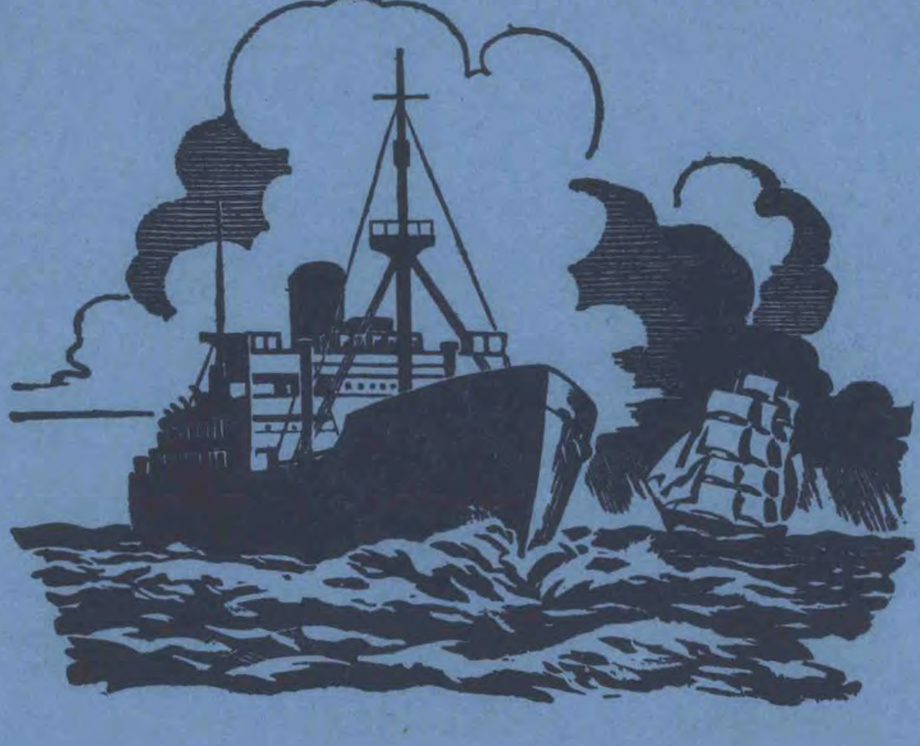
Met.O. 859

The Marine Observer

A quarterly journal of Maritime Meteorology



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THE
MARINE OBSERVER

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

Vol. XLIII

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

VOL. XLIII No. 239 JANUARY 1973

CONTENTS

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

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Editorial

He was wont to seken the causes whennes the souning windes moeven and bisien the smothe water of the see; and what spirit torneth the stable hevene; and why the sterre aryseth out of the rede eest, to fallen in the westrene wawes; and what atempreth the lusty houres of the firste somer seasoun, that highteth and apparaileth the erthe with rosene flowres; and who maketh that plentevouse autompne, in fulle yeres, fleteth with hevy grapes. And eek this man was wont to telle the dyverse causes of nature that weren y-hidde.

Chaucer's translation of Boëthius, *De Consolatione Philosophie*, Book I.

This passage appeared under the heading 'Epitaph of a Keen Observer' in the Additional Remarks pages of a meteorological logbook from the *Bulimba* some time ago. At that time the ship was still in the hey-day of her voluntary observing career and the notice seemed rather premature. During the past year, however, she has left us, though happily not for the breaker's yard as so many loyal observing ships have done recently, but to fly the flag of another nation on whose voluntary observing fleet list, and wearing her new name *Bunga Kenanga*, we shall hope to see her one day.

No doubt most prose tends to lose something in translation and the double translation to which this ancient passage has been subjected to bring it into modern English may not have helped it. But it is still a good Epitaph for a Keen Observer in the way it has been kindly brought up to date for us:

He used to investigate how the roaring winds move and trouble the smooth waters of the sea, and what spirit turns the sphere of the fixed stars; and why the constellations rise out of the red east to sink in the western waves; and what warms the lusty hours of early summer which call forth rosy flowers to deck the earth; and who makes the generous autumn, in a fruitful year, abound with heavy grapes. This man used also to expound the manifold hidden laws of nature.

The scientific world of Chaucer's day in general subscribed to the seventeen-hundred-year-old Aristotelean concept of the universe: the earth as centre surrounded by a sphere of air (the atmosphere), then a sphere of fire, the seven planetary spheres, the sphere of fixed stars and finally by the *primum mobile*, the power house of the universe driving the fixed stars in their daily rotation.

There were, no doubt, many of Chaucer's contemporaries who, like our Keen Observer, dared to question this philosophy and their numbers would undoubtedly grow as the years rolled on, but over two hundred years were to pass before a sixteen-year-old undergraduate of Trinity College, Cambridge, named Francis Bacon (later to achieve fame in many spheres) was to declare openly to his teachers that their science was grounded on a crude and scanty observation of nature and that he would dedicate himself to free the world of what he called "this Aristotelean theology" and devote his energies to accumulating evidence from actual observation and experiment, basing his conclusions only on known facts. We may, perhaps, presume to call that the beginning of intelligent observing and inductive reasoning as it is practised in the voluntary observing fleets of the nations today.

Many of the questions asked by these old-time philosophers have been answered but this has only come about through the patient accumulation of facts and observations over many years; there is yet to be found a satisfactory answer to the first question posed above: "How the roaring winds move and trouble the smooth waters of the sea"; on the answer to this question rests largely the solution of problems such as the ocean current circulation of the world, the suitability of various areas for building oil rigs, dock and harbour installations, the future design of ships in relation to the areas in which they are likely to operate, the problem of ice accretion on trawlers, in fact so very many problems in connection with the safety of life at sea. And once again it is only observations and facts which can solve them.

When we consider the last sentence of the passage, "To expound the manifold hidden laws of nature", our minds instinctively turn to the *Marine Observers' Log* section of this journal. In four successive numbers, quite recently, we find that we have published extracts from ships' meteorological logbooks concerning Aurorae, Bats, Beetles, Birds, Comets, Crickets, Currents, Earthquakes, Fireballs, Fish, Fish Parasites, Flashes Blue and Green, Fog Bows, Gegenschein, Icebergs, Insects, Lightning, Line of Demarcation, Locusts, Luminescence, Marine Life, Moths, Phosphorescent Wheels, Radar phenomena, Refraction, St. Elmo's Fire, Sea Smoke, Squalls, Tropical Storms, Volcano, Waterspouts, Waves, Whales, Wind Funnels and Zodiacal Light; everything from A to Z in fact. All these observations are a good measure of the keenness and enthusiasm for scientific observation which characterize the present-day observer, a worthy successor of Boëthius' friend of so many years ago. We are always glad to have material such as this for, even if there is no room to publish it, it is always sent on to the appropriate experts; nothing is ever wasted.

Recently our hearts were warmed by a letter from a shipmaster from which we quote: "... it is often discovered that recordings made by sea-going people are little mentioned and not even acknowledged, giving little incentive to those concerned in making them. The Meteorological Office in this direction, I can assure you, is unique, for your letters do give us a sense of belonging." We liked this because the personal touch has always loomed very large in the organization of our Voluntary Observing Fleet. There are many ships, nowadays the number is increasing, which seldom come to a British port. In fact the ship responsible for quoting Chaucer, as above, 'signed on' in April 1959 and was only seen by a U.K. Port Meteorological Officer five times during her thirteen years of observing. And when she was withdrawn it had to be done for us in Singapore. Thus correspondence concerning their meteorological logbooks and the quarterly publication of *The Marine Observer* are virtually the only links we have with some of our most loyal supporters. We do, in fact, sometimes like to think of each issue of *The Marine Observer* as being a letter from home to members of a large family, giving news of the various members to the others and we are never averse to receiving letters at the parental home in Bracknell or, if they have time, having members of the family visit us.

In this spirit then may we wish you all, in port, at sea, in tropic, temperate or polar clime, a good New Year. May it bring health, happiness, reasonable weather and good landfalls to all.

L. B. P.

January, February, March

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

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

HURRICANE 'YOLANDE'

Western South Pacific

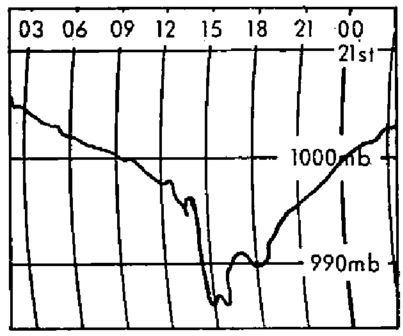
s.s. *Northern Star*. Captain D. T. Mouldey. Brisbane to Lautoka, Fiji. Observers, the Master and all officers.

18th–22nd March 1972. At 0600 GMT on the 18th the vessel sailed from Brisbane; a course of 075°T was set and maintained until 1300 on the 20th; speed approx. 19 kt. During this leg of the passage the weather was mainly fine and sunny with some Sc cloud but there were occasional showers during the night. The temperature ranged from about 21°C at night to 26° during the day. The wind, however, was fairly constant from E–SSE, force 6–8.

During this time regular weather forecasts and the Analysis FM 46D were received and a synoptic chart produced. The first report received about the presence of a cyclone was a warning issued at 1330 on the 19th. It was then named Tropical Cyclone Yolande, centred at 19°S, 170°30′E, moving SW at 10 kt. Winds up to 45 kt were expected within 300 miles of the centre in the southern quadrant, and 200 miles in the eastern quadrant. All possible weather reports were monitored by the Radio Officer (a 24-hour watch is kept) and the movement of the cyclone was plotted.

At 1500 on the 19th we started to transmit 3-hourly reports; hourly reports were sent from 0900 on the 20th, by which time the SE'ly wind had increased to force 9, with several heavy rain squalls. The barometer had fallen from a steady 1007 mb at 0100 to 997·8 mb at 0900. At 1000 the pressure rose quickly to 1000·5 mb but then fell again, at times at the rate of 1·2 mb every 20 min. There was a very rough sea and the very heavy swell waves were 15–18 m high.

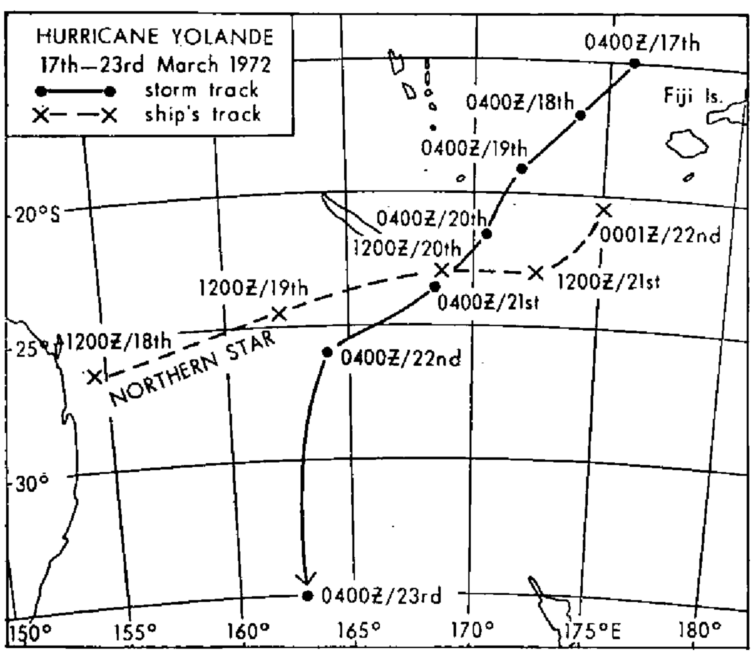
At 0100 on the 20th, with the wind SSE, force 10, the vessel was riding head to swell (088°T) at reduced revs., almost hove-to, pitching heavily but not rolling as she is stabilized. The wind continued to increase until about 1600 when it exceeded hurricane force 12. During the previous hour it is thought that the vessel entered the eye of the storm as the wind died away almost completely for several minutes. A warning issued at 1600 officially upgraded the cyclone to a hurricane with winds in excess of 70 kt expected within 60 miles of the centre.



The vessel maintained an easterly course as Yolande continued to move SW at about 5 kt and by 0100 on the 21st was well clear of the centre. The effects of the storm's passage, fresh winds and rough seas, could still be felt until about 1300 on the 22nd when the vessel was some 600 miles from the centre.

On arrival at Lautoka, Fiji, a senior met. officer from Nandi Airport visited the vessel and asked for photostat copies of the transmitted observations, the barograph trace, etc. It is interesting to note that the forecast central pressure was given as 995 mb whereas our lowest recorded reading was 986·1 mb.

Position of ship at 1200 on 20th: 23° 00′S, 168° 42′E.



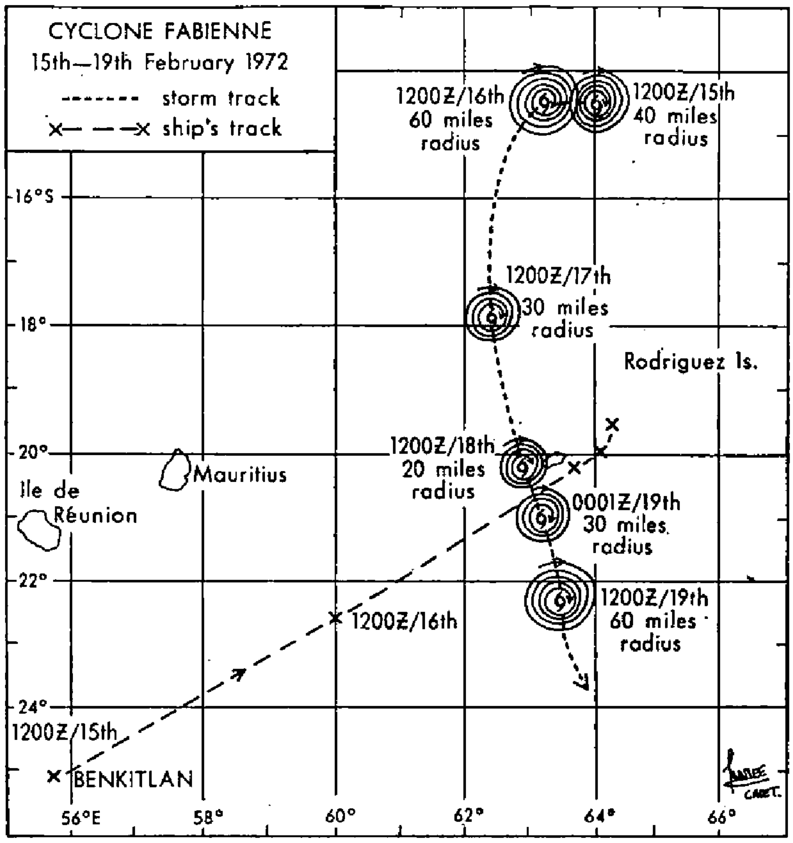
Note. The path of Yolande, together with the ship's track, is shown on the diagram. From satellite pictures it would appear that this storm temporarily reached hurricane strength during 20th and 21st March. The path of Yolande, though unusual, is not exceptional; typical storm tracks shown in the relevant Admiralty *Pilots* indicate that some storms follow persistent south-westerly courses into the Coral and Tasman Seas before recurving towards the south and south-east.

CYCLONE 'FABIENNE'

Indian Ocean

m.v. *Benkitlan.* Captain J. M. Macleod. Antwerp to Penang. Observers, the Master, Mr. A. I. MacFeate, 1st Officer, Mr. A. M. Begg, 2nd Officer, Mr. P. J. Morrison, 3rd Officer and Mr. S. C. Lee, Cadet.

15th–19th February 1972. At 1200 GMT on the 15th a warning was received of cyclone Fabienne, formed within 40 miles radius of 14° 30′S, 64° 00′E and moving W'ly at 7 kt. At that time our position was 25° 12′S, 55° 36′E; wind E'ly, force 3, pressure 1011·0 mb, air temp. 27·4°C falling, slight sea and heavy cross swells 3·7 m in height.



The position of the storm was plotted and its track closely followed with the help of weather warnings received. At the same time the watch-keeping officers kept a close watch for changes in weather and sharp differences in pressure. The ship was still maintaining her course and speed as the cyclone was about 800 miles north-east of us.

At 1200 on the 16th the cyclone was reported to have intensified and moving W–SW at 5 kt from 14° 30′S, 63° 18′E. The barometer continued to fall and the wind freshened. By 2200 the wind was E'S, force 6–7 and there were heavy rain squalls which reduced visibility. The vessel was pitching and rolling in the very rough and confused sea and the heavy cross swells, shipping light water for'ard and spraying over all.

By 1200 the next day the cyclone was about 150 miles north-west of us, moving S–SSW at 10 kt. In order to divert from the path of the storm (which was expected to travel SSW and only to recurve to SSE in the latitude of Mauritius) or at least navigate in the navigable semicircle, the Master altered course to 090°T and speed was reduced due to adverse weather. The wind had increased to E'ly, force 10–11, visibility was less than 1 mile in rain squalls and heavy spray. The vessel was hove-to in a phenomenal seaway; she rolled 35° to port and starboard in swells from NNE of 15 m and from E'N of 9 m, making little headway but fortunately still maintaining steerage way. Pressure was 995·5 mb, still falling steadily.

The warning issued at 0001 on the 18th indicated that Fabienne had recurved earlier than expected and had moved SSE at 7 kt to 90 miles west of the vessel. The wind attained its maximum speed of more than 70 kt (force 12+) and a swell from NE'N was as high as 21 m. Visibility was almost nil. Pressure was 982·9 mb, falling steeply and very unsteadily. Paint on the sections exposed to the weather, such as hull, masts, for'ard accommodation, was stripped off during the storm.

By 0800 on the 19th sea conditions had improved, wind was WNW, force 7–8, the rain had ceased, visibility was over 5 miles and the barometer had risen 5 mb in 5 hours. The ship was brought back to her original course and attained maximum speed.

During the storm, weather reports were transmitted to OBS CQ every 3 hours and

6-hourly weather warnings were received from Meteo Mauritius. The ship had steamed 55 miles in 48 hours.

Position of ship at 1200 on 17th: 20° 00′S, 63° 54′E.
Position of ship at 1200 on 19th: 19° 24′S, 64° 30′E.

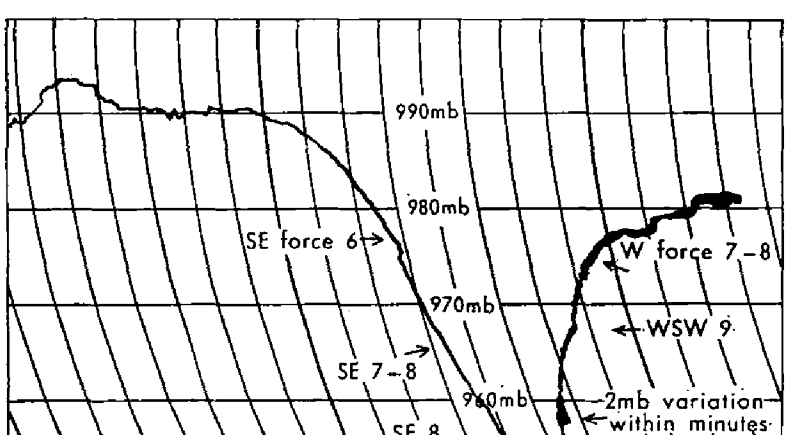
INTENSE DEPRESSIONS

North Atlantic Ocean

m.t. *Ross Orion*. Skipper A. Osler. Iceland to Hull. Observer, Mr. R. R. N. Laing, Radio Officer.

23rd January 1972. At 1130 GMT the vessel sailed, bound for Hull. Due to a very steep drop in barometric pressure and freshening SE'ly wind fishing had ceased rather earlier than intended. The wind remained SE, force 7–8 until shortly after 1400 when, with the barometer reading 947·5 mb, it veered quickly to SW and rapidly increased to force 10. Very low cloud combined with spray reduced visibility to less than half a mile and by 1515 the wind force was estimated to be in the region of 60–70 kt, the vessel by this time, of course, being hove-to. The barograph trace, from its lowest reading of 947·5 mb, rose even more quickly than it had fallen and from 1515 until 1800 the wind remained SW, force 11–12, with occasional gusts of greater strength. (About 1700 the barograph showed a sharp drop of 2 mb—also indicated on the precision aneroid—then resumed its rapid rise.) By 1900 the wind had decreased and veered slightly to WSW, force 10, and the vessel was put back on course of 130°T, proceeding at half speed. The barograph trace shows this extreme pressure gradient.

Position of ship at approx. 1130: 64° 40′N, 12° 00′W.
Position of ship at 1800: 64° 12′N, 10° 48′W.



Note. The barograph trace indicates the rapid approach and departure of a deep depression which had left the eastern coast of the U.S.A. only 48 hours earlier when its central pressure was about 1005 mb. The localized drop in pressure at about 1700 during a period of sharp rise in pressure can perhaps be attributed to a violent squall in the rear of the depression.

m.v. *Manchester Courage*. Captain D. G. Thomas. Montreal to Manchester. Observer, the Master, Mr. C. R. Darnley, 3rd Officer and other officers.

19th February 1972. The following observations were made while the vessel was involved with a vigorous Atlantic depression.

GMT

0150: Position of ship 48° 36′N, 41° 54′W. Wind veered rapidly from NNE to S'ly remaining steady at force 7–8. Pressure 975·2 mb, falling steadily. Air temp. 4·5°C and wet bulb 4·1° rose to 14·4° and 14·0° after shift of wind.

Very distinct rain edge observed on the radar running NNE/SSW, visible for 48 miles (maximum radar range).

0400: Position of ship 49° 00′N, 40° 00′W. Barograph trace falling less rapidly, wind veering slowly, force 8.

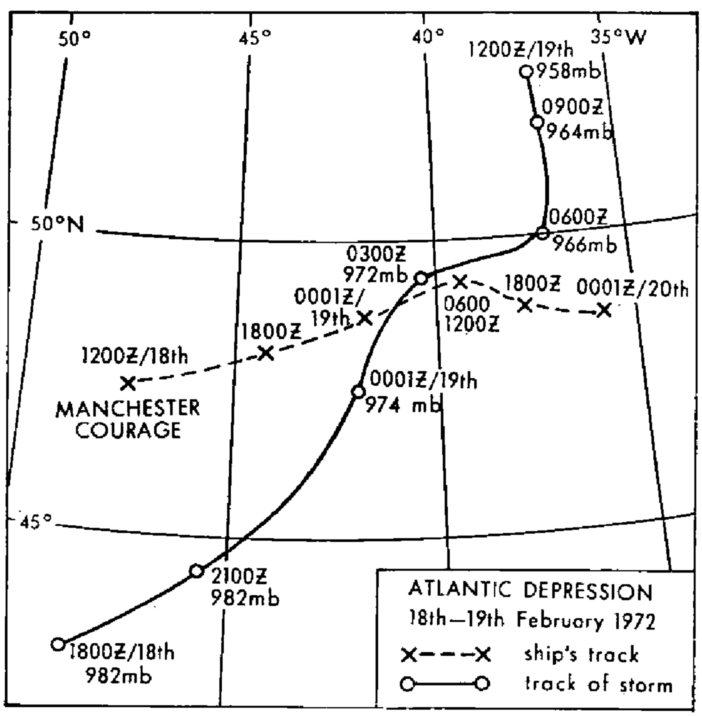
0715: Wind veered rapidly to NW, force 12 or above. Pressure 965·7 mb then the barograph trace started to rise nearly vertically. Vessel hove-to in approx. position 49° 12′N, 39° 26′W in very heavy and precipitous swell waves, very confused. Heavy continuous rain commenced at 0720.

0900: Wind NW, force 10–11. Seas very steep (12 m) and confused. Barograph trace continued to rise steeply. Rain turned to violent squalls in gusts up to force 12.

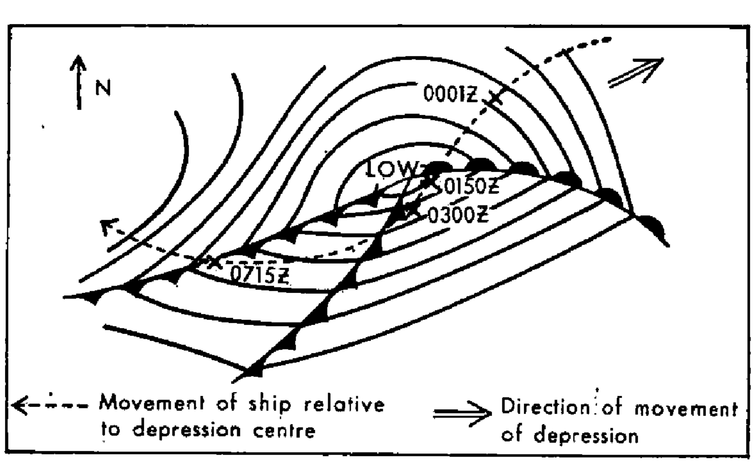
1100: Wind backed to W'ly, force 8; barometric pressure 996·8 mb and rising. Conflicting swell pattern.

1200: Wind W'ly, force 8. Barometer rising steadily. Air temp. 3·2°, wet bulb 3·0°. Vessel hove-to in approx. position 49° 12′N, 39° 26′W.

Note. The *Manchester Courage* was overtaken by a vigorous and still deepening depression whose track, at least for a few hours after the time of passage (approx. 0230), lay close to and almost parallel to that of the ship. The tracks of both ship and depression are shown below.



The most interesting features of this report are the abrupt wind direction changes at 0150 and 0715. These changes occurred at the passage of the warm and cold fronts respectively; considerable troughing must have occurred on both fronts to account for such dramatic wind veers.



The second diagram is a schematic representation of the configuration of the isobars at about 0300 when the storm centre had just overtaken the ship. A minor cold front has been drawn ahead of the main cold front to account for the intermediate slight veer.

Observations from this ship revealed that W–NW'ly gales in the rear of the depression continued until late evening on the 20th.

HOLY CHILD CURRENT

Peruvian waters

m.v. *Mystic*. Captain E. H. Gregson. Balboa to Caldera, Chile and return via Antofagasta, Arica, Matarani and Callao. Observer, Mr. C. G. G. Hawken, 2nd Officer.

January–February 1972. During late January the south-going Holy Child Current was in evidence off the north coast of Peru, displacing the cold Peru Current [formerly called the Humboldt Current]. Above-average sea temperatures were experienced up to 6°S and southerly sets were measured. At a latitude of 5°S the sea temperature was 23·3°C but by 6° 30'S this had dropped to 17·8°. Small amounts of smoky-grey discoloured water were observed in patches. Sea temperatures remained normal from 6°S until the ship left the vicinity of the coast of south Peru (17°S) when, once again, the sea temperature rose to 23°. However, a predominantly northerly drift was still experienced off the coast of Chile.

During late February low sea temperatures were measured in south Peru and northerly sets experienced. A considerable upwelling of cold water is presumably the reason for these low temperatures at the 100-fm line. However, just north of Callao (12°S) the Holy Child Current was once again in evidence, having advanced to about 10°S during the 30-day period. Above-average sea temperatures were observed, together with southerly sets.

Position of ship at 0001 GMT on 28th January: 08° 42'S, 79° 36'W.

Note. Mr. Hawken has provided a great deal of information on the Holy Child Current over the past few years. His observations indicate that this Current has prevailed further south than normal in four out of the past five years; according to the *South America Pilot*, Vol. III (1968 edition) the frequency of occurrence south of 3°S in January and February is roughly one year in four. The past few years may be an exceptional period, in which case the long-term frequency will eventually be restored. On the other hand, the recent abnormal behaviour of the Holy Child Current may indicate the beginning of a longer-term change in the current pattern off Peru with attendant disastrous results for the coastal economy of the region.

SUBMARINE EARTHQUAKES

Western North Pacific

s.s. *Esso Warwickshire*. Captain H. Johnson. Kharg Island to Okinawa. Observers, the Master, Mr. T. J. Lowe, 2nd Officer and ship's company.

4th January 1972. At 0318 GMT a violent shuddering was experienced which lasted for approx. 15 sec; our first impression was that the vessel had run aground. Charted depth was over 2,000 fm, full speed was maintained, therefore not aground nor lost propeller. No change in sea surface observed. Assumed to be a submarine earthquake.

Position of ship: 22° 17'N, 123° 00'E.

m.v. *Benstac*. Captain R. S. Lumsden. Bugo, Mindanao Is. to Keelung. Observers, the Master, Mr. M. E. Harris, 2nd Officer and other officers.

4th January 1972. At 0320 GMT very strong vibrations were felt on the vessel; they lasted about 10–15 sec. Soundings showed no trace at 180 fm and everything was reported normal in the engine room. Slight sea, moderate to heavy NE'ly swell. Course 345°T at 19 kt.

Position of ship: 22° 54'N, 122° 47'E.

Note. Mr. R. C. Lilwall of the Institute of Geological Sciences, Edinburgh, comments: "The vibrations on 4th January were almost certainly caused by an earthquake which was felt strongly in the Taiwan region: time 03h 16min 54·5s GMT; position 22° 06'N, 122° 06'E; magnitude 6·9 Richter."

Western North Pacific

m.v. *Benvalla.* Captain R. L. Bruce. Bugo to Keelung. Observers, Mr. J. Elder, 3rd Officer and Mr. R. Blacklaws, Cadet.

25th January 1972. At approx. 0200 GMT mild but rather unusual vibrations were experienced for about 2 min, thought to have been caused by seismological activity. Sounding no bottom at 1,000 fm. Wind light and variable. Confused swells. Course 000°T at 21 kt.

Position of ship: 21° 35'N, 121° 10'E.

m.v. *Cumbria.* Captain W. S. Lewis. Mormagao, Goa to Kure, Japan. Observer, the Master and ship's company.

25th January 1972. At 0207 GMT the vessel shuddered violently for approx. 1 min. At the time we thought we had hit an underwater obstruction but later heard that it had been an earth tremor. It was recorded at Okinawa as 4·8 on the Richter scale and in east Taiwan as 6·0.

Position of ship (approx.): 22° 06'N, 123° 54'E.

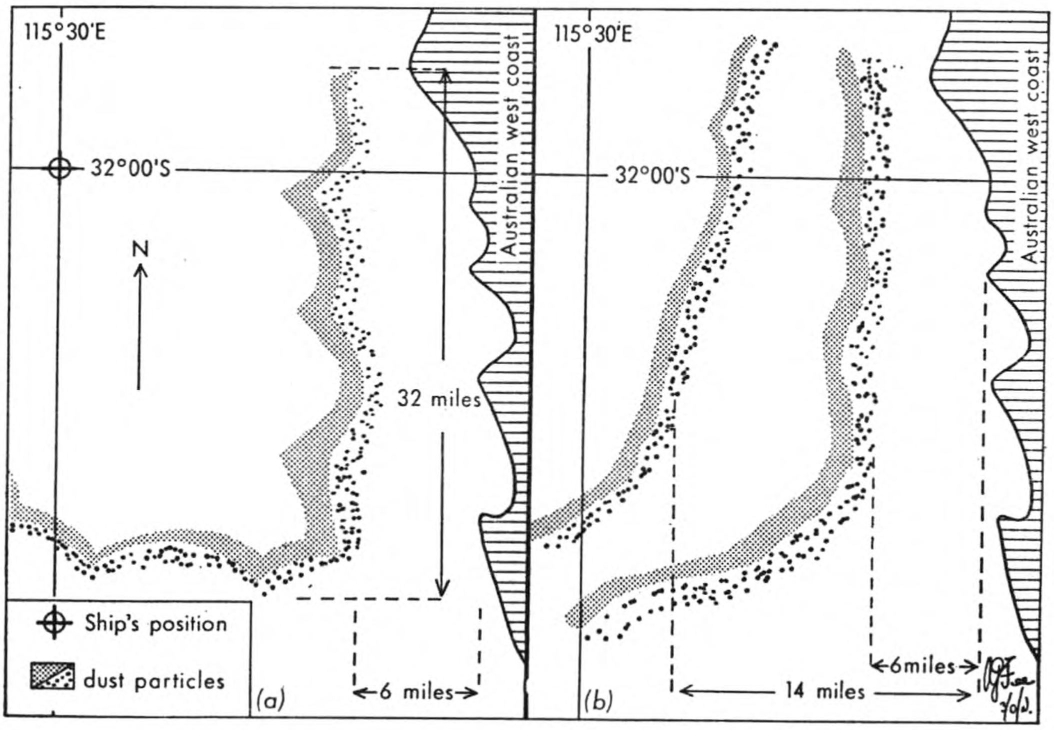
Note. Dr. C. W. A. Browitt of the Institute of Geological Sciences, Edinburgh, comments: "The National Oceanic and Atmospheric Administration of the U.S.A. gives the preliminary determination of the epicentre as: Taiwan region, 22·5°N, 122·3°E, depth 33 km, origin time 02h 06min 23·3s on 25th January. One person killed, five houses destroyed and some damage to roads on Taiwan. Also felt on southern Ryukyu Islands, on northern Luzon and at Hong Kong."

RADAR ECHOES

off Western Australia

s.s. *Discovery Bay.* Captain J. Cosker. Fremantle to Sydney. Observer, Mr. A. J. Fee, 3rd Officer.

12th February 1972. At 1300 GMT (2130 LMT) the vessel had just rounded Rottnest Island. The weather was fine and clear with a few clouds (C_L1) and shore lights



visible at maximum range; the loom of Rottnest Island Light (80 m, distance 23 miles) was visible 60 miles away.

The radar picture of land was extremely well defined. As shown in sketch (a), a ridge of what must have been dust particles in the atmosphere began to form some 6 miles off the coast, appearing more or less as a duplicate of the coastline and covering a distance of 32 miles. The wind, obviously a land breeze in the vicinity of the coast, carried the ridge along in a NW'ly direction to a distance of 8½ miles off shore. A second ridge then formed 5 miles off the coast, approx. 3½ miles behind the first. The land breeze seemed to lose its effect 13 miles off shore where the first ridge remained stationary (sketch (b)), allowing the second to be blown seawards and merge with it some 14 miles from the coast. Here the wind direction changed to SSW, force 3–4, causing the ridge to disperse in a NNE'ly direction. At no time did visibility deteriorate at the ship. Air temp. 21·8°C, wet bulb 19·7°.

Position of ship: 32° 00'S, 115° 30'E.

Note. From the facts given it is clear that abnormal refraction was occurring at the time of this report. Under such conditions it is not unlikely that anomalous propagation of radar waves was also occurring. The effect described may well be attributed to this; any airborne dust would have led to a reduction in visibility.

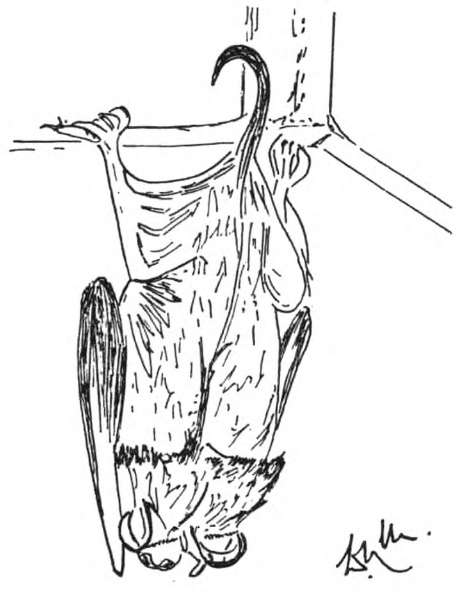
BAT

Southern North Atlantic

m.v. *Britannic.* Captain W. A. Murison. Southampton to Cape Town. Observer, the Master.

15th March 1972. At 1730 SMT, when the vessel was 120 miles from the Guinea coast, a bat was discovered hanging upside-down on a fish-plate at the head of a deck ladder. It was 89 mm long from nose to tip of tail, with greenish-brown fur and black skin. A drawing was made of the bat and it was left undisturbed. It flew off soon after nightfall.

Position of ship: 8° 15'N, 15° 37'W.



Note. Mr. J. Edwards Hill, Mammal Section, Department of Zoology, Natural History Museum, comments:

"The bat reported by the *Britannic* is clearly a member of the family Molossidae, or free-tailed bats. These may be recognized quite readily by their fleshy ears, rather thick flying membranes and by the projection of a free portion of the tail membrane, points very evident in the illustration provided.

"Molossid bats are not common among species reported as far as 120 miles from land, and it would be of some interest to know if the vessel had called at some West African port where the bat could have come aboard." [The vessel's first port of call after leaving Southampton was Cape Town.]

BIRDS

Eastern North Atlantic

m.v. *King George*. Captain J. H. Beavan. Cape Town to Cadiz. Observers, the Master, Mr. L. Robbins, 3rd Officer and all deck officers.

6th–10th March 1972. At 0900 on the 6th the Captain saw a pigeon on the fore-deck and called our attention to it. The pigeon was later to be seen sitting in a sheltered position on the after-deck. On the afternoon of the 7th she appeared on the starboard bridge wing and it was around here that she was to remain throughout her stay. When it got dark the pigeon, now named Henrietta, moved into the wheel-house. However, as it was of course pitch black in there, she was taken into protective custody in the chart room. The Purser came up with a box for her and he, being a one-time pigeon fancier (and an all-time 'bird' fancier), identified her as being female, about two years old and of the Blue Chequer variety. We had noticed a ring on her left leg before but had never got close enough to inspect it (none of the deck officers knew how to pick her up anyway!). Henrietta was now up-ended in order that we could examine her ring. She took great offence at this but the information obtained was: 71 ESPANA 25387.

For the next couple of days Henrietta had the run of the bridge by day and was put into the chart room at night. She tended to get under people's feet when they were rushing in to take sights and we found it necessary to keep a scrubbing brush and bucket handy as we never did succeed in house-training her! One morning we thought we had lost her as she took flight when the crew came to wash down, flew up to the monkey island, slipped on the taffrail and, as there was a force 5 wind blowing, was seen to disappear aft at a vast number of knots. Twenty minutes later Henrietta appeared, flapping valiantly, level with the bridge. She made five or six circuits of the ship before swooping down on to the bridge wing and attacking the food which was put out for her (rice, lentils, cornflakes, All Bran and puffed wheat, though we found that the latter did rather tend to blow away!). Henrietta would only take water if it was poured onto the deck, a lengthy and wasteful process.

We arrived in Cadiz early on the morning of the 10th. At 0900 she was still sitting unhappily on the bridge wing (the first time she had been deserted since she had arrived) but was shooed away by the Mate. We never did see her again but we thought how clever it was of her to find a ship that was going to Spain amongst all those sailing the ocean.

Position of ship at 0900 on 6th: 22° 58′N, 17° 22′W.

Note. The above report was sent to Major L. Lewis, M.B.E., Secretary of the Royal National Homing Union Council.

Indian Ocean

m.v. *Fremantle Star*. Captain D. Mackillop. Adelaide to Port Elizabeth. Observers, the Master and Mr. M. J. Chinn, 2nd Officer.

11th March 1972. A Red-tailed Tropic-bird was sighted. Plumage mainly white with a black band in a half circle over the eye. The two central tail feathers were elongated and red in colour, their length being roughly 30 cm. The bill was an orange colour and feet darkish, probably black. Body length, without tail feathers, about 51 cm.

The bird landed on the vessel but managed to fly off again without help in a N'ly direction. This had been the only bird observed on the Indian Ocean crossing since leaving Australian waters and would appear to be south of its usual habitat.

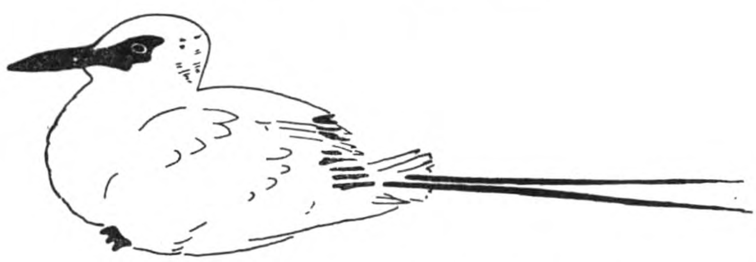
Position of ship: 35° 30′S, 49° 10′E.

North Pacific Ocean

m.v. *Cotswold.* Captain J. F. Ashbridge. Kwinana (near Fremantle) to Ferndale (south of Vancouver). Observers, Mr. J. H. Adcock, 3rd Officer, Mr. J. Booth, Jnr. Engineer, Mr. D. Mackenzie and Mr. A. J. Lewis, Cadets, and other officers.

12th–13th March 1972. During the early hours of the morning an unidentified bird alighted on the main deck and took refuge in the lee of the after tension-winch. The wind at the time was WSW, force 4. The bird, an obvious member of the 'gull' family, was first sighted shortly after breakfast, but it was not until midday that a closer inspection was made. It was then realized that the bird was no ordinary gull, or at least not of a type that anyone on board had observed previously.

Its two most distinguishing marks were its beak and its tail. The beak was 5·7 cm in length, bright scarlet with black nostrils. The tail, or rather tail 'accessories', consisted of two 40 cm, very thin feathers, the shaft of each a polished black and the feathers a bright scarlet. I refer to these two feathers as accessories as the bird also had a more conventional fan-shaped tail (similar to a dove's), the feathers in which were, on average, 7·6 cm long. The wing span (fully outstretched) was 107 cm and the over-all length 81 cm. The plumage was mainly white with grey flecks on each side of the head but the inner flight feathers on each wing were black. Its large black eyes were surrounded by black patches. The legs were off-white or grey and its webbed feet were four-clawed, predominately black.



As well as these colourful features the bird also had a very colourful personality (perhaps better described as short-tempered). It was a rather unwilling recipient of our well-meaning attention, making this quite plain by puffing out its feathers and emitting a quite fearful squawk. We did eventually manage to ascertain that there were no broken bones; the bird was however extremely exhausted.

All offers of sardine, fish scraps, bread, rice and water were refused but at 1000 the following morning the bird had a perfunctory preen of its feathers and flew off into the wind, leaving behind the traditional gull 'message' of gratitude. We would be interested to know to which species this bird belonged.

Position of ship on morning of 12th: 34° 24′N, 165° 00′W.

Note. The following reply was sent to the ship with a copy of Captain G. S. Tuck's article "Sea-birds on board ships" from *The Marine Observer*, October 1970:

"We shall be passing a copy of your letter and sketch to Captain Tuck, Chairman of the Royal Birdwatching Society, but we amateurs are becoming familiar with such birds and can say without hesitation that yours was a Red-tailed Tropic-bird. The following details are taken from *Sea Birds of the South Pacific Ocean,* by P. P. O. Harrison.

" 'There are three species of Tropic-bird and their breeding places are all within the Tropics, outside of which they are seldom seen. A straggler will, however, venture further afield and the writer has recorded one in latitude 34° 46′S, longitude 173° 25′W. Only rarely has a Tropic-bird been recorded in New Zealand in recent years.

" 'The name Bo'sun Bird has been given them by sailors because the elongated tail feathers have the appearance of a Boatswain's marlinspike. Bo'sun Birds are inquisitive and frequently fly over and round the ship; but they are not scavengers. Perhaps the ship disturbs the shoals of flying-fish and discloses them to the watching birds. Tropic-birds dive from a height of about 50 feet to obtain their food which consists mainly of fish and squids.

" 'Occasionally a Bo'sun Bird lands on deck through having hit the ship in the dark. Invariably it disgorges the contents of its stomach which always consists of the above-mentioned diet. They are quite helpless on deck and have to be assisted overboard. They are vicious and must be handled with caution.

" 'As the squid is sensitive to light and does not rise to the surface until darkness has set in, it is presumed that the birds must be nocturnal feeders. This may account for their frequent presence at night over the ship and where the bioluminescent glow of the bow wave may reveal their prey to the birds. Bo'sun Birds have a shrill call, so that even if they are not seen at night their presence is made known. They feed in the centre of the oceans and are rarely seen near the land except when breeding.'

"Tropic-birds do not belong to the gull family (Laridae) but belong to one of six distinct families in the Order Pelecaniformes (pelicans and allies)—the Family Phaëthontidae. When we looked up a similar word in the dictionary it said, '(Greek) Phaethon, son of Helios (Sun-god) and famous for bad driving of sun chariot' so perhaps the Tropic-birds acquired their Latin name from their unfortunate habit of crash-landing on ships!"

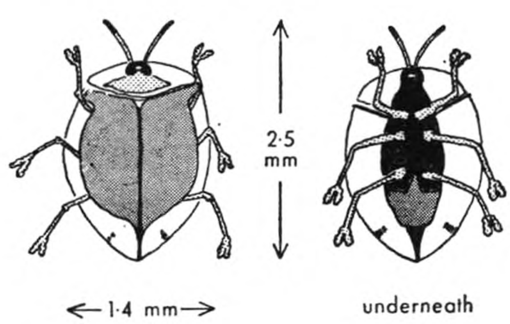
INSECTS

Moçambique Channel

m.v. *City of Toronto*. (Captain not named.) Durban to Bombay. Observers, Mr. M. J. Herring, Chief Officer and Mr. H. C. Thorburn, Cadet.

25th February 1972. At 0730 LMT a green and yellow insect was found on the bridge wing when the vessel was 70 miles due west of Grand Comoro Island. It had a semi-transparent shield around its body which separated like wings in the same manner as that of a lady-bird. Occasionally it emitted a high-pitched wail. It made no attempt to move when picked up and remained alive for a period of about 24 hours.

Position of ship (approx.): 11° 40'S, 42° 00'E.



Note. Mr. R. T. Thomson of the Department of Entomology, Natural History Museum comments:

"This insect is a tortoise beetle (Chrysomelidae, Cassidinae), but I regret that a closer identification is not possible. Identification is often difficult even when specimens are available. I can only add that the specimen in question is near the lower limit of size for the group."

Indian Ocean

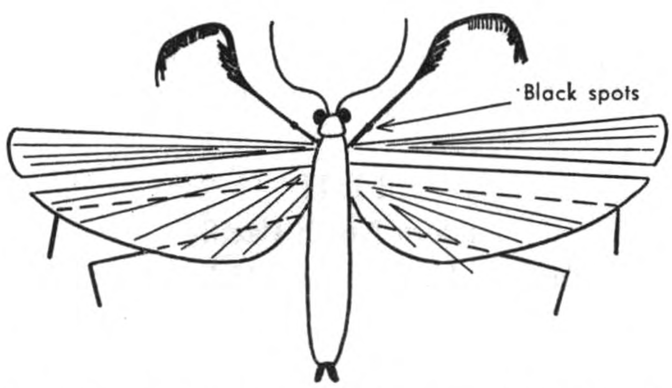
m.v. *Author*. Captain M. D. R. Jones, Beira to Dar-es-Salaam. Observers, Mr. O. M. Owen, Chief Officer, Mr. K. A. McGeorge, 2nd Officer and Mr. D. Macleod, 3rd Officer.

21st March 1972. After heavy rainfall during the morning a large 'UFO' was found dead on the port wing of the bridge. It was greenish in colour with a wing span of 98 mm and body length 71 mm. The vessel was approx. 50 miles off the coast of Tanzania. Course 346°T.

Position of ship: 9° 58'S, 40° 37'E.

Note. Mrs. J. Marshall of the Department of Entomology, Natural History Museum, comments:

"The large dead insect found on board is a Praying Mantis, *Mantis religiosa* L. This species



is common in southern Europe and northern Africa. The specimen found was probably a female, judging by its fairly large size; males are smaller."

MARINE LIFE

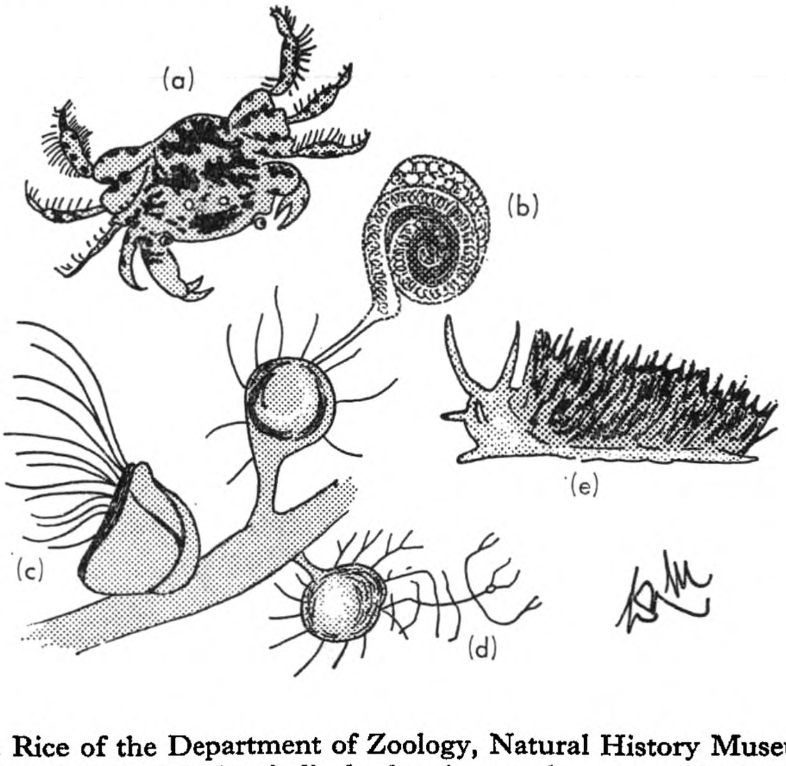
North Atlantic Ocean

m.v. *Britannic*. Captain W. A. Murison. Curaçao to Avonmouth. Observer, the Master.

12th February 1972. While stopped for engine adjustments a bucket was used to fish a small piece of sargasso weed aboard. The sketches show some of the guests found in the weed: (*a*) One yellow and brown crab, 10 mm across its shell; (*b*) three curled egg sacks; (*c*) 35 pulsating bivalves, shell up to 7 mm; (*d*) four transparent 'skeleton lobsters', 5 mm; (*e*) one pink 'hedgehog' slug, 20 mm.

Also found in the weed but not sketched: two pink crabs, 7 mm across shell; several thousand assorted eggs; two yellow shrimps, bodies 5 mm; one brown shrimp, 7 mm body; four cellular worms, up to 50 mm long. (Drawings of a brown shrimp and a cellular worm were published in *The Marine Observer*, April 1971.) All this on one piece of weed that would fit into a pint pot! Sea temp. 15·7°C.

Position of ship: 35° 43′N, 44° 25′W.



Note. Mr. A. L. Rice of the Department of Zoology, Natural History Museum, comments: "I am returning Captain Murison's lively drawings and notes, with the following list of identifications—or guesses: (*a*) crab *Planes minutus*; (*b*) molluscan egg-mass, possibly of sea slug; (*c*) barnacle of the genus *Lepas*; the one usually found on Sargassum weed is *L. pectinata* but this has a definite stalk which is not apparent in the sketch; (*d*) skeleton shrimp of the order Amphipoda, family Caprellidae; (*e*) sea slug, eolid nudibranch.

"The shrimps mentioned but not sketched could possibly be the Sargassum shrimp, *Latreutes fucorum*."

FISH

Eastern North Pacific

m.v. *City of Liverpool*. Captain H. Swinney. Yokohama to Cristobal. Observer, Mr. C. Hainsworth, 1st Officer.

29th February 1972. At 2231 GMT a large fish of the ray family was sighted about half a mile distant. The fish was surfacing at 15 sec intervals and three-quarters of it left the water; it then appeared to twist on to its back and land flat on the sea. It continued to do this for 5 min and then disappeared from sight. Visible length and span were each approx. 1·8 m. The underside was white and the back light and dark grey. Angle of leaving water: head to tail axis, 60° to horizontal; wing tip axis, 40° to horizontal. Air temp. 26·0°C, sea 25·7°.

Position of ship: 12° 04′N, 112° 26′W.

Note. Mr. G. Palmer of the Fish Section, Department of Zoology, Natural History Museum comments:

"It is known that many of the large rays do leap out of the water from time to time and it is suggested that this may be done to assist in ridding themselves of unwanted parasites."

WHALES

Eastern South Pacific

m.v. *Mystic*. Captain E. H. Gregson. Balboa to Caldera, Chile and Matarani to Callao, Peru. Observers, Mr. C. G. G. Hawken, 2nd Officer and Mr. J. H. Owens, Chief Officer.

28th January and 15th February 1972. A dead Sperm whale was sighted on two separate occasions. In place of the small dorsal fin there was a great gaping wound and a mass of broken flesh. Both sightings were close to the animal.

Position of ship on 28th January: 13° 36′S, 76° 48′W.

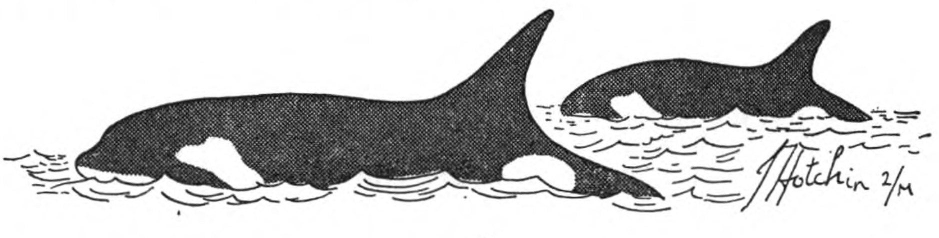
Position of ship on 15th February: 15° 24′S, 75° 48′W.

off coast of Graham Land

R.R.S. *John Biscoe*. Captain M. J. Cole. Adelaide Is. to King George Is., Graham Land and return. Observers, the Master, Mr. M. Phelps, Chief Officer, Mr. I. Hotchin, 2nd Officer and Mr. M. L. Shakesby, 3rd Officer.

21st February 1972. At 1900 GMT, while the vessel was at the northern end of Gerlache Strait, passing Lecointe Island, a group of whales was observed blowing about 2 miles distant. The vessel altered course to investigate and on closer approach were seen to be Killer whales. There were about 15 in the group, dominated by one old male, identifiable by the extremely large dorsal fin (about 1·5 m high); the remainder were younger males and females. No calves were observed. The vessel passed through the middle of the pack, none of which showed any alarm, swimming alongside the vessel and even sporting in the bow wave.

Position of ship at 1800: 64° 36′S, 62° 54′W.



23rd February 1972. At 1115 GMT when the vessel was in Croker Passage, numerous birds (including Pintado Petrels and Wilson's Storm Petrels) were seen fluttering on the surface in a mass off the port bow. The Master came on the bridge and altered course to investigate. Approaching the area we discovered a dead whale of the Bottlenosed species floating on its side. The vessel circled the whale, going almost alongside; we estimated its length to be about 6 m. From all appearances it would seem that it had probably been attacked quite recently by Killer whales (possibly the pack seen in the same area on the 21st) as blood was still flowing from a wound in its neck.

Position of ship: 63° 55′S, 61° 43′W.

COLLISIONS WITH WHALES

Eastern North Pacific

m.v. *Britannic*. Captain W. A. Murison. Bluff, N.Z. to Balboa. Observers, the Master, Mr. R. Calder, Chief Officer, Mr. R. J. Knight, 3rd Officer and Mr. A. Webber, 2nd Officer.

4th February 1972. At 1714 GMT 'full ahead' was rung after a stoppage for engine repairs. It was at this time that three Humpback whales were observed 3 cables on the starboard bow, heading in a direction of 315°T. The ship's head was 046°T. At 1723 the ship gave a shudder as though hitting a sandbank. The three whales were then approx. 1 cable on the starboard bow and blowing. A brown liquid, like tallow in colour, was seen to surface abreast No. 2 hatch. The ship then gave a second shudder and a Humpback whale surfaced on the port quarter. Its tail was approx. 6 m across and extended well out of the water. The whale was of a considerable size and was thrashing its tail from side to side. When it was astern of the ship it was seen to be bleeding extensively. Unfortunately at no time was this whale seen on the surface before the collision.

Position of ship: 5° 17′N, 82° 00′W.

North Atlantic Ocean

m.v. *Geestcrest*. Captain M. Macleod. Kingston to Barry. Observers, the Master, Mr. K. Pearson, Chief Officer and Mr. N. Slater, 3rd Officer.

4th–5th July 1972. At approx. 2230 SMT on the 4th the vessel started vibrating a lot more than at any other time during the voyage. The Sal-log was seen to drop from registering 20 kt to 14. Upon ringing the engine room they said it was jammed tight and nothing could be done about it. Next morning at 0800 the Chief Officer went for'ard and, upon inspection, found a whale straddled across the stem. The whale was 12–14 m long and was dead, its backbone having been broken upon impact. No damage was observed on the ship. The vessel was stopped and taken astern to clear the stem of this obstruction. Upon reflection this explains the increase in vibration and the blocked log.

Position of ship at 2230 on 4th: 46° 05′N, 21° 34′W.

Note 1. Although the *Geestcrest* observation rightly belongs to the July 1973 edition it is included here because the following Note covers both of the above reports.

Note 2. Mr. S. G. Brown of the Whale Research Unit, National Institute of Oceanography, comments:

"Instances of vessels colliding with whales are reported fairly regularly each year but in relation to the mileage covered by world shipping in any one year, they must be considered rare events. Some years ago we kept a list of reports of such collisions published in the world press. In the four years June 1957 to August 1961 ten reports were noted and it may well be that others were overlooked. Seven of the collisions took place in the Atlantic, two in the Pacific and one in the Mediterranean Sea. In all cases a single animal was involved; seven were reported to be large whales and three of these were said to be sperm whales. Five of the vessels concerned were liners and were presumably travelling at speed at the time of the collision.

The other vessels included a 25-ft yacht reported to have hit a sperm whale when sailing at about 6 kt, and the U.S. nuclear submarine *Sea Dragon* which suffered a bent propeller after colliding with a whale while travelling on the surface during trials.

"As in the case of the *Geestcrest* collision, three of the reports referred to the whale being struck by the bow and almost cut in two; two of the vessels had to go astern to free the body of the whale from the stem. In the case of the submarine and one of the liners, one of the propellers was damaged by the collision. A sperm whale is said to have cut across the path of a tanker, dived and smashed head-on into the vessel's side. The other reports refer to the vessel striking the whale but give no further details.

"It seems possible that in some cases the whale is asleep at the surface and that the vessel, travelling at speed, is on top of the animal before it is fully aware of the approaching danger and able to take evasive action. In other cases, as in the *Britannic* collision, the whale swimming across the path of an approaching vessel may perhaps misjudge the speed and size of the vessel, and so be struck by it or swim headlong into its side. It is perhaps significant that most, if not all, of the accounts refer to large whales than to the smaller species and dolphins. It may be that these latter are also the victims of collisions but go unnoticed on the vessel concerned but it is also possible that their mode of life and perhaps superior senses make them much less prone to unfortunate accidents."

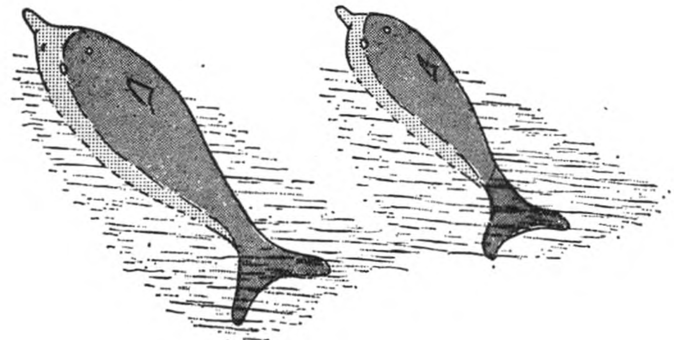
DOLPHINS

South Pacific Ocean

m.v. *Westmorland*. Captain I. Y. Batley. Port Lyttelton to Dunedin. Observer, Mr. H. M. Close, 2nd Officer.

23rd March 1972. At 0515 GMT, as the vessel was proceeding out of Lyttelton Harbour, two dolphins were seen on the starboard side. They were 2–3 m long and 0·75 m broad; their backs were dark grey, almost black, with light grey underneath. This observation was thought to be worthy of note as the animals were observed very close inshore, 5 cables at the most.

Position of ship: 43° 36′S, 172° 49′E.



Note. Dr. J. W. Brodie, Director of the New Zealand Oceanographic Institute writes:

"Thank you for sending on the observations by Mr. Close of dolphins in Lyttelton Harbour. The useful sketch suggests they are Dusky Dolphins, one of the two major species in our waters. They are not uncommonly seen in near-shore situations and inside harbours so that this present situation is not anomalous."

Atlantic, Indian and South Pacific Oceans

s.s. *Act 1*. Captain E. R. Jenkins. Brixham to Australia via Cape of Good Hope and return. Observers, the Master, Mr. I. F. Gosden, 3rd Officer, Mr. J. Peddie, Chief Officer and Mr. J. M. Laing, 2nd Officer.

January–March 1972. Dolphins (and porpoises) usually play around the bow wave or follow a ship, sometimes for lengthy periods, but on this particular ship we have noticed that, on approaching the bow, the animals immediately swam away. On some occasions they have never come closer than about 130 m, then turned and moved away. We have all noticed this and wondered what the explanation could be. The service speed of the vessel is about 21·75 kt and she has a bulbous bow: could that have anything to do with it? The average r.p.m. is 130/131. We would be interested to know if observers on ships of similar performance have noticed the same phenomenon.

Position of ship at 0001 GMT on 1st February: 34° 30′S, 44° 18′E.

Position of ship at 0001 on 1st March: 30° 00′S, 77° 00′E.

ABNORMAL REFRACTION

Eastern North Atlantic

m.v. *St. Margaret*. Captain M. Mortimer. Immingham to Monrovia. Observers, the Master and ship's officers.

28th March 1972. Between 1945 and 2030 GMT Cap Vert Light (range 26 miles, height of eye 17 m, giving a range of 31½ miles) was plainly visible to the naked eye while the vessel was still 76 miles N′W of the Cape. There was also a pronounced increase in radar detection ranges; ship target echoes were plainly visible at the radar's maximum display range of 48 miles, giving an increase in detection range of three to four times that normally expected for this type of target on our radar. Cap Vert Light was again picked up at 2300 at a range of 37 miles.

The sky, especially to the east, appeared to be covered with a very thin film of Cs although there was no lunar halo present. This gave the sky a pronounced over-all white glare. It was thought this could have been due to the moon being high, bright and two days before full. Air temp. 21°C, wet bulb 19·5°, dew-point 19°, sea 19·4° (condenser intake). Pressure 1010·7 mb, increasing slowly. Wind N′E, force 4. Course 179°T at 13.1 kt.

Position of ship: 17° 56′N, 17° 50′W.

Note. The conditions leading to the abnormal refraction of light waves (low-level temperature inversions) may also result in the refraction, or ducting, of radar waves.

UNUSUAL REFLECTION

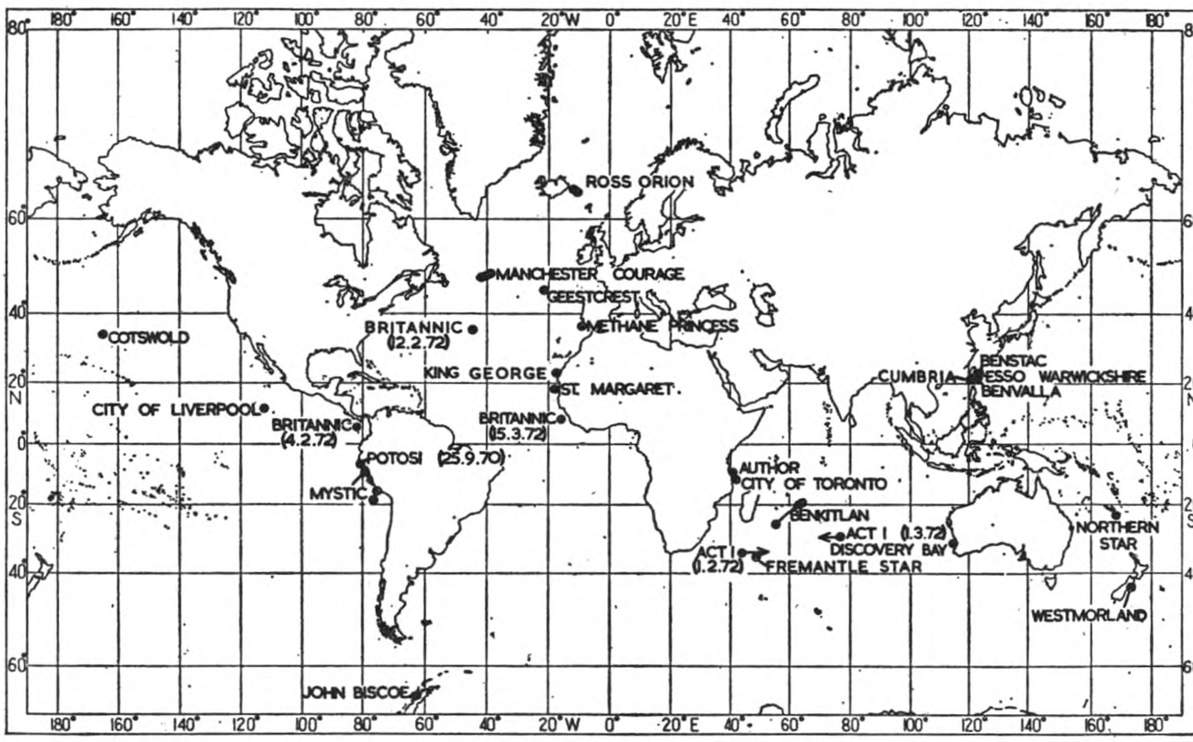
off Cape St. Vincent

s.s. *Methane Princess*. Captain S. W. Dean. Arzew, Algeria to Canvey. Observer, Mr. J. G. Ruffell, 2nd Officer.

18th January 1972. At 0340 GMT, when the vessel was rounding Cape St. Vincent Light (candle power 11,200,000) at a distance of approx. 2½ miles, a mirror image of the loom of the light could be seen on the horizon on a reciprocal bearing. This phenomenon gave an exact impression of a powerful light below the horizon but not yet visible to the eye (height of eye 18·9 m); it was most definitely not just the sweep of the light's beam on the cloud. This continued until we were 5–6 miles distant from the light. The cloud to the west (where the reflection was observed) was Sc at 180–300 m; confused broken Sc and Cu in the rest of the sky. Air temp. 12·0°C, sea 14·0°. Wind NW, force 8. Visibility 16–19 miles.

Position of ship: 37° 02′N, 09° 03′W.

Note. Similar reports have been published in *The Marine Observer* on three different occasions (January and October 1964 and January 1965). In one report Cape St. Vincent was again the Light concerned; the other Lights involved were Cape Byron and Cape Reinga. The associated meteorological conditions vary widely; for example, on the earlier occasion involving Cape St. Vincent the wind was light W′ly whereas in the present report a NW′ly gale prevailed. The explanation given with one of the earlier reports was that a temperature and humidity discontinuity, arranged in a near-vertical plane, acted as a mirror in reflecting the light. However, in gale-force conditions such discontinuities are unlikely to occur. The observer claims that the effect was not simple reflection from low cloud; the earlier report states that the sky was cloudless. No explanation can be offered for the phenomenon described.



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

POSTSCRIPT

Peruvian waters

s.s. *Potosi.* Captain D. J. Houghton. Buenaventura to Pimentel. Observer, Mr. C. G. G. Hawken, 2nd Officer.

A report from the *Potosi* on large groups of cormorants, pelicans and porpoises seen off the Peruvian coast on 25th September 1970 was published in the July 1972 number of *The Marine Observer* with comments. These were read by Mr. Stephen E. Chapman, Second Officer of the *Pizarro*, who wrote to the Editor as follows:

"In view of the interest shown by voluntary observing officers on this [Peruvian] coast I feel that the records should be kept straight, for some error has crept into your note. There are in fact three species of cormorant commonly encountered on the desert coast of Peru and Chile. They are the Guanay Cormorant, *Phalacrocorax bougainvillii*, the Red-legged Cormorant, *P. gaimardi* and the Bigua Cormorant, *P. olivaceous.* Of the three the Guanay Cormorant is by far the most numerous and is habitually gregarious, feeding often in dense flocks and is more likely the one which Mr. Hawken observed. The other species are less gregarious, in fact the Red-legged is solitary by comparison, and in my experience not found any distance from the shore. The Red-legged Cormorant may be distinguished by its crimson red bill, legs and feet, white neck patch and greyish back; the Bigua is entirely black and lacking the white belly which characterizes the Guanay Cormorant.

"However, having said all this about cormorants, I get the impression from Mr. Hawken's description that the birds were diving from the air and not from the surface of the sea, in which case they would be Boobies, *Sula sp.* the tropical counterpart of the Gannet, *Sula bassana* and not Guanay Cormorants which dive from the water surface. In this area, 10 miles south-east of Lobos de Tierra Island, one might expect to see either the native and generally more abundant Peruvian Booby, *Sula variegata*, or the less numerous Blue-footed Booby, *Sula nebouxi.*

"In summary, there are three abundant species of sea birds on the east coast of South America—commonly known as the Guano Birds—which feed on the anchovy, *Engraulis ringens*: the Pelican, *Pelecanus thagus*, that everyone knows, the Guanay Cormorant and the Peruvian Booby, sketched below."

Guanay Cormorant

Peruvian Booby

Note. Captain Tuck of the Royal Naval Bird Watching Society, who wrote the comment on the observation from the *Potosi* mentioned in Mr. Chapman's letter, comments:

"Of course, Stephen Chapman is plumb right. I am in full agreement with his letter. Having just returned from a 12,000 mile journey in a Land Rover through tropical Africa from west to east and with a particularly heavy load of sea reports to study on return, my comment was too hurried. It may be of interest to know that from the meteorological log-books of ships received during 1971 and 1972 up to August I have studied 110 observations of sea birds and 65 observations of land birds, excluding others in which no clue to their identity was possible. The mounting interest in birds at sea in these reports is much appreciated."

AURORA

The following notes have been received from Mrs. Mary Hallissey of the Aurora Survey:

"The auroral reports received at the Balfour Stewart Auroral Laboratory of the University of Edinburgh from British ships for the three months January–March 1972 are summarized briefly below. We acknowledge with thanks these reports and sketches and would assure you that the briefest of accounts is welcome—a height estimate, whenever possible, being of great value.

"We wrote in the last notes that the sunspot activity chartline was showing a gradual downward slope towards solar minimum, but figures plotted for 1972 to date show a decided levelling off. This, however, is due rather to prolonged periods of moderate magnetic activity than to any spectacular outbursts and has resulted in little aurora to report from lower latitudes, while the weather ships at 'Alfa' and 'India' and the trawler support ship confirmed activity in the auroral zone.

"Although the highest figure of magnetic activity occurred on 6th/7th March, there was no sign of the generally expected equinoctial increase. On this date rayed bands were overhead in the latitude of Shetland. Reports from the *Weather Reporter*, the Netherlands weather ship *Cumulus* and meteorological observers at Benbecula gave us the overhead position of the forms, but many areas of land and sea were cloud covered.

"Observers in the *Mabel Warwick* off the Norwegian coast confirmed a southwards extension of the aurora in association with a rise of geomagnetic activity on 16th January. An arc overhead near the auroral zone at 1830 GMT moved southwards to be at the latitude of the Faroes at 2215h, rays reaching almost to the observer's zenith. The ship was at the same geographic latitude as Iceland, which is in the auroral zone, but the zone sheers away to the north of Norway, so that geomagnetically the ship shared a latitude with the Faroes.

"On 10th February from the same region an observer in the *St. Margaret* reported another short-lived southward-spreading development, seen also as an arc from Kiruna, Sweden, and as a glow from northern Scotland. This was associated with only moderate geomagnetic activity.

"The observation by the radio operator in the *Ross Orion* on 14th January at 0800 GMT was at a time of very low geomagnetic activity (this observation was referred to in our notes in the July 1972 edition in order to reply to a query as to whether the sighting might refer to a possible halo), as was the glow seen by the observer in the *Miranda* at roughly the same latitude (geomagnetic and geographic). That is to say, both ships were in the auroral zone, where it is possible to see aurora at some time during almost every clear night."

Date (1972)	Ship	Geographic Position		Λ	Φ	I	Time (GMT)	Forms
6th Jan.	*Miranda*	66°18′N	23°54′W	070	72	+77	2235–2245	HB
8th	*Miranda*	65°32′N	24°45′W	070	72	+77	1850–1900	HA
9th	*Weather Surveyor*	58°35′N	17°20′W	070	64	+72	0045–0300	N
	Weather Reporter	52°29′N	19°53′W	060	59	+69	0250	N
	Miranda	64°35′N	23°30′W	070	71	+76	2030–2045	HA
11th	*Bamburgh Castle*	66°05′N	09°20′E	110	66	+76	0045–0053	N
	Weather Surveyor	56°12′N	09°25′W	080	61	+70	0235–0400	N
13th	*Miranda*	66°12′N	23°54′W	070	72	+77	0130	HB, RB
	Miranda	66°18′N	23°30′W	070	72	+77	2115	HB
14th	*Ross Orion*	66°45′N	14°47′W	080	71	+76	0800–0810	N
	Miranda	66°12′N	24°35′W	070	72	+77	2359	N
16th	*Mabel Warwick*	64°45′N	05°45′E	100	65	+75	1830–2400	RA, RB, N
20th	*Miranda*	66°00′N	24°02′W	070	72	+77	2130	HB
21st	*Miranda*	66°18′N	24°24′W	070	72	+77	0001	RR
		66°30′N	24°30′W	070	72	+77	0300	N
22nd	*Weather Adviser*	59°05′N	18°50′W	070	65	+72	0400, 0500	N
23rd	*Weather Adviser*	59°00′N	19°00′W	070	65	+72	0800	N
	Weather Adviser	59°02′N	19°18′W	070	65	+72	2015–2125	RA, RB, RR
24th	*Miranda*	65°38′N	24°41′W	070	72	+77	2000	HA, HB, RB
6th Feb.	*Weather Monitor*	59°00′N	18°53′W	070	65	+72	2050–2300	N
7th	*Weather Monitor*	58°55′N	19°05′W	070	65	+72	2050–0600	RA, RR, N
8th	*Weather Monitor*	58°47′N	19°20′W	070	65	+72	1947–2300	N
10th	*St. Margaret*	63°36′N	06°50′E	100	64	+74	2015–2120	RB, V
13th	*Weather Monitor*	59°00′N	18°00′W	070	65	+72	2345–2355	N
14th	*Weather Monitor*	59°01′N	18°05′W	070	65	+72	0144–0210	N
							0440–0445	N
	Weather Monitor	59°06′N	18°50′W	070	65	+72	2145–2355	RA, RR, N
15th	*Weather Monitor*	59°03′N	18°50′W	070	65	+72	0137–0152	N
							0340–0645	N
16th	*Weather Monitor*	58°50′N	18°16′W	070	65	+72	0245–0400	N
	Weather Monitor	59°00′N	18°27′W	070	65	+72	2345–0100	N
17th	*Weather Monitor*	59°12′N	19°21′W	070	65	+72	2345–2355	N
26th	*Weather Reporter*	61°56′N	33°04′W	060	70	+76	2100	N
3rd Mar.	*Weather Reporter*	62°05′N	32°58′W	060	70	+76	0720–0725	RB
	Weather Reporter	62°06′N	33°20′W	060	70	+76	2255–0200	RB, RR, N
5th	*Weather Reporter*	62°20′N	32°49′W	060	70	+76	2350–0100	RR, N
6th	*Weather Reporter*	62°20′N	32°52′W	060	70	+76	0245–0330	RB, N
	Weather Reporter	62°08′N	32°33′W	060	70	+76	2130–0600	HB, RB, RR, N
7th	*Weather Reporter*	62°08′N	32°30′W	060	70	+76	2245–0500	HB, RB, RR, N
9th	*Weather Reporter*	62°10′N	32°30′W	060	70	+76	0045–0600	RA, RR, N
10th	*Weather Reporter*	62°00′N	33°20′W	060	70	+76	2245	RB
11th	*Weather Reporter*	66°00′N	33°24′W	060	70	+76	0045	HB
							0230–0500	HB, RB, N
13th	*Weather Reporter*	62°00′N	33°40′W	060	70	+76	0001	P
							0200–0300	HB, RA
							0550	N
	Weather Reporter	62°04′N	33°35′W	060	70	+76	2300–0400	HA, HB, RB, RR, P
17th	*Weather Reporter*	61°44′N	32°14′W	060	70	+76	0001–0600	HA, HB, RA, RB, P
18th	*Weather Reporter*	60°15′N	29°30′W	060	68	+75	0001–0600	HB, RB, N
20th	*Weather Reporter*	56°42′N	13°33′W	070	62	+72	0250–0400	N

KEY: Λ = geomagnetic longitude; Φ = geomagnetic latitude; I = inclination; HA = homogeneous arc; HB = homogeneous band; RA = rayed arc; RB = rayed band; R(R) = ray(s); P = Patch; V = Veil; S = striated; N = unidentified auroral form.

(*Opposite page* 24)

The New Richardson Wing of the Meteorological Office Headquarters (*see* page 35).

(*Opposite page* 25)

The Prime Minister unveiling the commemorative plaque in the Richardson Wing (*see* page 35).

551.5:06

The History of the World Meteorological Organization with special reference to Oceanography*

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Introduction

We are all—meteorologists and oceanographers—coming more and more to regard oceanography and meteorology as part of one over-all discipline and, although some specialists in oceanography may be able to ignore meteorology and likewise some specialists in meteorology may be able to ignore oceanography, yet, generally speaking, progress in one discipline is seen to be dependent in many important ways upon progress in the other. Evidence of this is to be found not only in the numerous joint projects of research into ocean-atmosphere interaction, but also in the efforts to incorporate oceanographic aspects into studies of the general circulation of the atmosphere and into studies of long-term changes of climate. There are also joint projects in the organizational or operational sense where bodies like the Intergovernmental Oceanographic Commission (IOC), the World Meteorological Organization (WMO) and the Food and Agriculture Organization (FAO) are working together in response to United Nations Resolutions to improve the frequency and regularity and comprehensiveness of the observational data obtained from the oceans.

The history of WMO began formally in 1873. My authority for making that statement is that in 1973 WMO will be celebrating its centenary. But there are many dates, mainly before 1873 but some later, which might well be regarded as seeing the transition of international co-operation in meteorology from an inspired vision into a practical reality.

Meteorology as a science dependent upon international collaboration may be said to have begun when it was realized that the weather experienced in a small area on any particular day was not merely a local phenomenon but the end product of physical processes taking place on a planetary scale. It is probably not possible to give a date to this beginning but at any rate we must be careful not to err on the side of lateness as if mankind were slow to realize some rather elementary facts about its environment. The seventeenth century saw a number of important advances like the formulation of Boyle's Law and the invention of the barometer and with these and other aids such as the thermometer it was possible to begin the quantitative study of the physics of the atmosphere. Then at the end of the seventeenth century we had Edmund Halley's account of the trade winds and monsoons and as he was probably the first to associate the general circulation with the effects of solar radiation he has been called the 'father of dynamical meteorology'. In 1735 George Hadley described the effects of the earth's rotation upon the motion of the air and, by means of the famous Hadley Cell, introduced the concepts of thermal circulations described by vertical as well as horizontal motions.

By these steps and many others we were gradually approaching the requirement for synoptic meteorology with its weather maps. Towards the end of the eighteenth century and during the nineteenth century scientists in many countries all over the world appreciated that the weather systems in the atmosphere were of various scales, were complicated and reacted upon one another. It was therefore concluded that the atmosphere must be observed frequently, simultaneously and everywhere over the globe and, if these objectives were to be attained even partly, then an

* From an address given to the Second International Congress on the History of Oceanography, arranged to celebrate the Challenger Expedition Centenary, held in Edinburgh, September 1972.

international organization to promote scientific collaboration would be indispensable.

As would be expected, meteorological observing stations came into existence in various places shortly after the necessary instruments became available and it became customary to preserve the records so that eventually the means of the different parameters could be calculated. In some areas, notably northern Italy and south-west Germany, rudimentary networks were set up for co-ordinated observations at specified times with standardized instruments. This might be described as a slow beginning and although I am now referring to the late seventeenth century and the first half of the eighteenth century and, even though the electric telegraph had not yet been invented to provide quick means of transmission, it is perhaps surprising that on land at least more extensive attempts had not already been made for the establishment of national and even international networks of reporting stations.

Mariners take the initiative

About this time and for some years to come the main impetus and sustained effort to expand the area of meteorological observing came from mariners. One might explain this urgency on the part of mariners by the consideration that they are in conflict with the elements in a dynamic rather than a static fashion and have always tried to make the best use of favourable weather, to take what action they could to avoid adverse conditions and to withstand safely and efficiently the worst conditions that are experienced. With these objectives there is scope for both strategy and tactics, for generalized and long-term information and for an up-to-date knowledge of prevailing conditions.

In his *Manual of Meteorology* Sir Napier Shaw suggested that the invention of the barometer about 1650 marked the beginning of our attempts to develop a science of meteorology for practical application to everyday life such as it was then. Before that time practical meteorology was limited to weather lore which had made little significant progress since the writings of Theophrastus around 300 B.C. However, some misjudgements occurred. The invention of the barometer was seen as the solution to all problems of weather and it became the custom to equip barometers with a scale of weather changes such as we find on the ornamental barometer today. However, when it was realized that the barometer was apt to give unreliable indications of the weather to come, a period of scepticism followed before the value of the barometer was properly appreciated. Thus, even though Robert Hooke had provided a marine barometer before 1700, we find a noted sailor nearly 80 years later writing that the weather often proves very different from that indicated by weather glasses, i.e. barometers, and adding "I doubt their being of any great service to sea-faring people".

However, by the beginning of the nineteenth century, the barometer was being recognized as an indispensable instrument for use at sea and the diurnal variations of pressure had been detected in low latitudes. The approach to systematic procedures for observing and recording the weather was indicated by Admiral Beaufort's scale of wind force introduced in 1805. Efforts also began to collect and analyse meteorological observations made at sea and, in 1831, William Marsden of the British Admiralty with the help of the Hydrographer of the Royal Navy made a proposal for dividing the oceans into 10° squares so that the central point of each square would be the reference point for the analysis of all observations made within the square. Later in the 1830s William Reid completed studies of west India hurricanes and Indian Ocean cyclones and in his book *The Progress of the Development of the Law of Storms and of the Variable Winds* he argued that observing stations should be established on an extensive scale in coastal areas.

Maury and the marine logbook

So far, in tracing the events which led steadily and irresistibly to the creation of

WMO I have already mentioned a lot of names and still more are to follow and it will be found that, with notable exceptions like Reid who was a soldier, a lot of them were sailors. But I have still to mention one who was perhaps the greatest visionary of them all—Lieutenant Matthew Maury of the United States Navy. In mentioning him I can introduce the term oceanography—at long last—because Maury was concerned with the physical properties of the marine environment, with ocean currents as well as winds, with the state of sea as well as with pressure variations. When appointed to command a sloop in 1831 he realized that wind and current charts for the high seas would be a boon to mariners and set about producing them by extracting data from the logbooks of American ships. The value of his work was quickly recognized in providing guidance as to the best course for a vessel to follow on its voyage from one port to another and many sailors were ready to acknowledge that Maury's *Sailing Directions* had shortened the times of passage by up to one-third, a very worthwhile gain in economic and other terms. Of course, weather routeing is as old as shipping but Maury clearly sowed the seeds of weather routeing as a systematic technique which is today a respected branch of applied meteorology.

With all his ideas and their practical realization, Maury was described in London as 'this great American philosopher of the seas'. One of his most important contributions was to organize among United States vessels the keeping of marine logbooks in prescribed form for the recording of air and sea temperatures, wind direction and speed, atmospheric pressure, the set of currents and so on. He also encouraged the release of sealed bottles containing a paper giving the date of release and the latitude and longitude and, when such bottles were picked up later, the latitude, longitude and date were again added and the record forwarded to Maury.

International collaboration—the first steps

When Maury had demonstrated the value of the work he was developing, in particular the maintenance of marine logbooks, the United States Government authorized him to solicit the co-operation of the maritime nations in Europe for a general system of meteorological research. However, such was Maury's vision, he was already drawing up proposals for the establishment of co-ordinated meteorological observations over land areas in view of the potential value of such information for agriculture. As it happened, about this time (1851) General Burgoyne in the United Kingdom, following on the work initiated by Reid, was formulating similar proposals to Maury's which were transmitted to the United States Government and, as a result, Burgoyne and Maury were put in touch with each other. Their discussions culminated in the first international Conference on Maritime Meteorology which was held in Brussels in 1853. At first it was proposed to call a conference between Britain and the United States only but finally delegates were invited from a total of 10 seafaring nations and the scope was limited to the seas "to effect international procedures for the routes to be followed and for the meteorological logs for the ships sailing on the oceans". At first the conference appeared to be concerned only with what could be done on board men-of-war but, by the end, procedures were elaborated which could be carried out on both warships and merchant ships.

About this time official meteorological services were being established in a number of countries and the need for international collaboration was becoming universally accepted. The British Meteorological Office was formed in 1855 under Admiral Fitzroy with terms of reference "to collect meteorological observations from ships at sea with the objective of compiling meteorological atlases and in order to provide other statistical information about the weather and surface currents of the oceans for the benefit of shipping." For many years from its inception, therefore, the Meteorological Office was largely an organization for marine meteorology and in the past 80 years or so, when the activities of a meteorological service have expanded in so many directions, the Office's Marine Division has continued to occupy an important place with responsibilities which have themselves increased in a variety of ways. I will quote a few passages from Fitzroy's first report after taking up his appointment. I quote these because, in outlining his objectives and methods, it seems to me even today, nearly 120 years later, that people like Fitzroy and Maury and many others showed a remarkable breadth of outlook at a time when there was little to build on and mighty strides in science and technology had still to be made.

> The maritime commerce of nations having spread over the world to an unprecedented extent, and competition having arrived at such a point that the value of cargoes and the profits of enterprise depended more than ever on the time and nature of voyages, it became a question of the greatest importance to determine the best tracks for ships to follow, in order to make the quickest as well as the safest passages. The employment of steamers in such numbers—the prevalent endeavour to keep as near the direct line between two places (the arc of a great circle) as the intervening land, currents and winds would allow—and the general improvement in navigation—caused a demand for more precise and readily available information respecting all frequented parts of the oceans.
>
> "It is one of the chief points of a seaman's duty", said [Captain] Basil Hall, "to know where to find a fair wind, and where to fall in with a favourable current": but with the means hitherto accessible, the knowledge of such matters has only been acquired by years of toil and actual experience, excepting in the great thoroughfares of the oceans, which are well known. By the Wind and Current Charts published of late years, chiefly based on the great work (of the United States Government) superintended by Lieut. Maury, and by studying his *Sailing Directions*, navigators have been enabled to shorten their passages materially—in many cases as much as one-fourth, in some one-third, of the distance or time previously employed. . . .
>
> There is no insuperable reason why every part of the sea should not be known as well as the land—if not, indeed, better, generally speaking, because more accessible and less varied in character. . . . Meteorological information . . . will therefore be collected and discussed with the two-fold object in view—of aiding navigators, or making navigation easier, as well as more certain—and amassing a collection of accurate and digested observations for the future use of men of science.

After the meeting in Brussels in 1853 the next important international conference was held in Leipzig in 1872 and to this were invited the Directors of all Meteorological Services then in existence and all other scientists who were known to carry out meteorological investigations of one sort or another. This conference has been described as more of an inquiry, a kind of gallup poll, than anything else since the main purpose was to provide responsible answers to numerous important questions, for example: "Does the interchange of weather telegrams appear so useful that it should receive a fuller development and a firmer organization?" Although the delegates to the conference were partly official representatives and partly non-official experts (advisedly so since a wide spectrum of scientific and technical opinion had to be canvassed), it was the official delegates who drafted and adopted the resolutions in order to ensure that they would carry authority and be implemented when the delegates returned to their own countries. One set of resolutions was concerned with the standards and procedures for meteorological observations made at land stations; so, in this respect, the 1872 conference extended to the continents the technical arrangements drawn up for the oceans at the first conference of all in 1853.

Formation of the International Meteorological Organization

One of the decisions of the Leipzig Conference was that it should be regarded as a preparatory one and be followed by another meeting in the following year which would be official in character and attended only by the Directors of Services. This next meeting was the Congress in Vienna (1873) and it was this Congress which is regarded as the starting-point for the International Meteorological Organization which, in 1951, changed its name to the World Meteorological Organization. The Vienna Congress consolidated the international work of the earlier meetings and prepared the way in the form of statutes and an organizational framework within which all national meteorological services could recognize their interdependence and work together effectively for the benefit of all. I imagine that many of us now attending this international conference in Edinburgh, if we try to look back 100 years, can be in no doubt that those who took part in this work of international co-ordination and construction faced tremendous difficulties but fortunately were not deterred by them. The International Executive Committee set up in Vienna to maintain action and continuity between conferences contains names that are still remembered today—Buys Ballot from the Netherlands (President), Scott from the U.K. (Secretary), Bruhns from Germany, Cantoni from Italy, Jelinek from Austria, Mohn from Norway and Wild (destined to be the next President) from Russia. These were famous names but perhaps rather narrowly drawn for a world-wide organization, a deficiency probably explained by difficulties of travel and communication. Whatever the reason, it was not until 1891 that this Committee became widely representative including members from the U.S.A., South America, India and Australia as well as from Europe and Russia.

Now I may well have taken an excessive proportion of the time available to me in talking about the early or embryo stages in the history of WMO. After all this I have only reached 1873 and, remembering the title of my talk, it would be reasonable to ask "Where is the oceanography?" Where indeed! Well, the omission so far is not serious because it was not until the *Challenger* accomplished its historic and classic expedition that the foundations of oceanography were well and truly laid. I have concentrated on the early or preparatory phases in the history of WMO because, in all my reading, it was these phases that I found to be most interesting and remarkable for their vitality.

So, for the rest, I do not wish to give a catalogue of meetings and describe the business that was conducted at them even though all these meetings were important and constructive in their aims. The salient features are that as the Organization expanded, the Congress and Executive Committee carried on much of the work by means of Regional Associations and Technical Commissions and, by this machinery, it has been found possible to deal effectively with the pursuit of efficiency in technical organization and with the need to maintain an adequate scale of activity in scientific research. About the Organization as a whole it is interesting to note that for the first 70 or 80 years of WMO's existence, that is until 1951, the International Meteorological Organization was an unofficial association of Directors of Meteorological Services and, even so, made remarkable progress in achieving a high degree of integration so that, from the operational standpoint, all the national Services aggregated themselves into a world-wide organization. However, eventually governments became increasingly aware of the importance of meteorology and some user applications developed in a formal inter-governmental way, and in 1951 the IMO gave way to the WMO and, at about the same time, WMO became a specialized agency of the United Nations like UNESCO, FAO and ICAO.

The Commission for Maritime Meteorology

Henceforth, instead of dealing with WMO as a whole, I propose to confine myself to the marine activities of WMO and, in particular, to the Technical Commission for Maritime Meteorology (CMM) which has always included among its work some elements of oceanography. The applications of meteorology, whether to aviation or agriculture or industry or to maritime interests, are essentially of a service nature, responsive to demands as expressed by the user or as suggested by the user in the form of a problem that needs to be tackled. Meteorology was encouraged to develop as an international organization because services were required for the assistance and protection of shipping. Merchant navies and fishing fleets formulated their meteorological requirements in the widest terms and included elements that were more the effects of meteorology than an integral part of the science of the atmosphere. The WMO Commission for Maritime Meteorology—and the all-important Brussels conference of 1853 could be regarded as the first meeting of this Commission—has always included in its terms of reference responsibility for marine meteorology and related aspects of oceanography and thus, from the earliest days, meteorologists have encouraged the measurement or observation of sea-surface temperatures, ocean currents, waves, swell and so on, and have been prepared to analyse, summarize and predict these parameters. Inevitably a lot of work has been done in subjects which are somewhat beyond the strict frontiers of meteorology but the common good has been served in the production by Meteorological Services of ice and sea surface current charts and other publications which fit fairly loosely into the term 'marine meteorology'. These facts illustrate the overlapping interests of meteorologists and oceanographers, the field of interest of the meteorologist extending well below the sea surface and the physical oceanographer recognizing that he must include data from a substantial layer of the atmosphere in his studies if he is to explain many of the processes that go on in the ocean.

Over the years, therefore, a fair proportion of the work of CMM has been concerned directly or indirectly with oceanography and, although the contacts began and developed informally, I believe a lot of valuable co-operation has taken place. As a practical example, oceanographers have been encouraged to make use of the facilities available on weather ships and much has been done on them by both physical oceanographers and marine biologists. It is important that this kind of co-operation should be encouraged and I am glad to say that the marine divisions of Meteorological Services, with their long-established contacts with merchant navies, are very willing to make their experience and facilities available in support of oceanography.

The outlook

In recent years much has happened to bring meteorology and oceanography closer together formally and in matters of organization. Just as meteorology was spurred on to the concept of World Weather Watch by a series of United Nations Resolutions, so has oceanography received considerable impetus since 1966 by UN Resolutions calling for greater exploitation of the marine environment and its resources, and encouraging long-term and expanded programmes of scientific research into the oceans. These Resolutions have led to much closer collaboration in a variety of ways between the international organizations—UNESCO's IOC, FAO, IMCO, IHO, WMO—and their national components which are concerned with the marine environment. WMO regards these developments as most important and has already shown its willingness to play a full part in all matters requiring co-operation between meteorologists and oceanographers. A great deal of productive and far-reaching work has already been done jointly by the international organizations involved and I need only mention the acronyms IGOSS, GELTSPAP, LEPOR and GESAMP* which are well known to all of you. Their growing importance is a guarantee that co-operation will be maintained and expand.

Meteorologists acknowledge their good fortune that substantial and imperative user requirements arose, first in shipping and later in aviation, to ensure the development of world-wide observing networks with the telecommunications and other supporting facilities for the establishment of forecasting services throughout the world. Meteorologists themselves showed great initiative in measuring up to what was required of them and the importance of the user demand is reflected in some of the celebrated names of the formative years—Beaufort, Maury, Fitzroy—all sailors. There are now signs of a similar impetus being given to oceanography which augers well for the future of that science and for the support it may expect

* Integrated Global Ocean Station System, Group of Experts on Long Term Scientific Policy and Planning, Long-term and Expanded Programme of Oceanic Research, Group of Experts on Scientific Aspects of Marine Pollution.

to receive from the maritime nations. WMO views these developments not in a spirit of rivalry but one of co-operation, realizing that meteorologists and oceanographers share many responsibilities and objectives. Both meteorology and oceanography are expanding sciences and, in the years ahead, the demands placed on both may be expected to increase all the time and progress in one will be helpful to progress in the other. For its part, therefore, WMO greatly values its collaboration and contacts with those international bodies whose main concern is the oceans and looks forward to an era in which the joint efforts already in progress will expand and yield valuable results for the benefit of mankind.

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The Alternating Currents of the Equatorial Indian Ocean

By R. M. Sanderson
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Sources of information about surface currents in the equatorial region of the Indian Ocean are not all in agreement as to the facts. In some cases the current at a particular place and time of year is described as easterly in one source and westerly in another. An investigation was accordingly undertaken covering the region within about 2° latitude of the Equator between the meridians of 65°E and 80°E in an attempt to resolve the discrepancies.

Since these currents, both east- and west-going, often run at a considerable rate, the current pattern of this area is of some importance to navigation. For example, in persistent bad weather the consequences of experiencing an unexpected adverse set could be disastrous on hauling north after an assumed eastward passage through the Equatorial or the One and Half Degree Channels.

Though the number of current reports from this area has increased since the development of a base at Gan (00° 41′S, 73° 10′E) and, more recently, since the closure of the Suez Canal, they are still insufficient to permit a detailed analysis. However, since the currents within this area are closely related to the prevailing winds, the investigation was aimed at determining the duration of the wind systems affecting the area and relating these to the available current observations. In order to define these wind systems, existing sources of information were supplemented by a new analysis of wind data from Gan.

Wind data

The analysis was based on routine monthly climatological reports for the period from June 1960 (when records began) to February 1972.

This analysis is presented in the form of a diagram (Fig. 1) which displays, by months, the occurrences of the three wind systems which affect the area, based on the reported surface-wind directions. The diagram shows the approximate durations of the wind systems and also gives some indication of the probability of a particular wind system in any given month. In using this diagram it has been assumed that the general pattern of seasonal winds and periods of transition which it reveals can be considered to be reasonably representative of the narrow belt within 2° latitude of the Equator with which this article is concerned.

Wind systems

The wind systems which affect this area are the north-east and south-east monsoons and the equatorial westerlies. Though the term 'north-east monsoon' will be familiar enough, the term 'south-east monsoon' perhaps requires some explanation. It is the northward extension of the South-east Trades into the equatorial belt

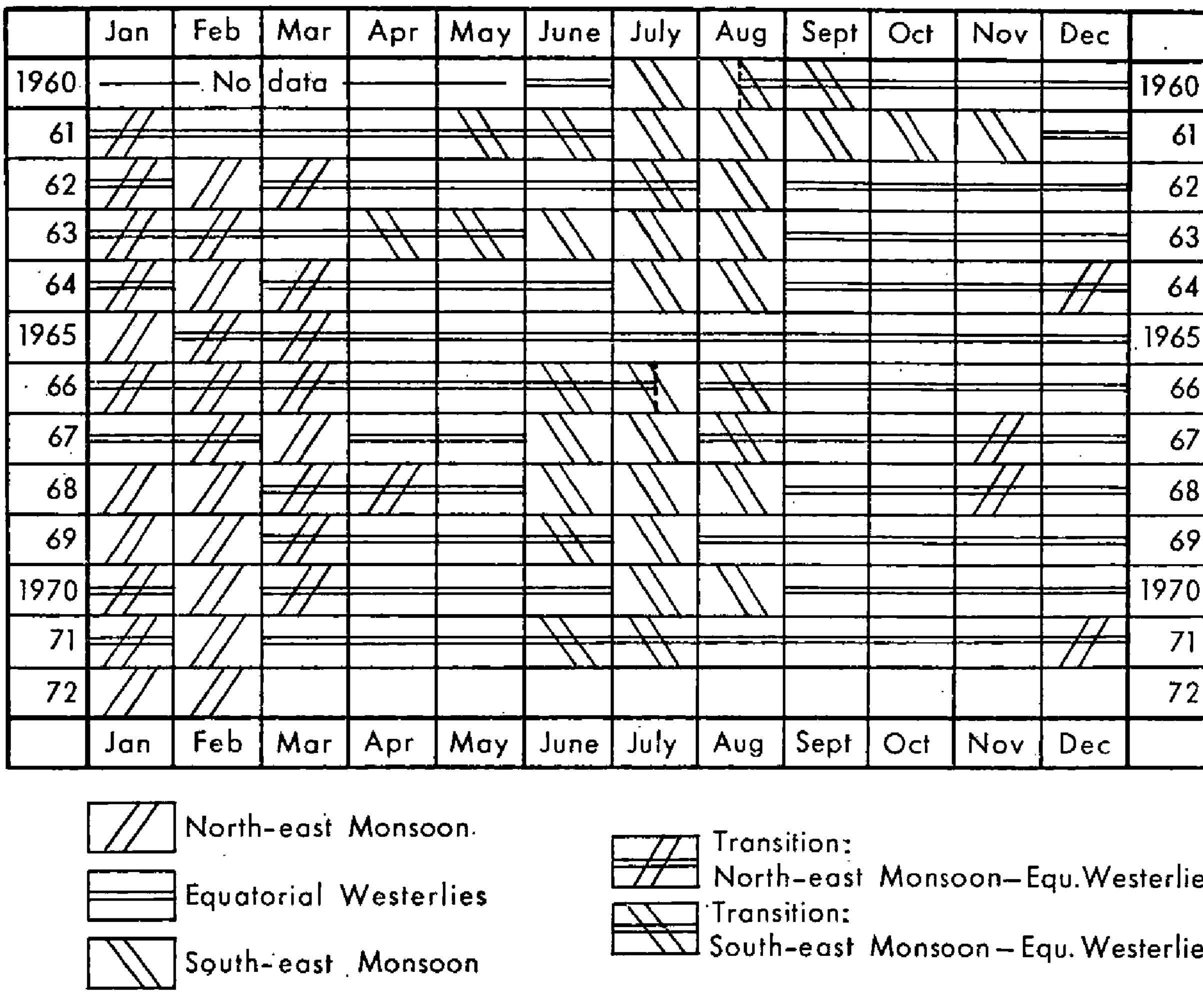

Fig. 1. Occurrence of North-east Monsoon, Equatorial Westerlies and South-east Monsoon at Gan.

during the northern hemisphere summer. (Since this wind system is seasonal within the area under discussion, the term 'monsoon' is used instead of 'Trade' which should be reserved for wind systems which prevail over a given area throughout the year.) The converging north-east and south-east monsoons are separated, over the tropical Indian Ocean, by a zone of westerly winds which moves north and south with the seasons.

These westerly winds, often referred to as the equatorial westerlies, prevail over the area for the greater part of the year. However, at the height of the northern winter (February) the equatorial westerlies are displaced southwards, beyond the Equator, so that the north-east monsoon is dominant over the equatorial region under discussion. At the peak of the northern summer (July/early August) the equatorial westerlies are displaced northwards by the south-east monsoon which, in most years, prevails over the area at this time.

Current/wind relationship

In the examination of current/wind relationship, only currents with rates of 1½ knots or more were considered; at about this value errors due to incorrect allowance for leeway, to quality of fix, etc. in computing the current assume less importance. When these reported currents were related to the prevailing wind systems there emerged a reversing pattern of currents which was, without exception, in phase with the changing wind systems. The distribution of these east- and west-going currents is shown by months in Table 1. *The west-going currents are associated with persistent winds from an easterly point and easterly sets predominate when westerly winds are prevalent.*

(*Opposite page* 32)

Mr. Heath holding his presentation copy of *Meteorology for Mariners* (*see* page 35).

(*Opposite page* 33)

Mr. Heath signing the visitors' book at Meteorological Office Headquarters, watched by Dr. B. J. Mason, the Director-General (*see* page 35).

Table 1. The frequency of reports of strong currents (over 1½ kt)

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
East-going					9	4			1	9	9	3	35
West-going	2	10	1				9	2					24

Current directions

On the basis of this relationship and knowledge of the wind régimes augmented by the Gan wind direction analysis, monthly patterns of predominant currents were deduced which are now discussed; these patterns are presented schematically in a series of chartlets (Figs. 2(a)–(f)) which, to give a broader picture, cover the area within about latitudes 5°N and 5°S.

JANUARY is usually the period of transition between the equatorial westerlies and the north-east monsoon over the narrow belt, within 2° of the Equator, under discussion. The currents of this region, shown in Fig. 2(a), are therefore variable but probably from some northerly point. It will be seen from Fig. 1 that there is a moderate probability that the north-east monsoon has already become established over this area, resulting in a predominantly west-setting current, while there is a very low probability that the equatorial westerlies still prevail, resulting in east-going currents.

The north-east monsoon prevails in FEBRUARY in most years, consequently the predominant currents are west-going in this month (see Fig. 2(b)). The main alternative is that transition conditions still prevail, resulting in variable currents.

MARCH is again a period of transition so that the current pattern for this month is similar to that shown in Fig. 2(b). There is a moderate probability, however, that east-going sets will predominate as in some years the equatorial westerlies prevail through this month.

During APRIL and MAY the equatorial westerlies are usually well established, resulting in easterly currents (see Fig. 2(c)).

There is an almost equal probability in JUNE that the equatorial westerlies or the south-east monsoon or a transitional stage between the two will occur. Fig. 2(d) therefore shows the currents to be variable over the area though the east- and west-going currents are shown close to the north and south of the region respectively.

In JULY and early AUGUST the south-east monsoon usually prevails over the area. The predominant currents in these months, shown in Fig. 2(e), are therefore west-going. In July the main alternative is variable currents associated with transition while in August in some years the equatorial westerlies prevail, resulting in easterly currents.

The transition from the south-east monsoon to the equatorial westerlies usually occurs during the period from late August to early September. The currents during this transition period will be similar to those shown in Fig. 2(d).

During the remainder of SEPTEMBER and in OCTOBER to DECEMBER the equatorial westerlies prevail with a high frequency of occurrence (see Fig. 1). The currents during this period, shown in Fig. 2(f), are predominantly east-going over the area.

Current rates

The currents of the equatorial oceanic belts, especially in the Indian Ocean, are among the few persistent strong currents which exist. The mean rate of the east-going Equatorial Counter-current for most of the six months when it prevails over the area is about 1½ knots. The rate of this current is apparently also influenced by the strength of the westerly winds. According to the Gan data, these winds are strongest in May and October, and to a lesser extent in November. In these months the mean rate of the Equatorial Counter-current increases to about 2 knots.

The converging Indian North-East Monsoon Current and the South Equatorial

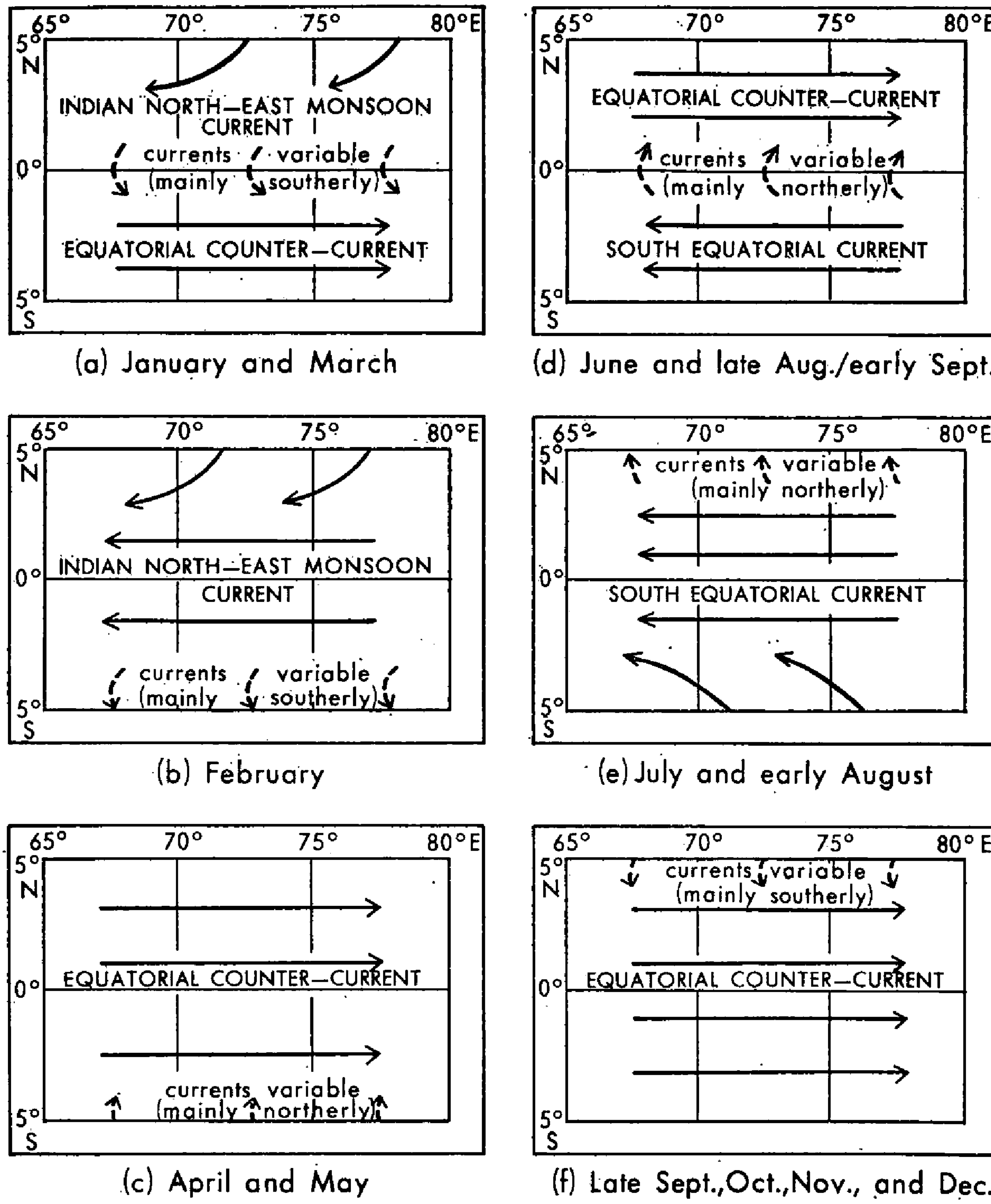

Fig. 2. Predominant current directions.

Current are turned to run in a more westerly direction as they approach the boundaries of the Equatorial Counter-current. By the time these west-going currents become established over the equatorial area, displacing the counter-current southward or northward according to the season, they run at a considerable rate which is perhaps due to 'channelling' against the boundary of the counter-current. The mean rate of the west-going currents, which usually prevail over the area in February and July/early August is about $1\frac{1}{2}$ knots.

On individual occasions in almost any month of the year, currents of up to 4 knots may be experienced, setting easterly or westerly according to the prevailing wind system. On rare occasions currents of 5 knots have been recorded in all seasons.

Conclusions

In this article the wind régimes of the area, as revised by the Gan data, have been used to deduce a modification to the boundaries of the currents which affect the area. When compared with the reports of strong currents (greater than 1½ knots) which have been received from the area, these deduced current directions were found to be in excellent agreement with those observed.

Most of these strong currents have occurred in the vicinity of the Equatorial and the One and Half Degree Channels but a significant number have been reported up to several hundred miles east and west of the southern Maldives indicating that these strong currents cannot be entirely attributed to the effect of funnelling through the channels within that archipelago.

It has been shown that the currents of this area are subject to variability dependent largely on the arrival and departure of the monsoons. In some months this variability is considerable and in others it is less so. East-going currents may be expected with a fairly high degree of confidence in April and May and from September to December. With somewhat less confidence west-going currents may be expected in February, July and August. In the remaining three months, January, March and June the currents are very variable.

In these latter months especially, considerable caution should be exercised when navigating in the vicinity of the Equatorial and the One and Half Degree Channels particularly when, through equipment failure and persistent bad weather, the safe navigation of the vessel may depend on dead reckoning.

Note. The information on currents in the *West Coast of India Pilot* (N.P.38) is being amended.

THE OPENING OF THE RICHARDSON WING OF THE METEOROLOGICAL OFFICE

The Prime Minister, the Rt. Hon. Edward Heath, performed the opening ceremony at the new Richardson Wing of the Meteorological Office Headquarters in Bracknell, Berkshire, on the afternoon of Friday, 6th October 1972 (*see* photographs following pages 24 and 32).

The Richardson Wing, a fine new building of five stories designed and built by the Department of the Environment, now houses the Meteorological Office operational centre, containing the Central Forecasting Office, the Telecommunications Centre and the Computing Laboratory. The new wing is named after Lewis Fry Richardson, F.R.S. who first conceived how to compute the weather from the complex mathematical equations which govern the behaviour of the atmosphere, treated as a fluid, in a remarkable book published 50 years ago.

Richardson's scheme, which in its essentials is very similar to those used today, could not then be implemented because it was not possible in those days to carry out the vast number of calculations required fast enough to keep up with the weather. This became possible only with the advent of powerful electronic computers, and now the Meteorological Office has installed one of the fastest computers in the world. This is the IBM 360/195, which is capable of carrying out about 10 million instructions per second.

In time, it is hoped that the combination of the new computer and the new mathematical models of the atmosphere will lead to marked improvements in the accuracy of forecasts for up to a few days ahead and, for the first time, enable the Meteorological Office to produce quantitative forecasts of rainfall over the British Isles and most of Europe for periods up to 36 hours ahead.

On 1st August the Office brought into operation a new ten-level mathematical model of the atmosphere designed to forecast the main weather developments over the entire Northern Hemisphere for up to 36 hours ahead. Such forecasts are made twice a day, each one involving 10,000 million arithmetical operations on the computer. This is the most sophisticated forecasting model in operation anywhere in the world at the present time.

However, the accuracy of the forecast depends not only on the quality of the mathematical model and the power of the computer but very much upon the quantity and quality of the meteorological observations made both at the surface of the earth and in the upper air over the whole of the hemisphere. These are roughly adequate over the populated parts of the northern hemisphere but are seriously deficient over the oceans, tropical regions, and the southern hemisphere where the inadequacies are likely to be met only by observations from satellites. The meteorological services of the world are also very dependent on good communications for receiving the large quantities of data within a few hours of the observations being made.

The Telecommunications Centre at Bracknell is responsible for the reception, transmission and through-relay of meteorological information amounting to over 1¼ million groups of coded observations and nearly 1,000 facsimile weather charts daily. To enable this task to be accomplished efficiently and expeditiously the Centre is being modernized and re-equipped to provide, eventually, a fully-automated, computer-controlled telecommunications system. In the first phase, now completed, a computer-controlled message switching system, utilizing Marconi Myriad II digital computers, provides a high-speed communications link with other major centres, such as Washington, Paris and Offenbach, so that the facilities at Bracknell now range from this sophisticated system to the modest morse key used for communicating with the Ocean Weather Ships. Later, an electronic interface will be provided to link the telecommunications computers directly to the giant computer producing the forecasts.

The Central Forecasting Office provides the vital link between the computer and the user, be he aviator, mariner or man in the street. Here, the computer products are examined and, if necessary, adjusted in the light of last-minute information and these then form the basis of the weather forecasts used by industry and the general public.

The Central Forecasting Office has three primary operational tasks. The first is the provision of guidance forecast charts and advisory bulletins covering the next two to three days for the benefit of the hundred or so outstations of the Office. Second is the preparation of numerous forecasts for radio and the national Press, including the shipping forecasts and gale warnings to shipping broadcast by the BBC. Thirdly, the Central Forecasting Office acts as a Regional Meteorological Centre as part of the world-wide organization known as the World Weather Watch; the aim here is to provide forecasts over a large part of the northern hemisphere for the benefit of other nations' meteorological services and for ships at sea, the arrangements having been made on a co-operative basis through the World Meteorological Organization.

The Meteorological Office provides a wide range of services; to military and civil aviation for operations over an area extending from the west coast of North America to the Middle East and beyond; to the mariner and fisherman in the North Sea and the Atlantic, and sometimes beyond; to the farmers; to the builder and the industrialist; to the gas, electricity and oil industries; to the rigs operating in the dangerous and exposed waters of the North Sea; and to the 13 million or so members of the general public who use the Post Office recorded weather forecast service annually and the 1½ million or so who every year telephone meteorological offices up and down the country for advice on their problems. The new facilities at Bracknell, the most advanced of their kind, are designed to benefit them all.

ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM JULY TO SEPTEMBER 1972

The charts on pages 38 to 40 display the actual and normal ice edges (4/10 cover), sea-surface and air temperatures and surface-pressure anomalies (departures from the mean) so that the abnormality of any month may be readily observed. (The wind anomaly bears the same relationship to lines of equal pressure anomaly as wind does to isobars. Buys-Ballot's law can therefore be applied to determine the direction of the wind anomaly.) The summary of iceberg sightings has been discontinued and is replaced during the iceberg season (roughly February to July) by southern and eastern iceberg limits. In any month when sightings have been abnormally frequent (or infrequent) this will be discussed briefly in the text.

The periods used for the normals are as follows. Ice: Eurasian sector, all data up to 1956,[1] North American sector, 1952–56 (for north of 68°N)[1] and all data up to 1963 (for south of 68°N).[2] Surface pressure: 1951–66.[3] Air temperature, 1951–60.[4] Sea-surface temperature: area north of 68°N, 1854–1914 and 1920–50,[5] area south of 68°N, 1854–1958.[2]

JULY

The effect of a cold winter over eastern Canada is clearly demonstrated by the ice excess over adjacent sea areas. This effect may well have spread to south Greenland where cold sea and air-temperature anomalies contributed to the ice excess in that region. Over the remainder of the Greenland Sea, however, and in the Barents Sea a warm south-westerly wind anomaly accounted for a continued, and sometimes enhanced ice deficit. The iceberg limit, shown on the pressure/air-temperature anomaly chart, lies once again beyond normal and encloses an abnormally large number of icebergs.

AUGUST

The excess over central and eastern Canada is attributed to the residual effect of the cold winter. The Greenland and Barents Seas deficit was reduced a little by a less favourable wind anomaly. By the end of the month the iceberg situation had recovered to normal and the season was considered to be over. The International Ice Patrol Service estimate that 1,587 icebergs drifted south of the 48th parallel off the east Canadian seaboard; this is the highest figure since records began in 1900.

SEPTEMBER

The main excess this month lies once more in the central and north-eastern Canadian Arctic. In many parts of these areas the last season's ice failed to clear before the onset of the new winter's freezing. The central Canadian Arctic has experienced a severe summer season, so much so that the single-handed yachtsman who interrupted his attempt to navigate the North-West Passage to spend last winter in this area has had to lay-up for yet another winter at an Eskimo settlement after making little progress this summer. Once again a large deficit occurred in the Barents Sea where a warm southerly wind anomaly accounted for a new extreme ice-edge position for this month.

R. M. S.

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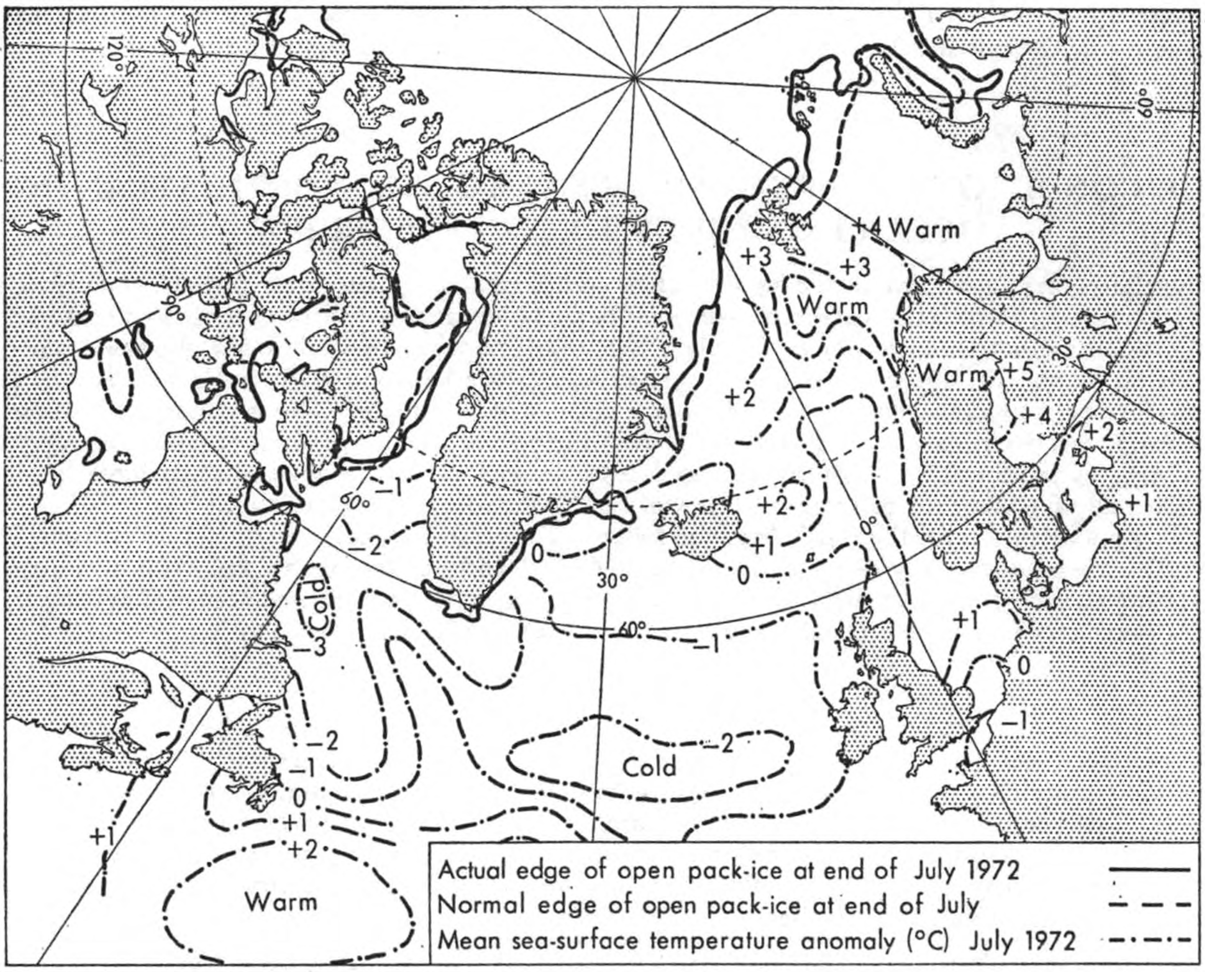
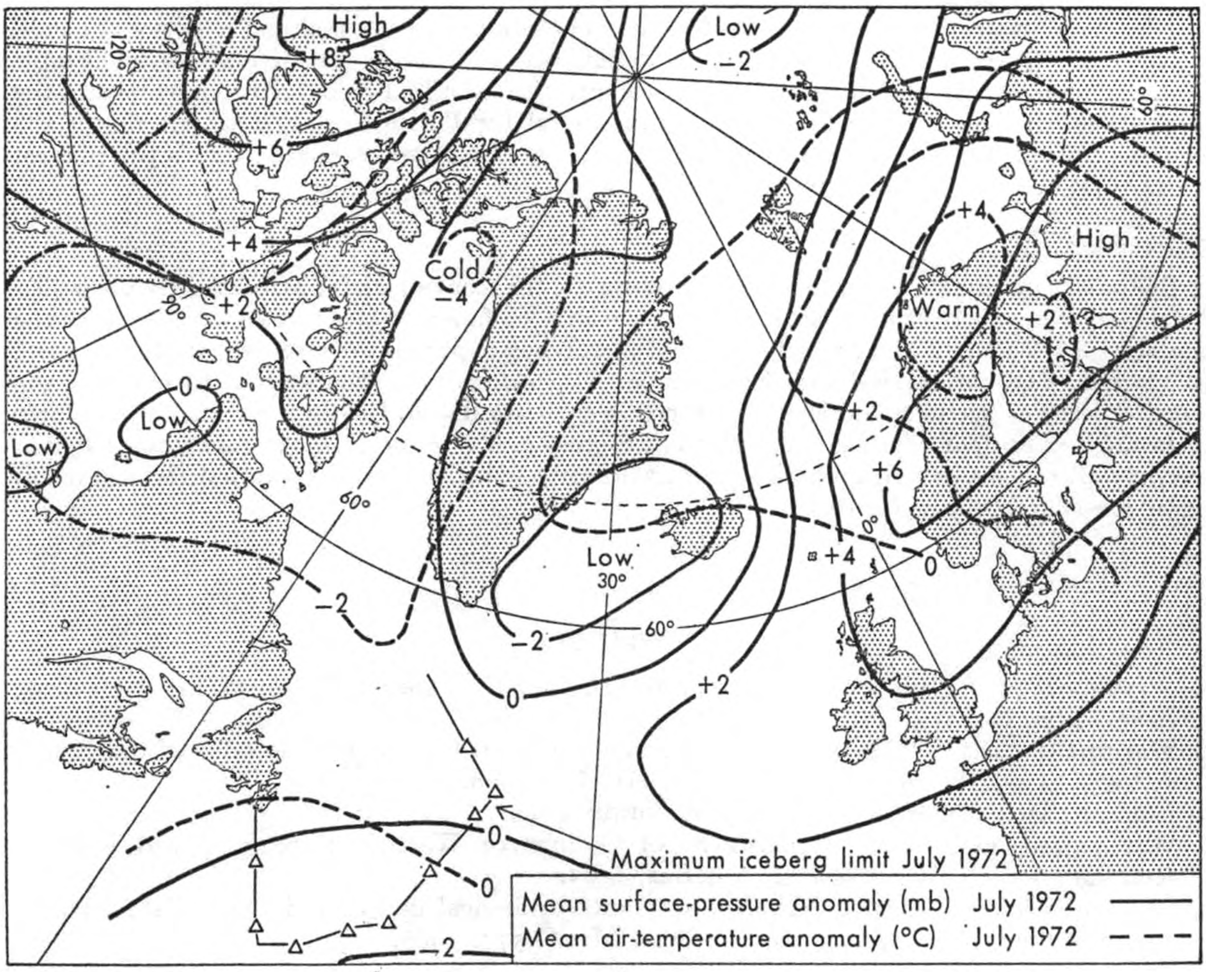
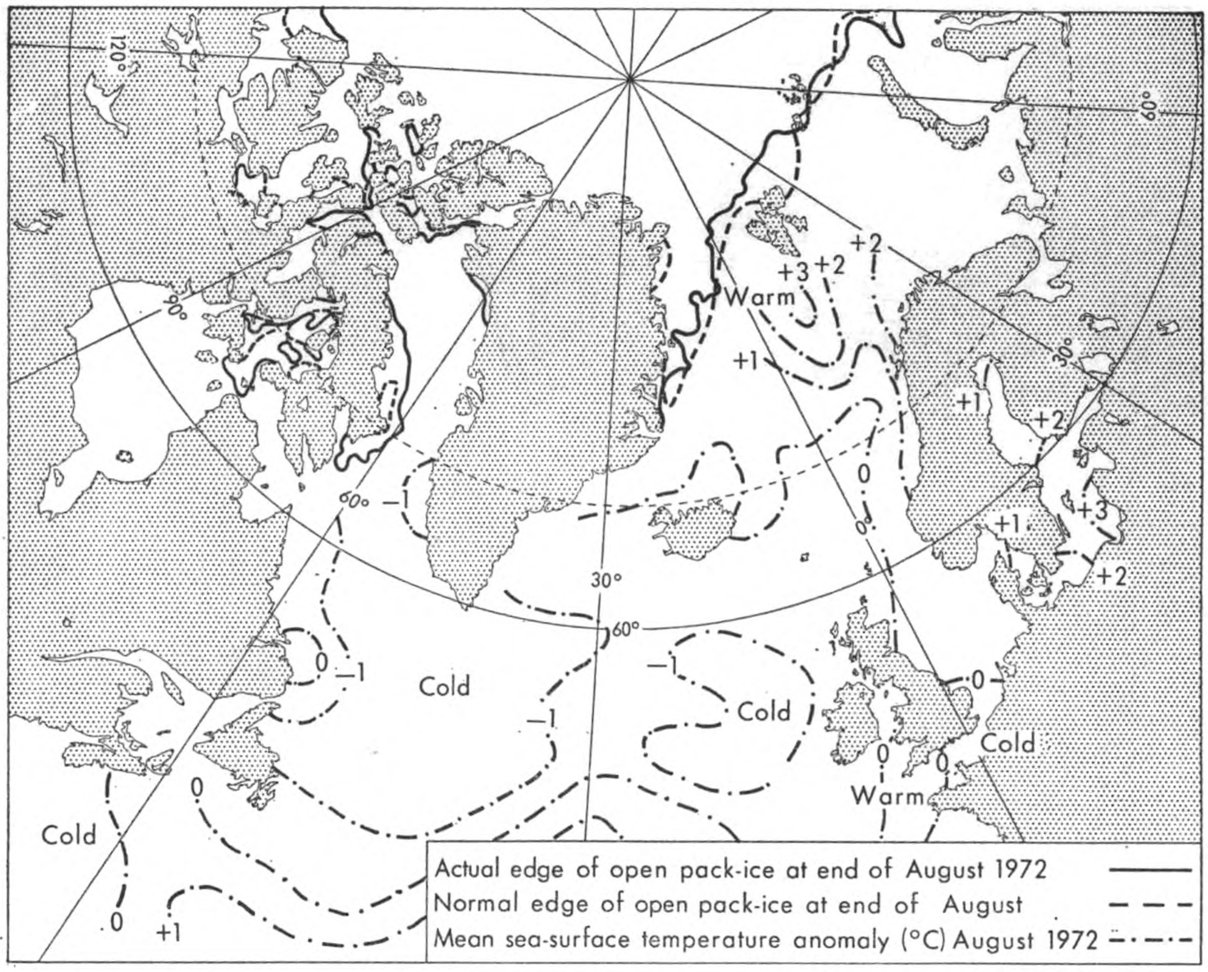
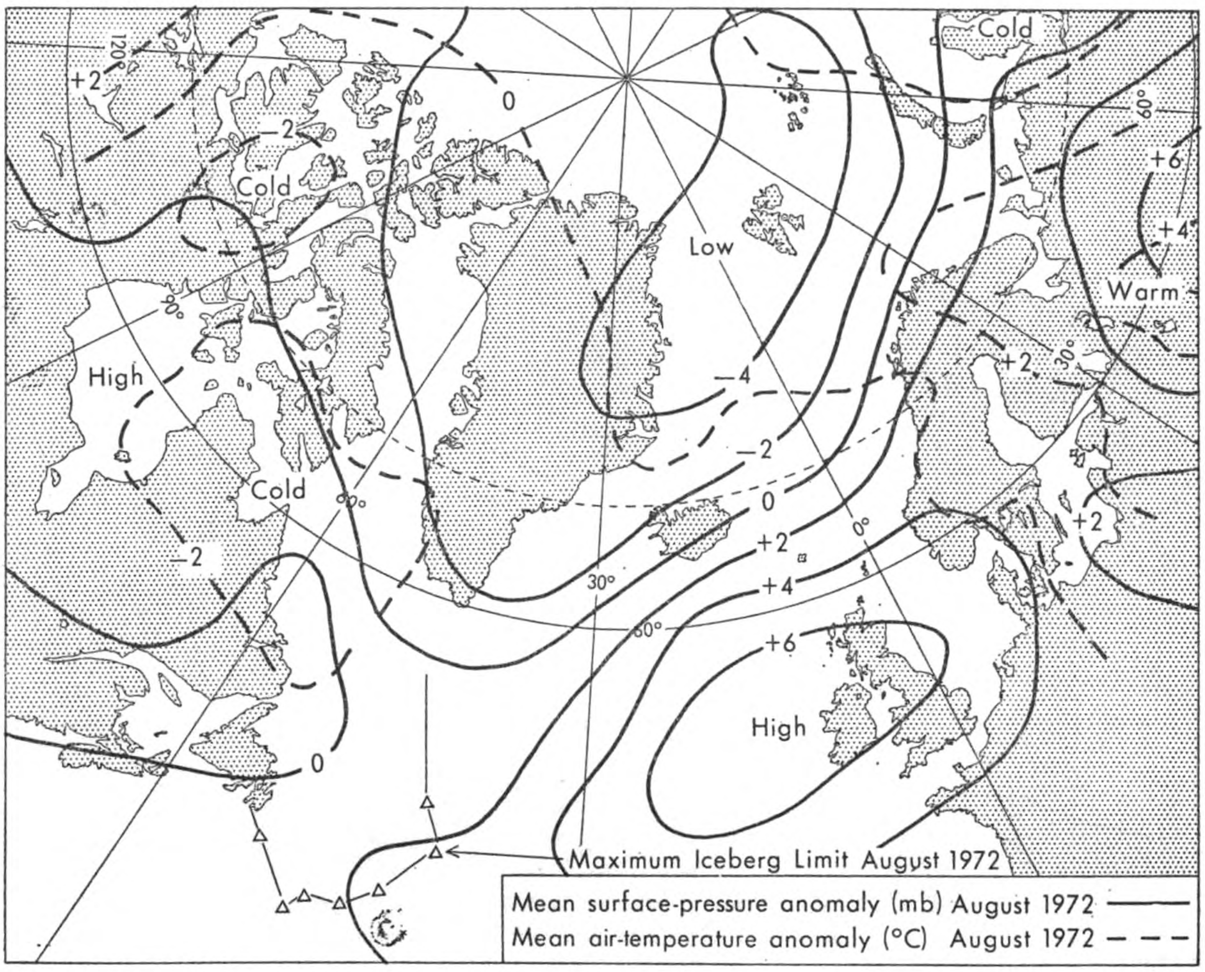
2. Washington, D.C., U.S. Naval Oceanographic Office. Oceanographic atlas of the North Atlantic Ocean. Pubn. No. 700, Section III: Ice, 1968.
3. London, Meteorological Office. Various publications.
4. Washington, D.C., U.S. Department of Commerce Weather Bureau. World weather records, 1951–60. Vol. 1: North America, 1965.
5. London, Meteorological Office. Monthly meteorological charts and sea surface current charts of the Greenland and Barents Seas. Met.O.575, 1966.


Actual edge of open pack-ice at end of July 1972
Normal edge of open pack-ice at end of July
Mean sea-surface temperature anomaly (°C) July 1972
Warm
Cold
Cold
Warm
Warm
Warm
+4 Warm

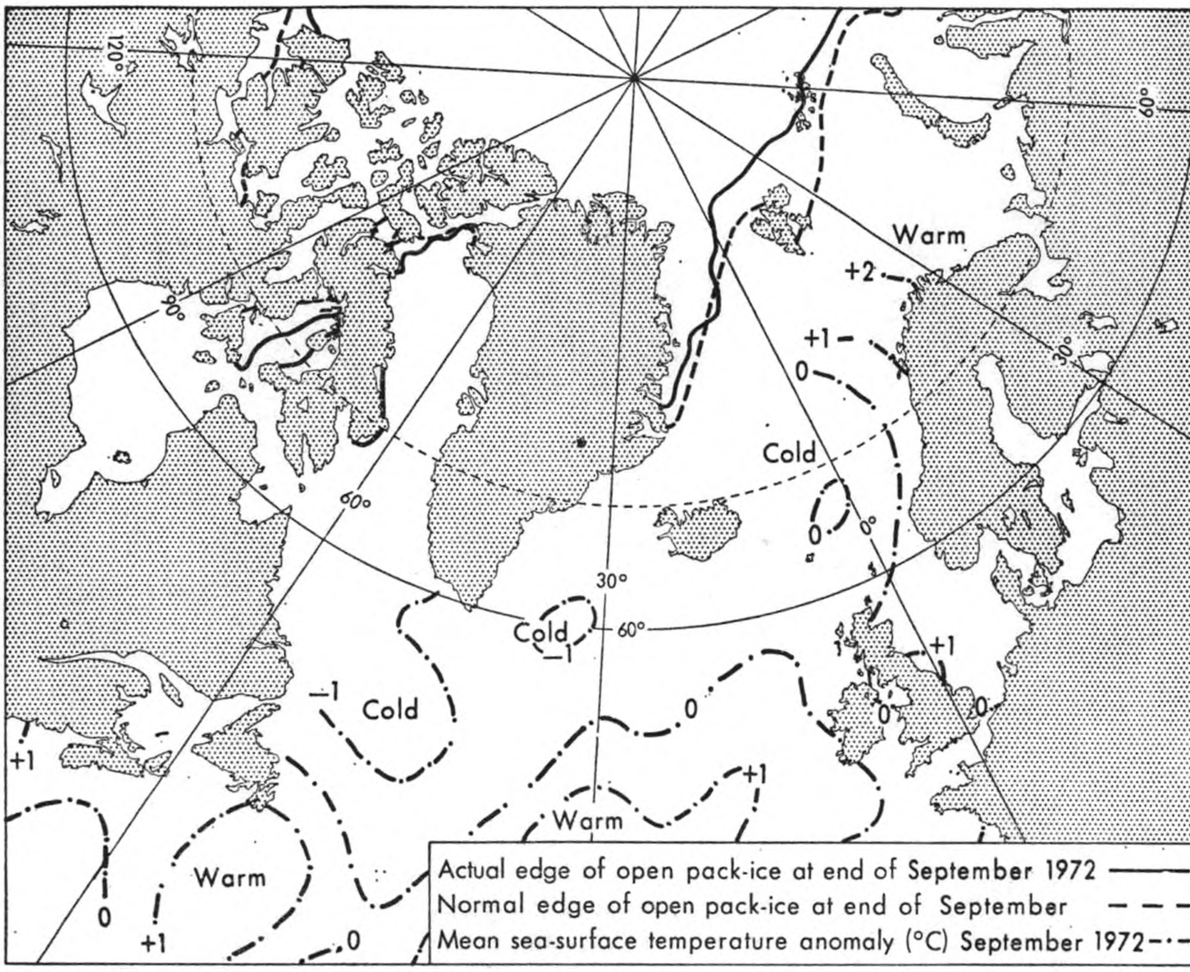

Maximum iceberg limit July 1972
Mean surface-pressure anomaly (mb) July 1972
Mean air-temperature anomaly (°C) July 1972
High
Low
High
Low
Low
Low
Cold
Warm

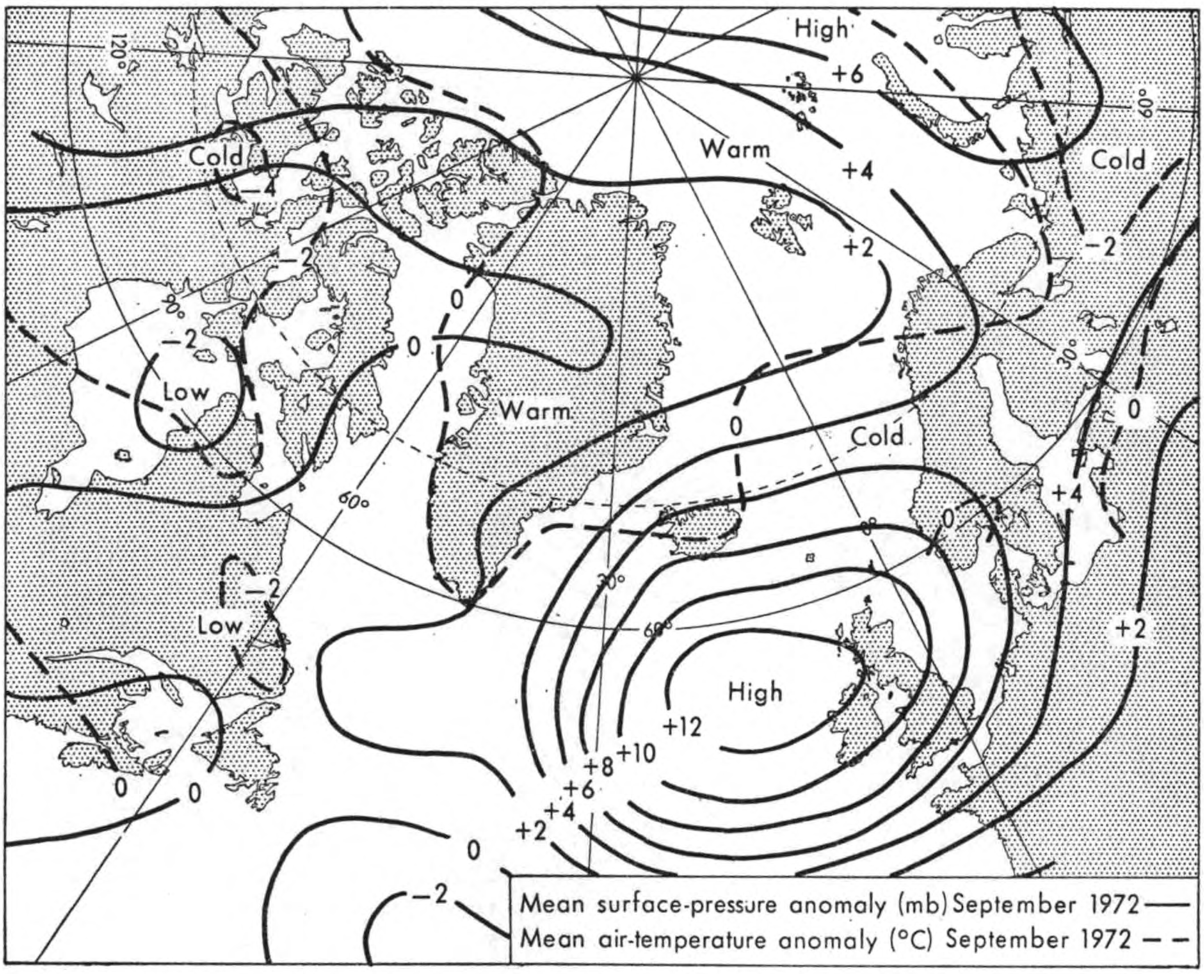


Warm
Cold
Cold
Cold
Cold
Warm
Actual edge of open pack-ice at end of August 1972
Normal edge of open pack-ice at end of August
Mean sea-surface temperature anomaly (°C) August 1972



Cold
Cold
Low
High
Cold
Warm
High
Maximum Iceberg Limit August 1972
Mean surface-pressure anomaly (mb) August 1972
Mean air-temperature anomaly (°C) August 1972


Actual edge of open pack-ice at end of September 1972
Normal edge of open pack-ice at end of September
Mean sea-surface temperature anomaly (°C) September 1972
Warm
Cold
Warm
Cold
Cold
Warm
Warm


Mean surface-pressure anomaly (mb) September 1972
Mean air-temperature anomaly (°C) September 1972
High
Warm
Cold
Cold
Low
Warm
Cold
Low
High

SPECIAL LONG-SERVICE AWARDS

Each year since 1948 the Director-General of the Meteorological Office has made special awards to the four voluntary marine observers whose long and zealous work on behalf of the Meteorological Office is considered as deserving special recognition.

All officers who have sent us meteorological records in 15 or more years, and who have compiled at least one meteorological logbook in the previous year, come within the orbit of the special award scheme and each year their personal cards are brought out and scrutinized. Consideration of the length of their service combined with the quality of their records effectively forms them into a 'League Table'.

This year there were 94 officers with 15 or more years voluntary service (those years can very seldom be continuous but are more often spread over 30 or more years) and the Director-General is pleased to make the special awards to the following shipmasters:

1. CAPTAIN D. E. MORAN of the P. & O. Lines (formerly the New Zealand Shipping Co.) whose first meteorological logbook was received here in 1948 from the *Gloucester*. During 23 years of voluntary observing he has sent us 44 meteorological logbooks, all but one of which have been classed excellent.

2. CAPTAIN P. N. FIELDING of Manchester Liners. He first observed for us in 1946 when he was in the *Manchester Commerce*; he also has 23 years of voluntary observing to his credit and has sent us 46 meteorological logbooks in that time.

3. CAPTAIN J. D. BLAKE of Messrs. Trinder Anderson & Co. Since his first meteorological logbook came here in 1948 from the *Kaituna* of the New Zealand Shipping Co. he has sent us 36 meteorological logbooks in 21 years.

4. CAPTAIN J. T. SHEFFIELD, M.B.E. of Furness Lines. During 20 years as a voluntary observer he has sent us 57 meteorological logbooks, the first one coming in 1929 from the *Peshawur* when he was in the P. & O. Lines.

As in past years, the award will be in the form of a suitably inscribed barograph and we congratulate these four shipmasters on this recognition of many years voluntary meteorological work at sea. They will be personally notified of the award and of the arrangements which will be made for its presentation.

L. B. P.

Personalities

OBITUARY.—We regret to record the sudden death of CAPTAIN JOSEPH REGINALD RADLEY at his home in Thetford, Norfolk. Joe Radley was well known in the ports of Southampton and Liverpool where he served as Port Meteorological Officer for many years. He was a popular and respected colleague.

A retirement notice, which included a summary of his career, appeared in the January 1968 edition of *The Marine Observer*. We offer our sympathy to his widow.

A. D. W.

RETIREMENT.—CAPTAIN R. H. FINCH has retired after 44 years in the Port Line.

Ronald Hazlewood Finch was born at Devonport, his father being in the Royal Naval Dockyard there. The family later moved to Malta and then to Pembroke Dock where his father died when young Finch was 9 years old. After moving back to Brixham, Finch was educated at Torquay Grammar School. He had two uncles in the Port Line (then known as the Commonwealth and Dominion Line) for both of whom we have individual cards showing that they were voluntary marine observers for a number of years. Finch signed indentures with this Company in July 1928 and first went to sea in the *Port Albany*. He passed for 2nd Mate in 1933 when prospects of employment at sea to match one's qualifications were bleak indeed. To keep the minds and hands of young officers active during these distressing years Port Line decided that one of their ships should be manned on deck entirely by certificated officers; the ship chosen was the *Port Gisborne* and Finch joined her as Able Seaman in October 1933. He made five voyages in her, latterly as Boatswain, and when his turn came to fill an officer's berth it was only to be that of 4th Officer, on half pay, of the *Port Curtis* laid up in the River Blackwater. Eventually he went to sea as 4th Officer of the *Port Melbourne*.

At the outbreak of World War II he was 3rd Officer of the *Port Sydney* and sailed in the second convoy of the war from Liverpool. Later he was in the *Port Darwin* but spent most of his war in the *Port Alma* as 2nd Officer. On one occasion, whilst the *Port Alma* was carrying the Commodore, the convoy was attacked off Cabo de Gata by German torpedo-carrying aircraft; the convoy was credited with shooting down eleven of these, having only two out of 30 ships damaged. Later the *Port Alma* made a voyage from New York with supplies for the United States Forces in New Guinea; this involved 'running the gauntlet' of a number of Japanese-occupied islands. At the end of the war Finch was Chief Officer of the *Fort Chambly*, a Lend-Lease ship which he delivered back to the United States at Mobile when the war was over.

Captain Finch had passed for Master in July 1941 and was appointed to his first command, the *Port Chalmers* in 1955; his last command was the *Port Nicholson*.

Captain Finch's record of voluntary observing for us goes back to 1938 when he sent us his first meteorological logbook from the *Port Jackson*. Since then he has, in 15 years, sent us 25 meteorological logbooks. He received Excellent Awards in 1957, 1960, 1961, 1962, 1963, 1970 and 1972.

We wish him health and a long happy retirement in his native West Country.

L. B. P.

RETIREMENT.—CAPTAIN R. G. HOLLINGDALE retired from the sea when he brought the *Hinakura* into London in August.

Richard George Hollingdale was born at Wembley, Middlesex; his maternal grandfather, George Kemp, was the Thames Pilot who took the first ship, the *Lapwing*, under the Tower Bridge at the opening in 1891. Captain Hollingdale received his early training in H.M.S. *Worcester* and was indentured to the New Zealand Shipping Company in 1929, making his first voyage in their *Northumberland*.

He passed for 2nd Mate in 1932. The early 1930s were very lean years for young officers with new certificates and he was variously employed ashore and afloat until 1935 when he joined the *Brightvega* belonging to the Bright Star Navigation Co. of London; a year later he made a voyage as 3rd Officer of the *Bonnington Court* owned by the Court Line of Newcastle. In 1938 he came back to the New Zealand Shipping Co. as 3rd Officer of the *Hertford*; he stayed with the company until his retirement.

Captain Hollingdale passed for Master in 1941 and was appointed to his first command, the *Kent* in 1952.

During World War II the *Tongariro*, of which he was 2nd Officer, met a Japanese submarine on the surface off West Australia; with her 4·7 inch gun she fought a surface action and succeeded in escaping. For his part he was mentioned in dispatches.

In January 1962, when in command of the *Durham*, Captain Hollingdale took off three very badly burnt crew members of the Norwegian ship *Jotunfjell* in the vicinity of the Azores; unfortunately they were so badly burnt that two of them subsequently died. Later, whilst in command of the *Remuera*, he took some 300 inhabitants, rendered homeless by an earthquake on the Azores island of São Jorge, to the island of Terceira.

Captain Hollingdale's record of voluntary observing goes back to 1938 when he sent us his first meteorological logbook from the *Hertford*. In 22 years of active observing he has sent us 46 meteorological logbooks, a large proportion of which have been classed Excellent. He received Excellent Awards in 1956, 1960, 1967, 1968, 1969, 1970, 1971 and 1972. In 1970 he received the Special Award of a barograph.

Captain Hollingdale is a Member of the Honourable Company of Master Mariners.

We wish him health and happiness in his retirement to Cornwall.

L. B. P.

FLEET LISTS

Corrections to the list published in the July 1972 number of *The Marine Observer*.

Information regarding these corrections is required by 20th October each year. Information for the July lists is required by 20th April each year.

GREAT BRITAIN (Information dated 4.10.72)

The following coasting vessels ('Marid' ships) have been recruited:

Name of Vessel	Captain	Owner/Manager
Brian Boroime	J. Peters	British Railways Board
Lairdsfox	N. McIntyre	Burns & Laird Lines Ltd.
Moyle	N. McAskill	Shamrock Shipping Co.
Rhodri Mawr	O. W. Jones	British Railways Board
Sassaby	J. Weigman	J. Weigman Shipping Co. Ltd.

The following vessels have been deleted:
Brightling, Pentland

The following skippers and radio operators have been added to the Trawler Fleet List:

Skipper	Radio Operator	Trawler Owner/Manager
G. Baxter	F. R. Hailstones	R. Irvin & Sons Ltd.
A. Brayshaw	A. Barrow	T. Hamling & Co. Ltd.
P. Crane	A. S. Wittlin	British United Trawlers Ltd.
C. Dunne	E. D'Constantine	Newington Trawlers Ltd.
P. Fenty	A. S. Wittlin	Northern Trawlers Ltd.
R. Ford	H. Bryan	Henriksen & Co. Ltd.
J. Gibson	K. H. Massey	T. Hamling & Co. Ltd.
J. Gordon	A. S. Wittlin	British United Trawlers Ltd.
W. Gouldson	K. H. Massey	T. Hamling & Co. Ltd.
P. Grayburn	D. D. Brickwood	Firth Steam Trawling Co. Ltd.
M. F. Hough	R. T. Murphy	T. Hamling & Co. Ltd.
J. W. Humphrey	T. P. Barrett	T. Hamling & Co. Ltd.
A. Iggleden	D. A. J. Johnson	Firth Steam Trawling Co. Ltd.
A. Jagger	D. D. Brickwood	T. Hamling & Co. Ltd.
G. Kent	H. C. L. Taylor	Boyd Line Ltd.
J. R. Nelson		T. Hamling & Co. Ltd.
D. Platten	P. M. Denehy	T. Hamling & Co. Ltd.
J. Pluck	P. R. Hickson	Northern Trawlers Ltd.
J. Pratten	A. S. Wittlin	Goweroak Ltd.
T. Sawyers	A. Barrow	T. Hamling & Co. Ltd.
J. Waisham		T. Hamling & Co. Ltd.

GREAT BRITAIN (*contd.*)

The following ships have been recruited as Selected Ships:

Name of Vessel	Date of Recruitment	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Asiafreighter	21.7.72	G. E. Mayne	H. Holmes, J. Liddle, J. McEwan	S. Musgrave	J. & J. Denholm Ltd.
*Bendoran**	24.5.72	R. Griffiths	J. N. Macnish, A. S. Green, T. V. Roberts	W. J. Campbell	Ben Line Steamers Ltd.
British Liberty	11.9.72	M. D. C. Michaels	A. R. Duggin, P. Hillier, D. Wallace	P. J. Trant	B.P. Tanker Co. Ltd.
British Maple	28.8.72	R. D. Othick	J. G. Worthington, P. Edwards, N. Strickland	D. Wilson	B.P. Tanker Co. Ltd.
Cardigan Bay	4.10.72	C. S. Mackinnon	T. Jackson, D. H. Atkin, D. MacAffrey	M. R. Palmer	Ocean Fleets Ltd.
Chelsea Bridge	4.5.72	K. Turner	J. D. Cameron, M. Jordan, D. S. Fuller	E. Goggin	J. & J. Denholm Ltd.
Clan Macintosh	3.5.72	A. Graham	A. Brown, W. Runcie, R. Flemington	N. Ellis	Clan Line Steamers Ltd.
Deido	31.8.72	E. Woosey	K. F. Seerey, J. Baudains, G. D. Warren	G. Douglas	Ocean Fleets Ltd.
Ebani	5.4.72	W. Griffith	C. Lay, J. B. Summerill, D. A. Graham	M. Foulkes	Elder Dempster Lines Ltd.
Edinburgh Clipper	17.5.72	R. E. Brooks	E. L. Jones, K. W. Gordon, B. C. Lee	J. W. Rose	Whitco Marine Services
Esso Cambria	19.9.72	I. D. Smith	J. M. Paterson, F. Clayton, D. O'Leary	J. Hartshorn	Esso Petroleum Co. Ltd.
Gallic Bridge	2.9.72	D. W. Bowen	R. J. Byles, F. MacIver, J. F. Fowler	R. W. McInnes	J. & J. Denholm Ltd.
Geestland	23.5.72	P. W. Groves	A. S. Cooper, G. Gough, A. Jones	J. Conway	Geest Industries Ltd.
Herefordshire	19.6.72	P. Saunders	J. A. Corcoran, P. E. Smith, M. R. Robans	M. Reid	Bibby Line Ltd.
Kowloon Bay	2.10.72	W. F. Rockett	P. A. Brown, P. Robinson, G. Thomson	W. Lloyd	Ocean Fleets Ltd.
Liverpool Bay	22.5.72	D. H. Stewart, R.D.	J. McGregor, A. S. Jackson, J. French	W. Lloyd	Ocean Fleets Ltd.
Markhor	29.9.72	J. B. Clemenson	D. Corrie, M. Patton, R. Roberts		Cunard-Brocklebank Ltd.
Oakworth	27.6.72	K. B. Jewell	T. Kent, G. Wilson, T. O'Kelly	T. G. White	R. S. Dalgliesh Ltd.
Overseas Adventurer	23.5.72	O. Conner	R. Maymen, D. Thomas, R. Ross	J. Moss	London & Overseas Bulk Carriers
Plainsman	13.6.72	E. D. Ashdown	R. K. Domin, H. Traynor, R. Babooram	D. J. O'Brien	T. & J. Harrison Ltd.
Port Alberni City	19.9.72	G. S. Garlick	B. Hopper, T. Haxell, R. Stuart	A. S. Ferguson	Sir Wm. Reardon Smith & Sons Ltd.
Prince Rupert City	2.5.72	W. J. Cross	C. R. Goddard, R. Clifford, K. Jones	J. R. Matthews	Sir Wm. Reardon Smith & Sons Ltd.
Rockhampton Star	1.6.72	J. Hunter	L. I. Shirkey, J. Luck, D. Bedford		Blue Star Line Ltd.
Stirling Bridge	26.6.72	D. Dickson	W. H. Jackson, B. P. Harvey, P. Kelvington	C. York	J. & J. Denholm Ltd.
Sydney Bridge	7.9.72	J. Hoffman	D. Pearce, J. Lewis, L. Boxwell	O. Ismail	Bowring S.S. Co. Ltd.
Tacoma City	6.4.72	T. W. D. John	A. A. McCalmont, N. P. Epps, D. B. Wootton	F. G. Taylor	Sir Wm. Reardon Smith & Sons Ltd.
Thorpe Grange	6.9.72	W. Lewis	F. Chmiel, J. Smith, J. Exley		Houlder Bros. & Co. Ltd.
Tokyo Bay	10.4.72	S. R. Arnold	P. A. Brown, A. J. Palmer, A. M. White	P. M. Dolphin	Ocean Fleets Ltd.
Troll Park	13.7.72	H. MacDonald	T. H. Withers, T. Sutherland, G. Shepherd		J. & J. Denholm Ltd.
Ulster Star	18.7.72	A. H. White	A. R. P. Geels, P. Daniel, A. Orford		Blue Star Line Ltd.
Vancouver Island	29.3.72	T. H. Turner	D. Murray, R. Montgomery, B. Davies		J. & J. Denholm Ltd.

The following ships have been recruited as Supplementary Ships:

British Fern	9.8.72	G. S. Willis	E. J. Turner	P. J. Abdey	B.P. Tanker Co. Ltd.
British Swift	25.8.72	P. J. Burleigh	W. Hopkins	P. B. Bradley	B.P. Tanker Co. Ltd.
Garrybank	22.6.72	W. W. Davies	A. Roberts		Bank Line Ltd.
Roybank	11.5.72	J. A. Appleby	A. Giles	J. H. Hutchinson	Bank Line Ltd.
Serenity	10.8.72	H. Roberts	T. Brunagh		F. T. Everard & Sons Ltd.

It is regretted that the following Selected Ships were omitted from the July 1972 Fleet List:

Baron Ardrossan	26.8.71	J. Hetherington	D. Houston, A. MacLeod, C. G. Stephenson	G. Walker	Scottish Ship Management Ltd.
Mahout	22.11.71†	D. Pritchard	I. D. Trantor, S. A. Evans, D. J. Hampson	R. F. Davies	Cunard-Brocklebank Ltd.

The following Selected and Supplementary Ships have been deleted:

Afghanistan, Argentina Star, Astyanax, Baltistan, Beaverfir, Benarmin, Bendoran, Benhope, Benkitlan, Benledi, Benmacdhui, Benvalla, Brasil Star, British Hero, British Merlin, British Sailor, Camellia, Camito, Carrigan Head, Chakdara, City of Bedford, City of Karachi, Clytoneus, Dorset, Elizabeth Bowater, Governor, Halifax City, Hector, Helenus, Howra, King Alexander, King Arthur, King Malcolm, Macharda, Mahronda, Melbourne Star, Northumberland, Oropesa, Oroya, Pando Sound, Pando Strait, Patroclus, Peleus, Pizarro, Port Adelaide, Port Burnie, Port Lyttelton, Port Nelson, Port Pirie, Port Sydney, Port Townsville, Pyrrhus, Ribblehead, Rowanmore, Salmela, Shropshire, Silverbeach, Silversea, Suevic, Trinculo.

* Upgraded from Supplementary to Selected.
† Date of last return.

BRITISH COMMONWEALTH

INDIA (Information dated 4.10.72)

(This complete list was not available for the July 1972 number)

Name of Vessel	Owner/Manager
Selected Ships:	
Andamans	Shipping Corporation of India Ltd.
Dumra	British India S.N. Co. Ltd.
Dwarka	British India S.N. Co. Ltd.
Indian Reliance	India S.S. Co. Ltd.
Indian Renown	India S.S. Co. Ltd.
Indian Security	India S.S. Co. Ltd.
Indian Success	India S.S. Co. Ltd.
Jag Kisan	Great Eastern Shipping Co. Ltd.
Jaladhanya	Scindia S.N. Co. Ltd.
Jaladharma	Scindia S.N. Co. Ltd.
Jaladuhita	Scindia S.N. Co. Ltd.
Jaladhruv	Scindia S.N. Co. Ltd.
Jalaganga	Scindia S.N. Co. Ltd.
Jalagouri	Scindia S.N. Co. Ltd.
Jalajawahar	Scindia S.N. Co. Ltd.
Jalakrishna	Scindia S.N. Co. Ltd.
Jalapalak	Scindia S.N. Co. Ltd.
Jalavikram	Scindia S.N. Co. Ltd.
Jalazad	Scindia S.N. Co. Ltd.
Karanja	British India S.N. Co. Ltd.
Lok Sevak	Mogul Line Ltd.
Maharaja	South East Asia Shipping Co. Ltd.
Mahavikram	South East Asia Shipping Co. Ltd.
Mohemmedi	Mogul Line Ltd.
Mozaffari	Mogul Line Ltd.
Nicobar	Shipping Corporation of India Ltd.
Rajula	British India S.N. Co. Ltd.
Saudi	Mogul Line Ltd.
State of Assam	Shipping Corporation of India Ltd.
State of Bihar	Shipping Corporation of India Ltd.
State of Gujarat	Shipping Corporation of India Ltd.
State of Haryana	Shipping Corporation of India Ltd.
State of Kutch	Shipping Corporation of India Ltd.
State of Madras	Shipping Corporation of India Ltd.
State of Maharashtra	Shipping Corporation of India Ltd.
State of Orissa	Shipping Corporation of India Ltd.
State of Tr. Cochin	Shipping Corporation of India Ltd.
State of Uttar Pradesh	Shipping Corporation of India Ltd.
Vishva Maya	Shipping Corporation of India Ltd.
Vishva Prabha	Shipping Corporation of India Ltd.
Vishva Sudha	Shipping Corporation of India Ltd.
Supplementary Ships:	
Akabar	Mogul Line Ltd.
Akash Maru	New India Fisheries
Apj Akash	Apeejay Line Ltd.
Apj Ambika	Apeejay Line Ltd.
Apj Anjli	Apeejay Line Ltd.
Apj Sushma	Apeejay Line Ltd.
Bailadila	Shipping Corporation of India Ltd.
Bande Nawaz	Hind Agencies Ltd.
Barouni	Shipping Corporation of India Ltd.
Bellary	Shipping Corporation of India Ltd.
Bhaskar Jayanti	Jayanti Shipping Co. Ltd.
Chanakya Jayanti	Jayanti Shipping Co. Ltd.
Cosmos Pioneer	Cosmosteels Private Ltd.
Damodar Zuari	Damodar Bulk Carriers Ltd.
Desh Bandhu	Shipping Corporation of India Ltd.
Gandhi Jayanti	Jayanti Shipping Co. Ltd.
Indian Industry	India S.S. Co. Ltd.
Indian Resolve	India S.S. Co. Ltd.
Indian Resource	India S.S. Co. Ltd.
Indian Splendour	India S.S. Co. Ltd.
Indian Strength	India S.S. Co. Ltd.
Indian Tradition	India S.S. Co. Ltd.
Indian Tribune	India S.S. Co. Ltd.
Indian Triumph	India S.S. Co. Ltd.
Indian Trust	India S.S. Co. Ltd.
Indian Valour	India S.S. Co. Ltd.
Indian Venture	India S.S. Co. Ltd.
Jag Anand	Great Eastern Shipping Co. Ltd.
Jag Anjli	Great Eastern Shipping Co. Ltd.
Jag Arti	Great Eastern Shipping Co. Ltd.
Jag Asha	Great Eastern Shipping Co. Ltd.
Jag Jawan	Great Eastern Shipping Co. Ltd.
Jag Jwala	Great Eastern Shipping Co. Ltd.
Jag Jyoti	Great Eastern Shipping Co. Ltd.
Jag Laxmi	Great Eastern Shipping Co. Ltd.
Jag Manek	Great Eastern Shipping Co. Ltd.
Jag Ratna	Great Eastern Shipping Co. Ltd.
Jag Ravi	Great Eastern Shipping Co. Ltd.
Jag Rekha	Great Eastern Shipping Co. Ltd.

Name of Vessel	Owner/Manager
Jag Shanti	Great Eastern Shipping Co. Ltd.
Jag Vijay	Great Eastern Shipping Co. Ltd.
Jagat Neta	Dempo S.S. Ltd.
Jagat Swamini	Dempo S.S. Ltd.
Jaladharati	Scindia S.N. Co. Ltd.
Jaladhir	Scindia S.N. Co. Ltd.
Jaladurga	Scindia S.N. Co. Ltd.
Jaladuta	Scindia S.N. Co. Ltd.
Jalagirija	Scindia S.N. Co. Ltd.
Jalagomati	Scindia S.N. Co. Ltd.
Jalagopal	Scindia S.N. Co. Ltd.
Jalajyoti	Scindia S.N. Co. Ltd.
Jalakala	Scindia S.N. Co. Ltd.
Jalakanta	Scindia S.N. Co. Ltd.
Jalakendra	Scindia S.N. Co. Ltd.
Jalakirti	Scindia S.N. Co. Ltd.
Jalamangal	Scindia S.N. Co. Ltd.
Jalamani	Scindia S.N. Co. Ltd.
Jalamatsya	Scindia S.N. Co. Ltd.
Jalamayur	Scindia S.N. Co. Ltd.
Jalamohan	Scindia S.N. Co. Ltd.
Jalamorari	Scindia S.N. Co. Ltd.
Jalamoti	Scindia S.N. Co. Ltd.
Jalapankhi	Scindia S.N. Co. Ltd.
Jalarajan	Scindia S.N. Co. Ltd.
Jalarashmi	Scindia S.N. Co. Ltd.
Jalaratna	Scindia S.N. Co. Ltd.
Jalatarang	Scindia S.N. Co. Ltd.
Jalaveera	Scindia S.N. Co. Ltd.
Jalavijay	Scindia S.N. Co. Ltd.
Jalavishnu	Scindia S.N. Co. Ltd.
Jalayamuna	Scindia S.N. Co. Ltd.
Jawaharlal Nehru	Shipping Corporation of India Ltd.
Krishna Jayanti	Jayanti Shipping Co. Ltd.
Mahabharat	South East Asia Shipping Co. Ltd.
Onge	Shipping Corporation of India Ltd.
Rama Jayanti	Jayanti Shipping Co. Ltd.
Ratna Chandra Lekha	Ratnakar Shipping Co. Ltd.
Ratna Manjushree	Ratnakar Shipping Co. Ltd.
Ratna Usha	Ratnakar Shipping Co. Ltd.
Red Snapper	Central Institute of Fisheries Operatives
Sagar Sudha	Africana Shipping Co. Ltd.
Shompen	Shipping Corporation of India Ltd.
State of Andhra	Shipping Corporation of India Ltd.
State of Kerala	Shipping Corporation of India Ltd.
State of Madhya Pradesh	Shipping Corporation of India Ltd.
State of Mysore	Shipping Corporation of India Ltd.
State of Punjab	Shipping Corporation of India Ltd.
State of Rajasthan	Shipping Corporation of India Ltd.
State of West Bengal	Shipping Corporation of India Ltd.
Varuna Kanchan	Thakur S.S. Co. Ltd.
Vishva Bhakti	Shipping Corporation of India Ltd.
Vishva Bindu	Shipping Corporation of India Ltd.
Vishva Chetana	Shipping Corporation of India Ltd.
Vishva Dharma	Shipping Corporation of India Ltd.
Vishva Jyoti	Shipping Corporation of India Ltd.
Vishva Kalyan	Shipping Corporation of India Ltd.
Vishva Kanti	Shipping Corporation of India Ltd.
Vishva Kaushal	Shipping Corporation of India Ltd.
Vishva Kirti	Shipping Corporation of India Ltd.
Vishva Kusum	Shipping Corporation of India Ltd.
Vishva Mahima	Shipping Corporation of India Ltd.
Vishva Mangal	Shipping Corporation of India Ltd.
Vishva Marg	Shipping Corporation of India Ltd.
Vishva Nayak	Shipping Corporation of India Ltd.
Vishva Nidhi	Shipping Corporation of India Ltd.
Vishva Pratap	Shipping Corporation of India Ltd.
Vishva Raksha	Shipping Corporation of India Ltd.
Vishva Sandesh	Shipping Corporation of India Ltd.
Vishva Seva	Shipping Corporation of India Ltd.
Vishva Shakti	Shipping Corporation of India Ltd.
Vishva Shobha	Shipping Corporation of India Ltd.
Vishva Siddhi	Shipping Corporation of India Ltd.
Vishva Suman	Shipping Corporation of India Ltd.
Vishva Tej	Shipping Corporation of India Ltd.
Vishva Tilak	Shipping Corporation of India Ltd.
Vishva Tirth	Shipping Corporation of India Ltd.
Vishva Usha	Shipping Corporation of India Ltd.
Vishva Vandana	Shipping Corporation of India Ltd.
Vishva Vibhuti	Shipping Corporation of India Ltd.
Vishva Vijay	Shipping Corporation of India Ltd.
Vishva Vikas	Shipping Corporation of India Ltd.
Vishva Vinay	Shipping Corporation of India Ltd.
Vishva Vir	Shipping Corporation of India Ltd.
Vishva Vivek	Shipping Corporation of India Ltd.

Auxiliary Ships: India has 25 Auxiliary Ships.

AUSTRALIA (Information dated 27.9.72)

The following have been recruited as Selected Ships:

Australian Enterprise (Australia National Line)
Esso Gippsland (Esso Standard Oil (Australia) Ltd.)
Koolama (Western Australian Coastal Shipping Commission)
Kooringa (Associated S.S. Pty. Ltd.)
Salamaua (Karlander New Guinea Line Ltd.)
Sariba (Karlander New Guinea Line Ltd.)

The following have been recruited as Supplementary Ships:

Ataluma (Department of National Development)
Lady Christine (Department of National Development)

The following ships have been deleted:

Dongara, Halifax Star, Hobart Star, Iron Cavalier, Port Albany, Port Huon, Port Melbourne, Port Montreal, Port New Plymouth, Rona, Sletholm, Taiyuan, Tanda.

HONG KONG (Information dated 11.9.72)

The following ships have been recruited:

Hoi Kung (Karsten Larssen & Co. (H.K.) Ltd.)
Hoi Wong (Karsten Larssen & Co. (H.K.) Ltd.)
Patagonia Argentina (Everett S.S. Corporation S/A)

The following ships have been deleted:

Eastern Cape, Eastern Cliff, Eastern Trader, Nyanza, Pando Gulf.

NEW ZEALAND (Information dated 14.9.72)

The following has been upgraded to a Selected Ship:

Hawea (Union S.S. Co. N.Z. Ltd.)

The following have been recruited as Selected Ships:

Act 5 (Blue Star Port Line Ltd.)
Lorena (Cook Island Shipping Co.)
Luhesand (Cook Island Shipping Co.)
Union New Zealand (Maritime Carriers Ltd.)
Zaida (P. & O. (N.Z.) Co.)

The following ships have been deleted:

Aotearoa, Kaitoa, Karamu, Kawaroa, Waimate.

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