</i>	†	—	—	SubSea Offshore Ltd
<i>Sulisker</i>	16.2.98	D.W. Temple	J.J. Coyle, A.W. Blance, I.C. Stevenson	Scottish Office, Agr. & Fisheries Dept
<i>Summer Breeze</i>	27.8.97	R.E. Lough	J.L. Ocampo, M.D. Ramos, G.R. Talusan, A.C. Beltran	Hoegh Fleet Services AS
<i>Summer Flower</i>	4.8.97	C. Bunt	F. Manuel, J.J. Duero, A. Asentista, F. Potestades	Hoegh Fleet Services AS
<i>Summer Meadow</i>	†	—	—	Hoegh Fleet Services AS
<i>Summer Wind</i>	†	—	—	Hoegh Fleet Services AS
<i>Sunda</i>	17.12.97	M. Ahmed	S.A. Modak, R.B. St Domingo, D. Lobo	Wallem Shipmanagement Ltd
<i>Sun Suma</i>	16.6.97	S. Behl	S. Mathew, M.N. Churai, A. Zachariah	United Ship Management Ltd
<i>Sunny Clipper</i>	†	—	—	Grand Seatrade Shipping Agencies Ltd
<i>Supertority</i>	†	—	—	F.T. Everard & Sons Ltd
<i>Swan Arrow</i>	27.5.97	R.M. D'Souza	E.M. Kuty, A.K. Win, S.K. Kartha, U. Shariff	Gearbulk (UK) Ltd
<i>Swan Bay</i>	17.7.97	L. Thorne	C. Ferraren, P. Siquinid, E. Borres, C. Delleya	Swan Shipping A/S
<i>Swan River</i>	18.8.97	A.L. Echin	D.R.J. Delro, C.G. Cordero, F.C. Nombre, P. Penaranda	Swan Shipping A/S
<i>Swan Stream</i>	*	—	—	Swan Shipping A/S
<i>Tamamonta</i>	†	—	—	V. Ships (UK) Ltd
<i>Tamar F.I.</i>	†	—	—	Byron Marine Ltd
<i>Tankerman</i>	†	—	—	James Fisher & Sons (Liverpool) Ltd
<i>Tasman Spirit</i>	27.6.97	P.M. Frost	R.S. Mabuyo, R. Lavictoria, D.A. Selvido	London Ship Managers Ltd
<i>Taunton</i>	23.1.98	M.J. Walker	R.T. Mattos, A.S. Mathur, D. Kapoor, P.D. Dewan	P&O Bulk Shipping Ltd
<i>Teignbank</i>	8.9.97	P.S. Chase	V. Ustinovich, G.R. Armstrong, D. Porublev, S. Cheknovuz	Andrew Weir Shipping Ltd
<i>Tepozteco II</i>	16.12.97	S. Swetnik	H. Hernandez, M.J. Alfredo, J. Gerdro, N. Deogracias	Transportacion Maritima Mexicana
<i>Tobias Maersk</i>	†	—	—	The Maersk Co. Ltd
<i>Toisa Conqueror</i>	†	—	—	Sealion Shipping Ltd
<i>Toisa Cougar</i>	†	—	—	Sealion Shipping Ltd
<i>Toisa Petrel</i>	†	—	—	Sealion Shipping Ltd
<i>Toisa Puffin</i>	26.11.97	S.L. Thomas	P.H. Nicholas, S. Bellamy, J.E. Legge	Sealion Shipping Ltd
<i>Toisa Sentinel</i>	18.12.97	R.T. Blackman	J.S. Martinez	Sealion Shipping Ltd

<i>Toisa Widgeon</i>	†	—	—	Sealion Shipping Ltd
<i>Torben Spirit</i>	†	—	—	Norbulk Shipping (UK) Ltd
<i>Towada</i>	28.10.97	D.S. Ritchie	—	Acomarit (UK) Ltd
<i>Trade Apollo</i>	3.11.97	R. McMillan	D.B. Minnow, H.D. Boham, E.S. Boye	Wah Tung Shipping Agency Co. Ltd
<i>Trade Eternity</i>	27.2.98	R.E. Fletcher	R.T. Liu, M.I. Siddiqui, M.K. Choudhury	Wah Tung Shipping Agency Co. Ltd
<i>Trade Maple</i>	21.11.97	S.F. Goonewardene	I.W. Chowdhury, Y.T. Hong, H. Rashid, S. Jayawickrame	Wah Tung Shipping Agency Co. Ltd
<i>Trade Selene</i>	*	—	M. Rashid, S.M. Iqbal, C.M. Kzung, X.G. Nan	Wah Tung Shipping Agency Co. Ltd
<i>Trojan Star</i>	†	—	—	Blue Star Ship Management Ltd
<i>Tsuru Arrow</i>	13.10.97	T. Brandal	G.M. Frange, J. Seneviratne	Gearbulk (UK) Ltd
<i>Tudor Star</i>	16.2.98	A. Tibbott	R.M. Canete, E. Deoman, N.A. Mondragon	Blue Star Ship Management Ltd
<i>Tycho Brahe</i>	12.8.97	A.J. Lewis	P.A. Carmichael, W. Ramoran, F. Collado	Hanseatic Shipping Co. Ltd
<i>Uisge Gorm</i>	†	—	—	Bluewater Operations (UK) Ltd
<i>Ullswater</i>	23.1.98	L.J. Hesketh	I.J. D'Souza, M.J. Howorth, M.J. Rajesh, P. Lalit	P&O Bulk Shipping Ltd
<i>Victoria</i>	9.7.97	C. Sample	P. Fielding, R.U. Booth, N. White	P&O Cruises Ltd
<i>Vigilant</i>	9.6.97	D.L. Beveridge	I. Beaton, A. MacCallum, R.J. Sheldon	Scottish Office, Agr. & Fisheries Dept
<i>Vine</i>	20.11.97	M.J. Walker	I.J. D'Silva, K. Bhattacharya, S. Gupta, E.A. Almeida	P&O Bulk Shipping Ltd
<i>Waasland</i>	†	—	—	Tecto N.V.
<i>Waterford</i>	17.11.97	P.A. Miley	S.N. Avhad, S. Fernandes, G.C. Squirrel, F.R. Patel	P&O Bulk Shipping Ltd
<i>Western Bridge</i>	27.10.97	S.J. Honey	S. Ramesh, A.G. French, J. Parkin	Ropner Ship Management Ltd
<i>Westfield</i>	23.12.97	M. Raguz	R.P. Santos, H.V. Tupos	Gearbulk (UK) Ltd
<i>Westminster</i>	†	—	—	Northern Marine Management Ltd
<i>Westra</i>	†	—	—	Scottish Office, Agr. & Fisheries Dept
<i>Whitcrest</i>	†	—	—	J.H. Whitaker (Tankers) Ltd
<i>Wilma Yukon</i>	8.12.97	P.A. Wickman	K. Gras, B. Loywuisz, K. Piekarski, J. Sztukowski	Anders Wilhelmsen & Co. AS
<i>World Nord</i>	9.2.98	J.A. Cullen	G.C. Asuncion, C.L. Tam, S.J. Hegge	World-Wide Shipping Agency (S) Pte Ltd
<i>World Place</i>	11.8.97	S. Sethi	R. Bhatia, L. Sahoo, B. Ahmed	Univan Ship Management Ltd
<i>World Spark</i>	4.2.98	S. Sharma	A. Imroz, M. Mukul, D.P. Mohan, T.V. Sangeeth	World-Wide Shipping Agency (S) Pte Ltd
<i>Yeoman Brook</i>	6.10.97	R.G. Head	S.B. Baldon, N. Villarin, M. Keijzerwaard	Egon Oldendorff
<i>York</i>	28.1.98	R.M. Ellsmoor	A.M. Joshi, O.J. Fernandes, R. Nosrati, M.V. Miranda	P&O Bulk Shipping Ltd
<i>Zetland</i>	8.12.97	S.B. Tudor	A. Lahiri, A. Rodrigues, H.D. Narvekar, S. Chanda	P&O Bulk Shipping Ltd

‘Marid’ Ships

The following is a list of ships recruited for the observing and reporting of sea temperatures from coastal waters of Great Britain.

Masters are requested to point out any errors or omissions in the lists.

NAME OF VESSEL	MASTER	OWNER/MANAGER
<i>Achatina</i>	R. Astridge	Shell International Trading & Shipping Co. Ltd
<i>Amity</i>	– Fenwick	F.T. Everard & Sons Ltd
<i>Amoria</i>	S. Soadby.....	Shell International Trading & Shipping Co. Ltd
<i>Anchorman</i>	W.P Mercer	James Fisher & Sons (Liverpool) Ltd
<i>Arco Avon</i>	D. Griffiths	ARC Marine Ltd
<i>Arco Dart</i>	– Forster	ARC Marine Ltd
<i>Arianta</i>	B. Lohnes	Shell International Trading & Shipping Co. Ltd
<i>Asprella</i>	M. Spoons	Shell International Trading & Shipping Co. Ltd
<i>Authenticity</i>	J. MacKay	F.T. Everard & Sons Ltd
<i>BP Springer</i>	N. Easton	BP Oil UK Ltd
<i>Balmoral</i>	P. Tambling.....	Waverley Excursions Ltd
<i>Blackfriars</i>	P. Mitchell	Crescent Shipping Ltd
<i>Briarthorn</i>	I. Walker	James Fisher & Sons (Liverpool) Ltd
<i>Celtic Terrier</i>	R. Garner	Campbell Maritime Ltd
<i>Chartsman</i>	W. Millar	James Fisher & Sons (Liverpool) Ltd
<i>City of Cardiff</i>	B. McIntyre	United Marine Dredging Ltd
<i>City of Chichester</i>	E. Natt	United Marine Dredging Ltd
<i>David M</i>	S. Wright	James Fisher & Sons (Liverpool) Ltd
<i>European Highlander</i> ...	H. Jones	P&O EF/IS Ltd
<i>Frederick M</i>	B. Moore	James Fisher & Sons (Liverpool) Ltd
<i>Hera</i>	E. Onsoien	Bergesen d.y. ASA
<i>Hernes</i>	—	Jebsens Ship Management (London) Ltd
<i>Hordnes</i>	R.D. Datu	Jebsens Ship Management (London) Ltd
<i>Lord Rank</i>	E. Green.....	Ocean Youth Club
<i>Marine Explorer</i>	R. Wood	Eidesvik Shipping Ltd
<i>Merchant Brilliant</i>	P. Ankers	Merchant Ferries/ V. Ships (UK) Ltd
<i>Merchant Venture</i>	K. Fort	Merchant Ferries/ V. Ships (UK) Ltd
<i>Michael M</i>	J. Olden	James Fisher & Sons (Liverpool) Ltd
<i>Northern Star</i>	D. Skivington	Celtic Marine Ltd
<i>Petro Avon</i>	J.A. Dunlop	Petroleum Shipping Ltd
<i>River Lune</i>	N. Humphreys	Belfast Freight Ferries
<i>Royalist</i>	J. Paling.....	Sea Cadet Association
<i>Saga Moon</i>	M. Leadley	Belfast Freight Ferries
<i>Sand Kestrel</i>	R.T. Harding.....	South Coast Shipping Co. Ltd
<i>Sanguity</i>	D. Golden	F.T. Everard & Sons Ltd
<i>Spheroid</i>	H. Thomson.....	Belfast Freight Ferries
<i>Stena Antrim</i>	—	Stena Line Ltd
<i>Stena Caledonia</i>	D. Ramsey	Stena Line Ltd
<i>Stena Challenger</i>	D.P. Farrell	Stena Line Ltd
<i>Stena Galloway</i>	—	Stena Line Ltd
<i>Stolt Avocet</i>	B. Bilic	Stolt-Nielsen Rederi A/S
<i>Stolt Kittiwake</i>	Q. Bretherton.....	Stolt-Nielsen Rederi A/S
<i>Superferry</i>	—	Swansea-Cork Ferries Ltd
<i>Taikoo</i>	—	Ocean Youth Yacht Club
<i>Tillerman</i>	A. Simson	James Fisher & Sons (Liverpool) Ltd
<i>UKD Bluefin</i>	M. Fraser	UK Dredging
<i>Union Arbo</i>	B. Willard	Union Transport Group plc
<i>Vanessa C</i>	H. Schilpzand	Carisbrooke Shipping plc
<i>Waverley</i>	D.L. Neill	Waverley Excursions Ltd
<i>Welsh Piper</i>	J. Norman	British Dredging Aggregates Ltd

Oil Rigs and Platforms

NAME OF RIG OR PLATFORM	OWNER/OPERATOR
<i>AH001</i>	Amerada Hess Ltd
<i>Beryl A</i>	Mobil North Sea Ltd
<i>Beryl B</i>	Mobil North Sea Ltd
<i>Buchan A</i>	Talisman Energy (UK) Ltd
<i>Captain WPP A</i>	Texaco North Sea UK Co. Ltd
<i>Drill Star</i>	Sedco-Forex
<i>Glomar Arctic III</i>	Global Marine Drilling Co. Ltd
<i>Gryphon A</i>	Kerr-Magee Oil (UK) plc
<i>Heather A</i>	DNO Heather Ltd
<i>Henry Goodrich</i>	Reading & Bates (UK) Ltd
<i>Iolair</i>	Reading & Bates (UK) Ltd
<i>John Shaw</i>	Transocean Offshore Ltd
<i>Maureen A</i>	Phillips Petroleum UK Co. Ltd
<i>Montrose A</i>	Amoco (UK) Exploration Co.
<i>Morecambe Bay API</i>	British Gas Hydrocarbon Resources Ltd
<i>Noble Ton Van Langeveld</i>	Noble Drilling (UK) Ltd
<i>Northern Producer</i>	Atlantic Floating Production Company
<i>Ocean Alliance</i>	Diamond Offshore Ltd
<i>Ocean Guardian</i>	Diamond Offshore Ltd
<i>Paul B. Loyd Jr.</i>	Reading & Bates (UK) Ltd
<i>Petrojarl Foinaven</i>	Golar-Nor Offshore
<i>Santa Fe Britannia</i>	Santa Fe Drilling Co. Ltd
<i>Santa Fe Galaxy 1</i>	Santa Fe Drilling Co. Ltd
<i>Santa Fe Magellan</i>	Santa Fe Drilling Co. Ltd
<i>Santa Fe Rig 135</i>	Santa Fe Drilling Co. Ltd
<i>Santa Fe Monitor</i>	Santa Fe Drilling Co. Ltd
<i>Santa Fe Monarch</i>	Santa Fe Drilling Co. Ltd
<i>Sedco 706</i>	Sedco-Forex
<i>Sedco 711</i>	Sedco-Forex
<i>Sedco 712</i>	Sedco-Forex
<i>Sedco 714</i>	Sedco-Forex
<i>Sovereign Explorer</i>	Sedco-Forex
<i>Tartan A</i>	Texaco North Sea UK Co. Ltd
<i>Tiffany Platform</i>	Agip (UK) Ltd
<i>Transocean Explorer</i>	Transocean Offshore Ltd
<i>Viking B</i>	Conoco (UK) Ltd

BRITISH COMMONWEALTH

The following lists give the names of Selected and Supplementary Ships, and the number of Auxiliary Ships where known (those which only report in 'sparse areas'), which voluntarily co-operate with meteorological services of the British Commonwealth.

Information for these lists is required by 15 March each year. Information for the January corrective lists is required by 15 September.

AUSTRALIA (Information dated 3 March 1998)

NAMES OF VESSELS		
Selected Ships: <i>Aburri</i> <i>Al Khaleej</i> <i>Al Kuwait</i> <i>Alltrans</i> <i>Arafura</i> <i>Aurelia</i> <i>Aurora Australis</i> <i>Australia Star</i> <i>Australian Achiever</i> <i>Australian Advance</i> <i>Australian Endeavour</i> <i>Australian Enterprise</i> <i>Australian Pride</i> <i>Barbican Spirit</i> <i>Barbican Star</i> <i>Boral Gas</i> <i>Botany Triumph</i> <i>Brigit Maersk</i> <i>Cape Grafton</i> <i>Capitaine Cook</i> <i>Capitaine Fearn</i> <i>Caribbean Challenger</i> <i>Challis Venture</i> <i>Chekiang</i> <i>Choyang Sydney</i> <i>Coral Chief</i> <i>Danny F II</i> <i>El Cordero</i> <i>Endeavour River</i> <i>Fair Princess</i> <i>Farid F</i> <i>Fitzroy River</i>	Selected Ships (contd): <i>Franklin</i> <i>Fua Kavenga</i> <i>Highland Chief</i> <i>Iron Carpentaria</i> <i>Iron Chieftain</i> <i>Iron Curtis</i> <i>Iron Dampier</i> <i>Iron Flinders</i> <i>Iron Kembla</i> <i>Iron Monarch</i> <i>Iron Newcastle</i> <i>Iron Prince</i> <i>Iron Spencer</i> <i>Iron Sturt</i> <i>Iron Yandi</i> <i>Iron Whyalla</i> <i>Klang Reefer</i> <i>Kowulka</i> <i>Leeuwin</i> <i>Lillo</i> <i>Lindesay Clark</i> <i>Maersk Oceania</i> <i>Mawashi Al Gassem</i> <i>Mosdeep</i> <i>MRS Pioneer</i> <i>Nivosa</i> <i>NOL Amber</i> <i>Northwest Sanderling</i> <i>Northwest Sandpiper</i> <i>Northwest Seaeagle</i> <i>Northwest Shearwater</i> <i>Northwest Snipe</i>	Selected Ships (contd): <i>Northwest Stormpetrel</i> <i>Ormiston</i> <i>Pacific Challenger</i> <i>Pacific Conquest</i> <i>Pacific Gas</i> <i>Papuan Chief</i> <i>Pathfinder II</i> <i>Portland</i> <i>Provider</i> <i>Rig Seismic</i> <i>River Boyne</i> <i>River Embley</i> <i>River Torrens</i> <i>Saraji Trader</i> <i>Seakap</i> <i>Sedco 703</i> <i>Sina</i> <i>Sitka</i> <i>Southern Surveyor</i> <i>Spirit of Tasmania</i> <i>Swan Reefer</i> <i>Tradewind Express</i> <i>Young Endeavour</i>
		Supplementary Ships: <i>Barbican Success</i> <i>Maersk Taiyo</i> <i>One and All</i>

Auxiliary Ships:

Australia has one Auxiliary Ship currently reporting.

INDIA (Information dated 21 April 1998)

Selected Ships:

Akbar
Arunchal Pradesh
B R. Ambedkar
Bhavabhuti
Harshavardhan
Lokmanya Tilak
Major Dhansingh Thapa PVC
Sabarimala
Sagar Kanya
Sagar Sampada
Samudra Manthan
State of Andhra Pradesh
State of Gujurat
State of Nagaland
Vishnu Sagar
Vishva Pallav

Supplementary Ships:

A B Tarapore PVC
APJ Anand
APJ Angad
APJ Anjali
APJ Priti
APJ Shalin
APJ Sushma
Aditya Usha
Alaknanda
Ankaleshwar
Annapurna
Aurobindo
Bhagat Singh
Bharat Seema
CHM Piru Singh PVC
Chandidas
Chennai Jaayam
Chennai Ookkam
Chennai Perumai
Chennai Polivu
Chennai Sadhanai
Chennai Veeram
Chennai Velarchi
Chhatrapati Shivaji
Continental Rose
Dadabhai Nowroji
Dakshineswar
Diglipur
Dweep Setu
Fonj Shekhon PVC
Gandhar
Ganga Sagar

Supplementary Ships (contd):

Guru Bachan Singh Salaria
PVC
Hardwar
Harkishan
Havildar Abdul Hamid PVC
Indian Goodwill
Indian Valour
Indira Gandhi
Jag Manek
Jag Pari
Jag Prabhat
Jag Prakash
Jag Preeti
Jag Vijay
Jagat Swamini/Priyamvada
Jagat Samrat
Jagat Vijeta
Jala Tapi
Jala Vallabh
Jameela
Jawaharlal Nehru
Jay Laxmi
Jay Narayan Vyas
Kabirdas
Kalidas
Kanchan Junga
Kanpur
Kolandia
Lal Bahadur Shastri
Lance Nail Albert Ekka PVC
Lt Arun Khetrupal PVC
Lok Maheshwari
Lok Pragati
Lok Prakash
Lok Pratap
Lok Pratima
Lok Rajeshwari
Lok Vikas
MMP Wealth
Maharashtra
Maharshi Dayanand
Maharshi Karve
Major Hoshiar Singh PVC
Mandakini
Maratha Melody
Maratha Prudence
Mizoram
Motilal Nehru
Murshidabad
Naik Jadunath Singh PVC
Nancowry

Supplementary Ships (contd):

Nand Hari
Nand Kala
Nand Kavita
Nand Kishore
Nand Rati
Nand Smiti
Nand Srishti
Nandu
Nanga Parbat
Netaji Subash Bose
Nicobar
Onge
Patilputra
Prabhu Das
Prabhu Daya
Prabhu Gopal
Prabhu Puni
Prabhu Satram
Rafi Ahmed Kidwai
Rajiv Gandhi
Rama Raghoba Rane PVC
Ramdas
Ratna Vandana
Ravidas
Sagar Deep
Sagar Samrat
Sanmar Pioneer
Sarojini Naidu
Satya Murti
Skandy Surveyor
State of Haryana
State of Manipur
State of Orissa
Subhedar Jogindar Singh
PVC
Tirumalai
Tulsidas
Uttar Kashi
Varanasi
Varun Adhar
Vishva Bandhan
Vishva Kaumudi
Vishva Mohini
Vishva Nandini
Vishva Pankaj
Vishva Parag
Vishva Parijat
Vishva Parimal
Vishva Yash
Vivekananda
Yerawa

NAMES OF VESSELS

Auxiliary Ships:

India has 37 Auxiliary Ships currently reporting.

NEW ZEALAND (Information dated 4 February 1998)

Selected Ships:

Ariake
America Star
Capitaine Kermadec
Capitaine Wallis
Challenger
Columbia Star
Crusader
Direct Kea
Forum Samoa
Frederick Brown
Freshwater Bay
Golden Bay
Kotuku
Marico
Matilda Bay
Melbourne Star
New Zealand Pacific
Ngamaru III

Selected Ships (contd):

Osa Ghent
Pacific Onyx
Ranginui
Rangiورا
Rangitata
SeaTow 22
SeaTow 25
Soren Larsen
Spirit of Competition
Sydney Express
Sydney Star
T A Explorer
T A Navigator
Taiko
Takitimu
Tangaroa
Tarihiko
Tasman Venture

Selected Ships (contd):

Toanui
Turakina
Union Rotoiti
Union Rotoma
Union Rotorua
Wellington Express

Supplementary Ships:

Arahanga
Arahura
Aratika
Straitsman
Suilven

NAMES OF VESSELS

Auxiliary Ships:

New Zealand has a fleet of 12 Auxiliary Ships currently reporting.

HONG KONG SPECIAL ADMINISTRATIVE REGION
(Information dated 1 January 1998)

NAMES OF VESSELS

Selected Ships:	Selected Ships (contd):	Selected Ships (contd):
<i>Al Mariyah</i>	<i>Maritime Joy</i>	<i>Rowan</i>
<i>Anahuac</i>	<i>Melanesian Chief</i>	<i>Seafalcon</i>
<i>Anna</i>	<i>Mundogas Orinoco</i>	<i>Seamaster</i>
<i>Ardmore</i>	<i>Navios Bulker</i>	<i>Sishen</i>
<i>Asian Challenger</i>	<i>New Oasis</i>	<i>Talabot</i>
<i>Asimont</i>	<i>Nongkhai Navee</i>	<i>Tampa</i>
<i>Bunga Kantan</i>	<i>OOCL Alliance</i>	<i>Tapiola</i>
<i>Bunga Pelangi Dua</i>	<i>OOCL America</i>	<i>Texas</i>
<i>Bunga Suria</i>	<i>OOCL Award</i>	<i>Torrens</i>
<i>Chengtu</i>	<i>OOCL California</i>	<i>Venture</i>
<i>Delmas Bougainville</i>	<i>OOCL China</i>	<i>Veracruz</i>
<i>Delmas Joinville</i>	<i>OOCL Envoy</i>	<i>Wawasan Setia</i>
<i>Eagle Malaysia</i>	<i>OOCL Exporter</i>	
<i>Eagle Respect</i>	<i>OOCL Fair</i>	
<i>Grand noble</i>	<i>OOCL Fidelity</i>	
<i>Gulf Spirit</i>	<i>OOCL Fortune</i>	
<i>Hai Kang</i>	<i>OOCL Hong Kong</i>	
<i>Hawk Arrow</i>	<i>OOCL Japan</i>	
<i>Highlander</i>	<i>OOCL Netherlands</i>	
<i>Ji Fung</i>	<i>OOCL Singapore</i>	
<i>Jin Fa</i>	<i>Ocean Beluga</i>	
<i>K.I.A. Waleed</i>	<i>Ocean Sincerity</i>	
<i>Kitty</i>	<i>Ocean Strength</i>	
<i>Kokopo Chief</i>	<i>Osaka</i>	
<i>Kurama</i>	<i>Osprey Arrow</i>	
<i>Kwangtung</i>	<i>Pacific Islander</i>	
<i>Maersk Asia Decimo</i>	<i>Pearl</i>	
<i>Maersk Nanhai</i>	<i>Poyang</i>	
<i>Marienvoy</i>	<i>Rickmers Shanghai</i>	
		Supplementary Ships:
		<i>Andes Challenger</i>
		<i>Eastern Sea</i>
		<i>Green Era</i>
		<i>Lamphun Navee</i>
		<i>Maritime Faith</i>
		<i>Maritime Victory</i>
		<i>Rainbow</i>
		<i>Seamaster 1</i>
		<i>Silver Clipper</i>
		<i>Success Bulker</i>
		<i>Toba</i>
		<i>Tohzan</i>

Auxiliary Ships:

Hong Kong has 1 Auxiliary Ship currently reporting.

Published by The Stationery Office and available from:

The Publications Centre

(mail, telephone and fax orders only)
PO Box 276, London SW8 5DT
General enquiries 0171 873 0011
Telephone orders 0171 873 9090
Fax orders 0171 873 8200
Subscription enquiries 0171 873 8499

The Stationery Office Bookshops

123 Kingsway, London WC2B 6PQ
0171 242 6393 Fax 0171 242 6394
68-69 Bull Street, Birmingham B4 6AD
0121 236 9696 Fax 0121 236 9699
33 Wine Street, Bristol BS1 2BQ
0117 9264306 Fax 0117 9294515
9-21 Princess Street, Manchester M60 8AS
0161 834 7201 Fax 0161 833 0634
16 Arthur Street, Belfast BT1 4GD
01232 238451 Fax 01232 235401
The Stationery Office Oriel Bookshop
The Friary, Cardiff CF1 4AA
01222 395548 Fax 01222 384347
71 Lothian Road, Edinburgh EH3 9AZ
0131 228 4181 Fax 0131 622 7017

Accredited Agents

(see Yellow Pages)

and through good booksellers

© Crown Copyright 1998

Published with the permission of The Met. Office on behalf of the
Controller of Her Majesty's Stationery Office.

Applications for reproduction should be made in writing to
The Copyright Unit, Her Majesty's Stationery Office,
St. Clements House, 2-16 Colegate, Norwich, NR3 1BQ.

Annual subscription
£22 including postage

£6

