

Met.O. 777

The Marine Observer

*A quarterly journal of Maritime
Meteorology*



Volume XXXVI No. 211

January 1966

PRICE 6s. 6d. NET

ROUTEING CHARTS

Charts have been published under the superintendence of the Hydrographer of the Navy for each month for both the North and South Atlantic. Information on the main charts includes steamship routes and distances, Load Line zones, wind roses, current arrows, ice information and areas where discharge of persistent oils by United Kingdom registered ships is prohibited. There are insets giving mean temperatures (air, sea and dew-point), mean pressure, frequency of low visibility and fog, frequency of winds of Force 7 or higher and the number of hurricanes reported in that month.

The Routeing Charts cost 10s. each, are published by the Hydrographic Department and are obtainable from any Naval Chart Agent.

Cloud Types for Observers

This publication has been designed to provide the weather observer with a small album on stout paper which he can take out of doors with him to identify cloud types. Pictorial guides and coding instructions, as drawn up by the World Meteorological Organization, have also been included to enable him to classify the sky in accordance with W.M.O. codes.

The former publications *Cloud Forms* and *Cloud Card for Observers* are now obsolete.

(M.O. 716)

9½ in. × 7¼ in 30 pp. 10s. 6d. (post 8d.)

OBTAINABLE FROM—

H M S O

OR THROUGH ANY BOOKSELLER

THE MARINE OBSERVER

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

Vol. XXXVI

1966

THE MARINE OBSERVER

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

VOL. XXXVI

No. 211

JANUARY 1966

TABLE OF PRINCIPAL CONTENTS

	<i>Page</i>
Farewell Message from Sir Graham Sutton	4
Editorial	4
Retirement of Sir Graham Sutton, C.B.E., F.R.S.	7
The New Director-General of the Meteorological Office	8
The Marine Observers' Log—January, February, March	9
Marine Bioluminescence. BY R. TURNER	20
The Yachtsman and the Shipping Forecast Broadcast by the BBC. BY GROUP-CAPT. E. F. HAYLOCK	29
The Visit of the Russian Oceanographic Research Ship "Nikolay Zubov" to the Thames	33
Notes on Ice Conditions in Areas Adjacent to the North Atlantic Ocean—July to September 1965	34
Australian Excellence Awards	37
Book Reviews:	
<i>The Physical Geography of the Oceans</i>	37
<i>Physics of the Marine Atmosphere</i>	39
Personalities	40
Notices to Marine Observers	42
Fleet Lists	45

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

Published for the Meteorological Office by
HER MAJESTY'S STATIONERY OFFICE

© Crown copyright 1966

To be purchased direct from H.M. Stationery Office, at any of the following addresses: 49 High Holborn, LONDON, W.C.1; 423 Oxford Street, LONDON, W.1; 13a Castle Street, EDINBURGH, 2; 109 St. Mary Street, CARDIFF; Brazennose Street, MANCHESTER, 2; 50 Fairfax Street, BRISTOL, 1; 35 Smallbrook, Ringway, BIRMINGHAM, 5; 80 Chichester Street, BELFAST, 1, or from any bookseller.

PRICE 6s. 6d. NET or £1 7s. 8d. per annum (including postage)

FAREWELL MESSAGE FROM SIR GRAHAM SUTTON

On my retirement from the Meteorological Office I would like to send to all concerned with observing the weather at sea my sincere thanks for their unfailing collaboration during my period of office. The reports we receive are now, more than ever before, essential for our work. Without them we could not maintain, let alone advance our work, and the fact that their production often entails discomfort, and sometimes danger, fills me with admiration for the work which is done on the oceans and around our shores.

The Meteorological Office was founded to assist mariners and throughout its long history there has always been the closest association with ships and the men who sail in them. I trust that this will always continue and wish every good fortune to all who take part in this work.

O. G. SUTTON

Editorial

To all readers of *The Marine Observer*, the Director-General and staff of the Meteorological Office send New Year greetings and a hope that your voyages through the seas of this coming year will be safe and pleasant.

The beginning of a new year traditionally is the time for making good resolutions. Safe and pleasant voyages depend very much upon something which we cannot control—the weather—but nowadays we can at least say what it is likely to be 24 hours or more ahead. This seems a good opportunity for meteorologists and our voluntary observers at sea, who are, *ipso facto*, so dependent upon one another, to resolve that the weather forecasts of 1966 will be more accurate than ever before. The voluntary observer's part in this plan is to make his observations carefully and regularly as he does at present and to see that each observation is transmitted by radio, even if some are transmitted several hours after the time of observation. The meteorological and communication authorities ashore, in their turn, need to ensure that coastal radio stations are alert and helpful and that every radio weather message from a ship, immediately after reception, is retransmitted to the appropriate collecting centre so that it can be speedily made available to all the meteorological authorities in the region. Thus armed with numerous up-to-date and accurate observations from that part of the ocean in which he is interested, it will be up to the forecaster to play his part.

Meteorologists always seem to be clamouring for more observations from the ocean. Up to the present, the difficulties have been not so much that there is a shortage of voluntary observing ships—except in oceanic areas where shipping is sparse—but that too many of the observations which are recorded in the logbooks are not transmitted for various reasons (due to the watch periods in 'single-operator' ships and difficulties in clearing the messages to certain coast stations) and there is evidence also that when the messages do get ashore they are not always disseminated as quickly as they should be. The accuracy of observations recorded in the logbooks is generally high but there are rather a lot of errors in the coded radio weather messages as received ashore—presumably due to a combination of copying errors, transmitting errors and receiving errors. These comments are not intended as criticisms of the radio officers in British Voluntary Observing ships; our evidence is, from a detailed study of our logbooks, that they are most helpful and conscientious in getting their messages away; we sympathise with the difficulties they sometimes have in achieving this.

The World Meteorological Organization (WMO) is making its contribution to better forecasting in 1966 by the introduction of a new plan for the collection and

dissemination of radio weather messages from ships, which is primarily intended to ease the task of the radio officer and also to ensure that all such messages, immediately they reach the shore, are disseminated for the benefit of all concerned. The plan specifically recognizes that the efficient transmission of ships' radio weather messages to shore "depends very much upon the goodwill and enthusiasm of radio officers aboard ship and also on the efficiency of the coastal radio stations". This plan, which was referred to in the Editorial of *The Marine Observer* in April 1965, was evolved by the Commission for Maritime Meteorology, and it is intended to be brought into force on 1st January 1966 or as soon after as possible.

The general principle of the new scheme is to give the radio officer more freedom of choice than he has at present as to the radio station to which he clears his message. Obviously, one cannot give complete freedom in this respect to ships fitted for HF transmission, for various practical reasons. For example, ship reports from the eastern North Atlantic are primarily of interest to countries in Western Europe and should preferably be transmitted to a radio station in that area, the message having the appropriate address; it wouldn't be very useful for such a message to be transmitted to (say) Buenos Aires radio station.

The map on page 6 shows that, as the first step to implementing this plan, the oceans have been divided into the six WMO Regions and each Region has been tentatively subdivided into a number of zones, each zone being related to a meteorological collecting centre (the zones may need some minor adjustment to suit Regional requirements). For obvious practical reasons the first principle is that the radio officer should endeavour to send his message to the nearest convenient radio station in the zone in which the vessel is navigating. If unable to clear the message, without delay, to any station in that zone he can send it to a station in a neighbouring zone in the same Region, or to any other radio station within that Region. In exceptional circumstances, he can send the message to a radio station in an adjoining Region and it will be the duty of the collecting centre in that Region to make sure that the message gets back to the Region in which the ship is located. A complication arises in relatively restricted areas like the Mediterranean. There, if a ship is coasting along the North African coast, she is in Region 1 and should endeavour to clear her message to a North African coast station; if unable to do that, her only sensible alternative would be to clear it to some other Mediterranean station (in Region 6). There would be little object in sending it to (say) Cape Town, merely because it is in Region 1. This kind of complication will be dealt with in the official instructions when these are issued.

An important proviso is that the message must carry the correct meteorological address appropriate to that radio station—thus a message transmitted to Portishead should be addressed "OBS Portishead" or if transmitted to Lisbon it would be addressed "METEO Lisb" and so on. It is hoped that this scheme will save radio officers from the annoyance of having to wait a long time 'queuing up' to clear their message to a particular radio station with the consequent delay in getting the message to the meteorologist. On the map, the place names appearing in each zone are the 'collecting centres' to which the messages are retransmitted immediately on receipt ashore and it is the responsibility of those centres to make sure that all meteorological services in the Region get all ship messages *without delay*. Details of this plan are given in the extract from the relevant WMO Resolution on page 43. It will be noted that coastal radio stations will, in future, only be listed by the WMO and in national maritime publications as stations for the reception of ships radio weather messages if they undertake to comply with certain minimum requirements as to the watch that they keep and give an assurance that they will deal promptly with ships' weather messages and disseminate them all without delay. Radio officers are requested to give details either by letter or in the "Additional Remarks" pages of the meteorological logbook of any occasion when there is difficulty in clearing their messages to coastal radio stations so that it can be thoroughly investigated.

One of the advantageous results of this scheme is that the more alert and efficient

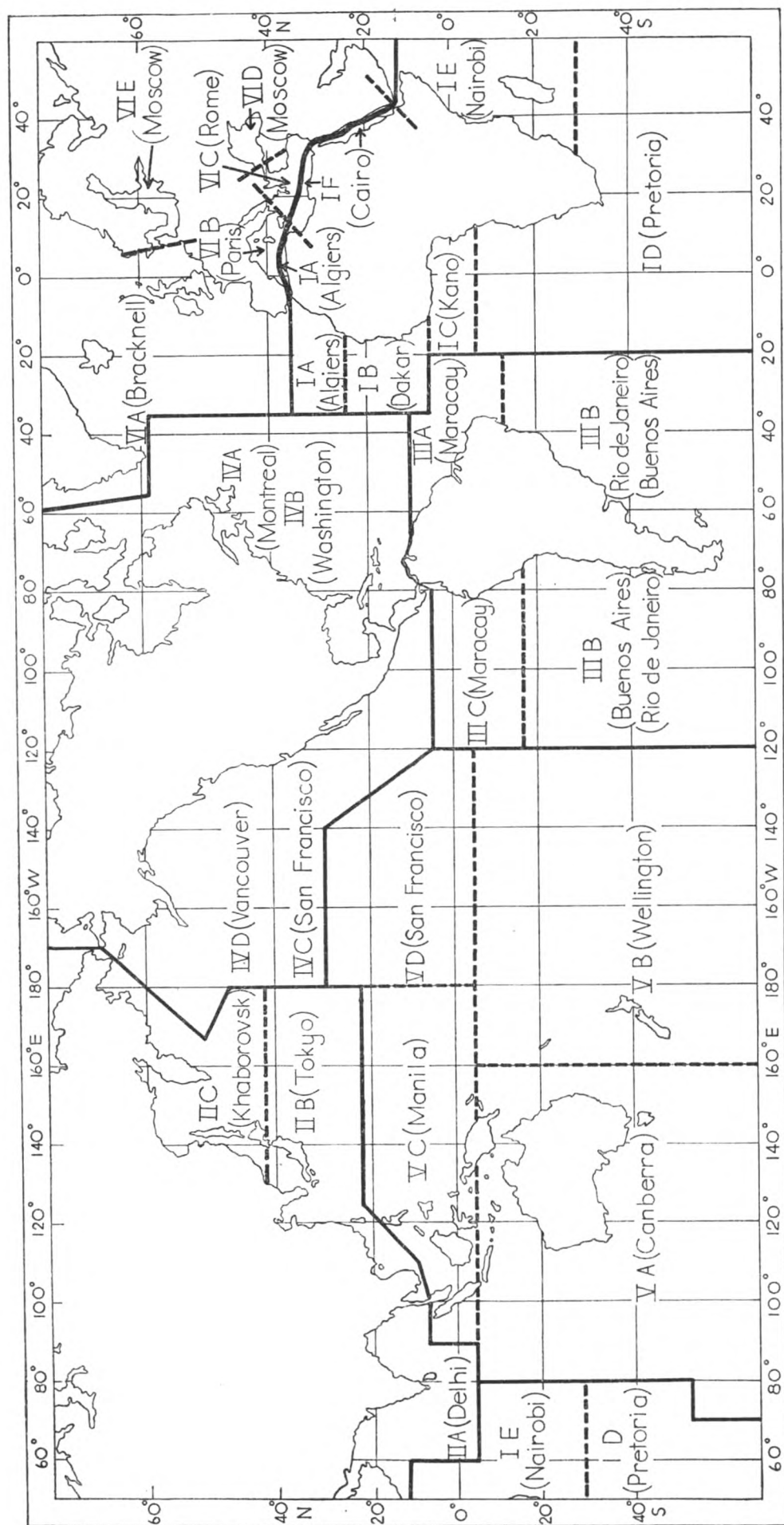


Fig. 1. Broad outline of zones for the collection and dissemination of ships' reports
 The names shown in the map are those of the meteorological centres for dissemination (re-broadcast) of the messages. Until otherwise notified, any of the stations listed in the *Marine Observer's Guide*, Part IV, or *Admiralty List of Radio Signals*, Vol. III, can be used in this scheme.

a radio station is, the more messages it will receive, because radio officers will no longer need to waste time trying to clear messages to 'sleepy' radio stations.

The WMO is also introducing, as from January 1966, a scheme to facilitate transmission of the maximum number of radio weather messages during the radio officer's watch in 'single-operator' ships. In view of the importance of radio weather messages for safety at sea, an international study was made by a technical working group about the possibility of changing certain of the radio watch hours aboard ship in order to coincide with the standard times of meteorological observations. This was found to be quite impracticable and the new WMO plan seeks to overcome this difficulty by making some adjustments to the time at which an observation can be made so that it can be transmitted before the radio officer goes off watch. For example, the 0600 observation can, if necessary, be made at 0500 GMT if this ensures its transmission before the radio officer goes off watch at (say) 0600. Any observation made at the standard times of 0000, 0600, 1200 and 1800 GMT can, if necessary, be transmitted up to 4 hours after the time of observation if this arrangement fits in with the radio officer's watch. Details of this scheme are given on page 44.

As a result of these two new schemes, it is hoped that it will only be on very rare occasions—e.g. when radio propagation conditions are exceptionally bad—that any meteorological observations made aboard ship will fail to be transmitted to some coastal station or other.

The Technical Regulations of the WMO specify that when ships' radio weather messages get ashore they *shall* be speedily retransmitted to a collecting centre and then immediately disseminated to all countries of the Region.

Maybe some of the British Voluntary Observing ships will be able to bring this new procedure into force on 1st January 1966. At the time of writing this Editorial, detailed official instructions are being prepared but the sub-division of the zones on the map has not yet been notified by the WMO and there are certain other minor details to be settled. It is intended that instructions will be issued before January, but it will obviously be some months before all ships get them. It is hoped that the ships which have not received detailed instructions will be guided by this Editorial and by information given on pages 43 and 44 of this edition of *The Marine Observer*.

C. E. N. F.

RETIREMENT OF SIR GRAHAM SUTTON, C.B.E., F.R.S.

Carved in stone on a wall in the entrance hall to the Meteorological Office at Bracknell is the following inscription:

HEADS OF THE METEOROLOGICAL OFFICE

Superintendent of the Meteorological Department of the Board of Trade	
Vice-Admiral R. FitzRoy, C.B., F.R.S.	1855-1865
Director of the Meteorological Office	
R. H. Scott, Esq, F.R.S.	1867-1877
Secretaries of the Meteorological Council	
R. H. Scott, Esq, F.R.S.	1877-1900
W. N. Shaw, Esq, F.R.S.	1900-1905
Directors of the Meteorological Office	
Sir Napier Shaw, F.R.S.	1905-1918
Colonel H. G. Lyons, F.R.S.	1918-1919
Sir Napier Shaw, F.R.S.	1919-1920
Sir George Simpson, K.C.B., C.B.E., F.R.S.	1920-1938
Sir Nelson Johnson, K.C.B.	1938-1953
Sir Graham Sutton, C.B.E., F.R.S.	1953-1957
Directors-General of the Meteorological Office	
Sir Graham Sutton, C.B.E., F.R.S.	1957-

On 30th September 1965, after 12 years as Head of the Meteorological Office, Sir Graham Sutton retired. The blank opposite his name on the above list can thus be filled in.

Born at Cwmcarn, Monmouthshire, his early schooling was at Pontywaun Grammar School and he was a graduate of the University College of Wales, Aberystwyth, and Oxford University. It was in 1928 that he first joined the Meteorological Office as a Professional Assistant—his first appointment being at the Artillery Ranges, Shoeburyness. From 1929 to 1943, like his predecessor Sir Nelson Johnson, he was working at Porton on the meteorological aspect of chemical warfare; he then left the Meteorological Office and was appointed Superintendent of Tank Armament Research. In 1945 he transferred to the Radar Research and Development Establishment as its Chief Superintendent and in 1947 he was appointed Dean and Bashforth Professor of Mathematical Physics at the Royal Military College of Science at Shrivenham. He had, by this time, gained a world reputation as an expert in the dynamics and micrometeorology of the lower atmosphere. In 1949 he was elected a Fellow of the Royal Society and was awarded the C.B.E. in 1950.

Before his return to the Meteorological Office as its Director in 1953, as Dr. O. G. Sutton, he had already represented the Royal Meteorological Society on the Meteorological Committee and was a member of the Meteorological Research Committee. In 1955 he was honoured with a knighthood. In 1957, as a result of some reorganisation of the Meteorological Office, the title of Director was changed to Director-General.

Under Sir Graham's energetic direction, the Meteorological Office Headquarters became housed for the first time in one building; the first electronic computer was installed, primarily for research purposes but also for forecasting; more effort was devoted to the provision of meteorological information for users other than aviation; and such public services as the Weather Centres at London, Manchester, Southampton and Glasgow were established.

During his term of office, Sir Graham was always very appreciative of the value of the observations provided by British Voluntary Observing Ships and he showed great interest in their work and in the activities of the Weather Ships. Whenever possible he personally presented the Long-service Awards to shipmasters of the Voluntary Observing Fleet. At an International Weather Ship Conference at Paris in 1954, he showed much skill as a negotiator when the Conference ran into difficulties.

Sir Graham was very active in the work of the World Meteorological Organization, being a member of its Executive Committee from 1953 to 1965; membership of this Committee is on a personal basis and his long term of office gives some indication of his international reputation. He is also a Justice of the Peace. Despite all these activities, Sir Graham has found time to write many books, including *The Science of Flight*; *Understanding Weather* and *The Challenge of the Atmosphere*.

Although retired from the Meteorological Office, Sir Graham is continuing in part-time national work as Chairman of the newly-formed Natural Environment Research Council, which is responsible for co-ordinating our national activities in the realm of geology, oceanography, forestry and nature conservancy. Sir Graham, as Director-General, was always very approachable and was always willing to give advice if asked; he never interfered, but left one to get on with the job.

We wish him success and happiness in his new appointment (which sounds as though it will be a busy one) and in his eventual retirement.

C. E. N. F.

THE NEW DIRECTOR-GENERAL OF THE METEOROLOGICAL OFFICE

Dr. B. J. Mason, F.R.S., succeeded Sir Graham Sutton as Director-General of the Meteorological Office on 1st October 1965.

Dr. Mason was born in Norfolk and received his early schooling at Fakenham Grammar School. During the war he served as an officer in the Radar Branch of the Royal Air Force and in 1947 graduated at Nottingham University with first class



Photograph by Walter Bird, F.I.B.P., F.R.P.S.

Sir Graham Sutton, C.B.E., F.R.S., Director-General (1953-65) (see page 7)

(Opposite page 9)



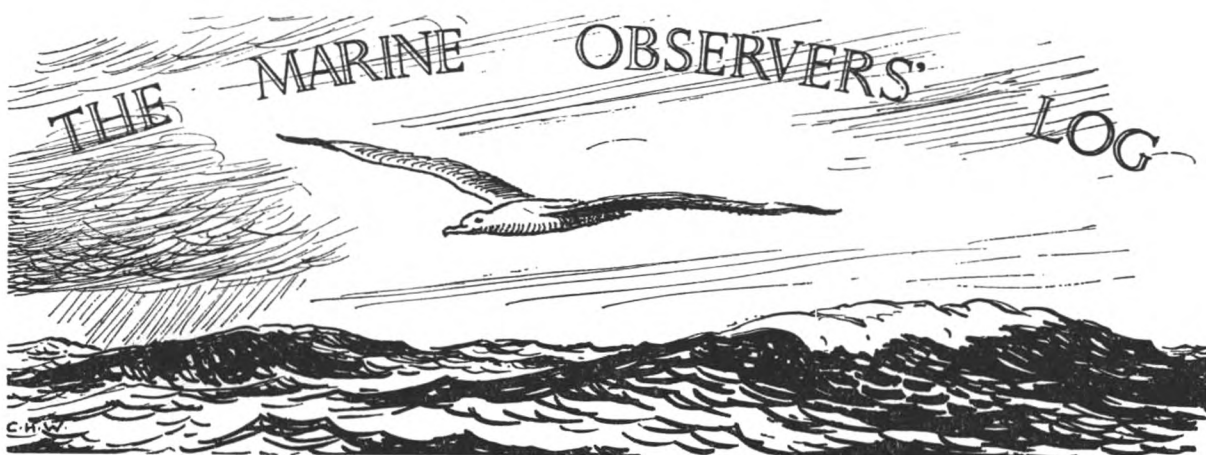
Photograph by Bassane & Vandyk Studios

Dr. B. J. Mason, F.R.S., the new Director-General (*see page 8*)

honours in physics. In 1948 he joined the Department of Meteorology at the Imperial College of Science and Technology, University of London, where he specialized in the study of microphysical processes in clouds. His book, *The Physics of Clouds*, was published in 1957 and the same year he was appointed a Warren Research Fellow of the Royal Society; in 1960 he was appointed to the newly-created Chair of Cloud Physics at Imperial College. Soon after this he evolved a novel theory of thunderstorm formation, which is regarded by many as the best yet produced in this difficult subject. In 1965 he was elected a Fellow of the Royal Society, at the early age of 41.

Although Dr. Mason has not previously served in the Meteorological Office, he is well known to many of the staff and he has served for many years on the Meteorological Research Committee which has made him familiar with many of the problems of the Office.

C. E. N. F.



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.

It sometimes happens that we are unable to offer an explanation for phenomena reported. In such cases we shall be very glad to hear from any reader who can put forward an authoritative or a possible explanation, which could be published in this journal. We should also be glad to hear from any reader who has witnessed a similar phenomenon in the past, but which has not previously been communicated to us.

RAPID BAROMETRIC CHANGES

Azores

m.v. *Rangitoto*. Captain L. W. Fulcher. London to Curaçao.

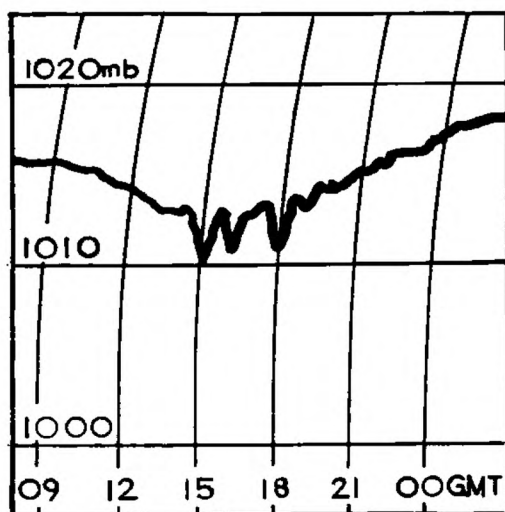
14th March 1965. While passing through the Azores, the rather large and rapid fluctuations in pressure shown in the accompanying diagram were experienced. The three large dips occurred at the following times and positions:

1700 GMT–1500 SMT; approaching Ilha Terceira ($38^{\circ}45'N$, $26^{\circ}43'W$)

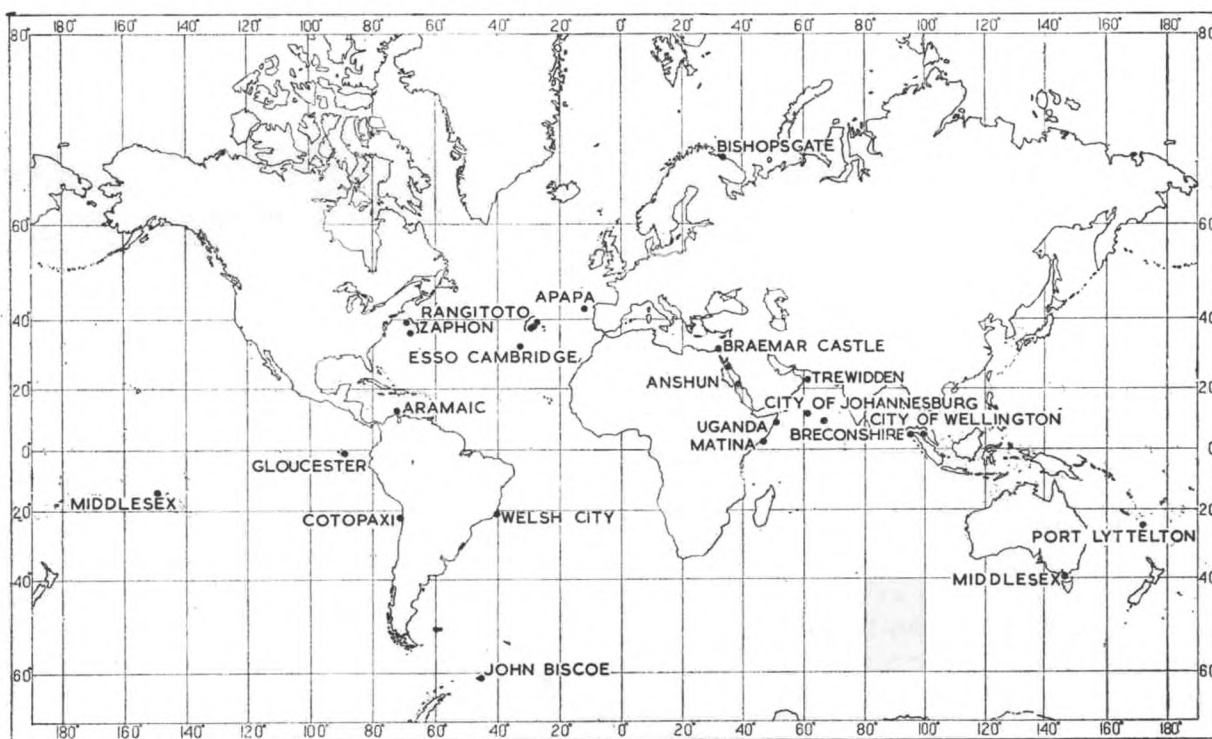
1830 GMT–1630 SMT; rounding Pta Das Contendas ($38^{\circ}36'N$, $27^{\circ}07'W$)

2000 GMT–1800 SMT; passing Sao Jorge to starboard ($38^{\circ}30'N$, $27^{\circ}37'W$).

Note. The synoptic chart for 1800 GMT on the 14th March shows that the warm sector of a



depression lay over the Azores and the adjacent area, the cold front of the system being some 180 n. miles to the w'ward. In the Azores area the wind was strong and coming from sw-ssw. The large fluctuations in pressure experienced appear to be due to the obstruction offered to the air flow by the large mass of the Island of Terceira. It is 3435 ft high and steep on the southern side, thus probably allowing some "piling up" of the air on the windward side, an unstable condition which would at intervals collapse. Turbulence and funnelling due to the nature of the terrain no doubt also played a significant part.



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

LARGE HAILSTONES

Eastern Mediterranean

s.s. *Braemar Castle*. Captain R. H. Pape. Genoa to Port Said. Observers, the Master, Mr. A. Sillars, Chief Officer and Mr. G. H. Draysey, Junior 2nd Officer.

31st March 1965, 1100-1300 GMT. A line of Cb cloud extending NE'wards over the sea gave heavy precipitation on the coast. At the ship there was also thunder and lightning accompanied by hail, some stones being $1\frac{1}{4}$ in across, with well-marked layers of clear ice and opaque ice crystals. The sea temp. was 62°F, but the air temp.

fell from 68° to 58°F and the wet bulb from 59° to 53°F. Wind light and variable.
Position of ship: off Damietta Point.

Note. At 1200 GMT a trough of low pressure covered the Eastern Mediterranean and thunderstorms and showers were reported off the Nile Delta at about that time. The well-defined layers of opaque and clear ice, combined with the unusually large size of the hailstones are an indication of the very severe turbulence in the Cb cloud in the area. The thundery activity was probably intensified by convergence in the trough.

SEA SMOKE

North Atlantic Ocean

s.s. *Zaphon*. Captain G. A. Nelson. Portland (Maine) to Puerto Miranda.

20th February 1965. Between 0800 and 1800 GMT when the vessel was steaming on a s'ly course, extensive areas of sea smoke were encountered, combined with gale force NNW winds and driving snow. The visibility was frequently reduced to less than 200 yd. At 0800, the air temp. was 28°F and the sea 62°. By 1200, the air was 34° and the sea 52°. At 1800, the air had risen to 41° and the sea to 63°. Throughout the period the barometer rose steadily from 1004 to 1012 mb.

Position of ship at 0800: 39° 00'N, 69° 00'W.

„ „ „ „ 1800: 36° 10'N, 68° 40'W.

Note. Throughout the day a rapidly deepening depression, which was located at 0600 GMT at about lat. 41°N, long. 55°W, moved NNE'wards towards Newfoundland. The vessel was in the very cold, gale force, NNW'ly winds associated with the disturbance. The sea smoke was caused by the very cold air becoming rapidly saturated by evaporation from the relatively warm sea surface, a process which was assisted and maintained by the strong winds.

off Murmansk

m.v. *Bishopsgate*. Captain M. H. F. Smith. At anchor. Observer, Mr. M. J. Paine, 3rd Officer.

25th February 1965. During a particularly cold night dense sea smoke about 100 ft in depth formed over the Kola Inlet. After dawn the air temp. rose slowly from the minimum value of -9°F, until by noon it reached 8°F. The sea temp. remained at about 29°F. The visibility, which was variable, improved from 50 yd to 800 yd by midday, the sea smoke then being only a few feet thick. Wind s'ly, force 1-2. A refrigerator thermometer was used to measure these low temperatures.

Note. During the night of the 25th a shallow area of relatively low pressure covered the Murmansk area, giving rise to light and rather variable winds. Although patches of ice were forming on the water, its temperature was many degrees higher than that of the overlying air, thus constituting conditions very favourable to the formation of sea smoke; the lightness of the wind favoured the development in depth.

FOG

Red Sea

m.v. *Anshun*. Captain F. Cunningham. Observers, Mr. N. R. Masterson, 3rd Officer and Mr. M. P. Robinson, 4th Officer.

6th-7th March 1965. At about 2300 GMT on the 6th the vessel ran into thick sea fog, the dry bulb, wet bulb and dew-point temperatures all being 68.0°F. The sea temp. was 79.0°. At 2350 the fog began to break-up, becoming wispy with alternate thick then clear patches. The temperatures at that time were: Dry bulb 72.9°F, wet bulb 72.1°, dew-point 70.7° and sea 78.8°. Shortly afterwards the fog cleared completely but the horizon remained hazy. The temps. at 0015 and 0035 were: Dry bulb 73.4°; wet bulb 71.6°; dew-point 69.8°.

Position of ship: 26° 40'N, 35° 20'E.

30th March. At 0500 while approaching Jeddah a bank of fog of moderate extent was observed. It drifted slowly down wind and passed over the vessel now at anchor in the outer roads: by 0615 it was about a mile down wind of the ship and seemed to be dispersing. The native pilot, a man of considerable experience, said that fog was comparatively rare at Jeddah, occurring two or three times annually. Temperatures were: Dry bulb 78.8°F; wet bulb 74.8°; dew-point 71.6°, sea 81.5°. Wind NW, force 3. Sea slight.

Position of ship: 21°28'N, 39° 09'E.

Note 1. It appears probable in both cases that air from the Red Sea had been drifted inland by a sea breeze during the afternoon and that after dark it cooled, in the cloudless conditions prevailing, to near its dew-point.

With the onset of a night breeze from off the land, the air on reaching the sea probably picked up sufficient moisture to cause fog to form. The quick dispersal of the fog was no doubt due to the warming up of the air by the rather high temperature of the sea.

Note 2. m.v. *Anshun* is on the Hong Kong Voluntary Observing Fleet List.

FOG BOW

South Orkneys

R.R.S. *John Biscoe*. Captain T. Woodfield. Surveying in S. Orkney area. Observer, Mr. A. B. D. Joubert, 3rd Officer.

21st January 1965. An almost complete halo was seen during a period of dense sea fog accompanied by bright sunshine. It enclosed the foremast and crow's nest and disappeared under the bows. Red and yellow colouration could be faintly seen, but the clearest was the whitish edging around the shadow. There were numerous icebergs in the vicinity, many hidden by the fog. Air temp. 41°F, sea 36°.

Position of ship: 60° 44'S, 45° 25'W.

Note. When dazzling rays of light originating from a source behind the observer, penetrate the fog or mist ahead of him, there is a strong probability that a fog bow will be seen. If the fog or mist is backed by a dark surface, such as the sea in the present case, the bow may sometimes assume the form of a complete circle. On very rare occasions a double fog bow has been observed.

CURRENT RIP

Indian Ocean

s.s. *Uganda*. Captain R. Baker. Aden to Mombasa. Observers, Mr. R. O. M. Wilson, 1st Officer and Mr. I. G. F. Harwood, 3rd Officer.

20th March 1965. At 1320 GMT a current rip 2 miles long and about 250 ft in width was seen running in an 060°-240° direction. The vessel swung off course to port and the speed decreased from 18½ to 17 kt. Sea temp. 80°F. Wind SE'ly, force 2. Low to moderate SE'E swell.

Position of ship: 10° 02'N, 51° 16'E.

Note. During February and March the current flowing wsw'wards across the South Arabian Sea, divides at Cape Guardafui, one branch continuing into the Gulf of Aden, while the other follows the Coast of Somalia. Considerable upwelling of cold water occurs in this region and the current rip experienced is to be attributed to the interaction between the upwelling water and the current moving ssw'wards along the coast. The sea temperature of 80°F was normal for the area in the month of March.

CURRENT RIPS

near Penang

m.v. *City of Wellington*. Captain H. Lewis. Penang to Suez. Observers, Mr. C. I. Pickering, 2nd Officer and Mr. A. I. Ghani, Cadet.

5th March 1965. At 1617 LMT when in the Strait of Malacca, nine distinct lines of what seemed to be low swell were seen running in a 130° – 310° (T) direction. They were approx. 200 ft apart. The sea was very smooth, but the surface became rippled to the south of the last of the lines. As the vessel passed through each line it swung violently to port, necessitating heavy helm correction by the auto-pilot. After passing through the last of the lines at 1623 the ship resumed her steady course (280° T) but the log speed dropped from 15.8 to 15.1 kt. The sea temp. (by bucket) of 85.6° F, before entering the rips, fell to 84.9° on leaving them. Wind mainly s'ly, force 2.

Position of ship: $5^{\circ} 38'N$, $99^{\circ} 35'E$.

Note. There is a current through the Strait of Malacca, with a maximum rate of $1\frac{1}{2}$ –2 kt, which sets towards the NW at all seasons. During the N.E. Monsoon it becomes a w'ly current to the south of the Nicobar Islands. The lines of what seemed to be low swell were probably due to interaction between this current and the Equatorial counter-current moving e'wards. The vessel would appear to have been close to the boundary between the two currents, the speed through the water dropping off when she entered the counter current.

TIDE RIPS

off N.W. Sumatra

m.v. *City of Wellington*. Captain H. Lewis. Penang to Suez. Observers, Mr. C. I. Pickering, 2nd Officer and Mr. A. I. Ghani, Cadet.

6th March 1965. While passing north of Rondo Island between 0748 and 0800 SMT, with a slight to moderate following sea and a long SW swell, the vessel encountered very broken water due it is thought to tide rips. While passing through this stretch of water which ran approx. 360° – 180° (T), the vessel took violent swings to starboard. Mr. Macleod, 3rd Engineer, said that during this period the engine revolutions increased.

A very strong tide rip was experienced in the position of the 100 fm line, and an even stronger one when the vessel clipped the edge of the 28 fm bank which has recently been inserted in Chart No. 2777. No soundings were obtained while crossing the bank. Sea temp. 83° F, remained unchanged. Wind ENE, force 3–4. Course 268° (T). Speed 17.5 kt.

Position of ship: $6^{\circ} 15'N$, $94^{\circ} 55'E$.

Note. *Admiralty Pilot* No. 44 (Malacca Strait Pilot) states that strong tide rips are experienced off the Island.

FALL OF SEA TEMPERATURE

Caribbean Sea

m.v. *Aramaic*. Captain E. E. Snaith. Curaçao to Cristobal. Observers, the Master, Mr. E. R. Snow, 2nd Officer and Mr. W. A. Anderson, 3rd Officer.

16th February 1965. At 1730 GMT the colour of the sea changed from light blue to dark green. The temp. of the light blue water was 71.9° F at 1300, while that of the green water was 70.5° . Previously the sea temp. had been fairly constant at about 78.8° .

Position of ship: $12^{\circ} 20'N$, $72^{\circ} 20'W$.

Note. The sea temperatures found are well below the normal for the time of year and may be accounted for by upwelling from the Venezuela Basin.

CHANGES OF SEA TEMPERATURE

off east coast of Brazil

m.v. *Welsh City*. Captain D. Beynon. Amsterdam to Buenos Aires. Observers, Mr. R. Stuart, 2nd Officer, and engine room staff.

14th February 1965. The sea temp. when taken for the 1200 GMT observation was 79°F, but at 1400 the engine room staff informed us that it was falling, and a reading taken showed that the temp. was then down to 70°. Another reading at 1430 gave a value of 74½°: by 1800 the temp. had risen to 76°. (All readings by insulated bucket.) At 1300 the vessel had passed from a sounding of 500 fm to one of 25 fm off Cabo de S. Tomé, so we assumed the fall of temp. to be due to upwelling. The air temp. remained constant at 80°F.

Position of ship: 20° 47'S, 40° 22'W.

Note. The vessel was in the region where the Brazil Current moving towards the ssw, meets the tail-end of the Falkland Current travelling NNE along the coast. Upwelling of cold water occurs in this area and so accounts for the variations in sea temperature.

LINE OF DEMARCATION

near Mejillones, Chile

s.s. *Cotopaxi*. Captain J. H. Allenby. Balboa to Antofagasta. Observers, Mr. M. Quirk, 2nd Officer and Mr. P. Lyons, Radio Officer.

17th February 1965. At 1930 GMT the vessel passed through a line of foam about 1 ft wide, which stretched as far as the eye could see in a N-s direction. The sea temp. fell almost immediately from 74° to 68°F and the air temp. from 70° to 68°. The wet bulb also went down from 67·5° to 66·5°. At the same time the low cloud amount decreased from 8/8 to 2/8. There was no sign of any of the bird life usually associated with the Humboldt current, but flying fish were noticed about half an hour before crossing over the line. Wind at 1800 was s'w, force 3. Low to moderate sea and swell from s'w.

Position of ship: 22° 49'S, 71° 07'W.

Note. Dr. L. H. N. Cooper, of the Marine Biological Association of the U.K. at Plymouth, comments:

"This is clearly a case of upwelling with a very sharp boundary. The great productivity of the Humboldt or Peru current requires not only nutrients but light for plants to grow. Only when the upwelling water rises to 20 fm or so below the surface can plant production start. Production of plants, of small animals which live on the plants and of larger animals which live on the smaller animals all takes time. Absence of sea birds means only that upwelling water had come up rather quickly to the surface.

"Our knowledge of these waters has come mostly from a few expeditions so we know little about seasonal changes in the Humboldt current or the effect on it of promontories sticking out like Pta Angamos and Pta Tetras. We also know very little of the bottom topography which may control the positions where upwelling may develop.

"Vessels loading or discharging at ports on this coast could add to our knowledge when on passage by making continuous measurements of depth, water and air temperatures and salinity from, say, the meridian of 73°W to the port. There is clearly much enthusiasm for this work amongst observers."

DISCOLOURED WATER

South Pacific Ocean

m.v. *Middlesex*. Captain R. E. Baker. Panama to Brisbane. Observer, Mr. P. D. H. Richards, 2nd Officer.

2nd February 1965. At 0300 GMT the vessel passed a long line of discoloured water. It was about 1½ miles long and only 20 ft wide, and lay about ½ a mile to the s of the vessel. As we approached from E'wards the normal blue of the sea changed

to a dark green and then, after about $\frac{1}{2}$ a mile, to a brilliant turquoise. Over the remaining mile, the colour reverted to the normal hue. In the turquoise area there appeared to be a sandy coloured substance under the surface of the water, but unfortunately it was not possible to obtain samples. According to the current Admiralty chart no discoloured water has previously been reported in this area. The echo sounder was in operation but no bottom was obtained at 600 fm. Air temp. 86°F , sea 81° . Wind E'ly, force 5.

Position of ship: $13^{\circ} 42'S$, $149^{\circ} 04'W$

Note. Dr. T. J. Hart, of the National Institute of Oceanography, comments:

"Probably a bloom of microscopic algae such as *Trichodesmium*, concentrated by surface currents in the neighbourhood of the southern tropical convergence. The presence of such blooms further to the NW, off New Caledonia, has been authenticated, but we have had very few samples from vast areas in the Pacific to base our guesses on."

m.v. *Port Lyttelton*. Captain A. W. Kensett. Balboa to Brisbane. Observers, the Master and Mr. B. Coldbreath, Junior 3rd Officer.

10th January 1965. The vessel passed through two areas of discoloured water, the first being about 10 square miles in size, while the second covered about 5 square miles. The discolouration was in the form of yellow brown streaks to windward, very similar to dust on the surface of the water. A sample of sea water taken was found to contain small cylindrical objects. No staining was seen on the ship's side, nor was any smell noticed. Soundings were taken on both occasions and in the second area marks were noted at 20-40 fm, 60 fm and 80 fm: there was a noticeably stronger mark at 70 fm. The vessel was definitely not in soundings at the time and it should be emphasized that the marks were very faint. Sea temp. 77°F . Wind E's, force 4. Sea slight; moderate s'ly swell.

Position of ship: $25^{\circ} 10'S$, $173^{\circ} 21'E$ to $25^{\circ} 17'S$, $172^{\circ} 53'E$.

Note 1. Mr. D. Rochford, Principal Research Scientist, Division of Fisheries & Oceanography, Commonwealth Scientific and Industrial Research Organization, Australia, comments:

"We have analysed the sample of sea water forwarded by m.v. *Port Lyttelton* and find that its salinity is 35.67‰ which is very similar to the value obtained by this Division in February 1960 at about the same position.

"Microscopic examination showed remains of planktonic algae, probably *Trichodesmium*, which is commonly found in sub-tropical waters aggregated in streaks down wind. No reason for this, except perhaps some form of convergence—divergence motion induced by the wind has been suggested."

Note 2. Dr. T. J. Hart comments:

"CSIRO comment gives all that can be said since I have not seen the sample. I would add that the scattering layers at depth were most likely due to aggregations of zooplankton or small pelagic fish, not necessarily having any direct relation to the conditions causing discoloration at the surface."

PIPE FISH

North Atlantic Ocean

s.s. *Esso Cambridge*. Captain H. W. Brice. Caripito to Immingham. Observers, Mr. A. A. Greenwood, 2nd Officer and Mr. M. Stacey, 3rd Officer.

15th February 1965. During the day numerous specimens of small, living sea creatures were captured, mainly found on a large piece of weed brought aboard in a bucket. Among them was the small thin fish shown full size in the sketch. Although



so small, it was relatively powerful.

Position of ship at 1700 GMT: $32^{\circ} 40'N$, $32^{\circ} 37'W$.

Note. Dr. P. H. Greenwood, of the Natural History Museum, comments:

"I was very interested in the neat drawing of the fish recovered from floating weed. This fish is a Pipe fish, and a member of the family fairly closely related to the Sea Horses. I cannot identify it accurately from the drawing but from its habitat I should say that it is undoubtedly *Sygnathus pelagicus*, a species which inhabits floating weed and is common in the Sargasso Sea.

"Judging from the drawing the specimen is, as it were, a pregnant male! In this species, as in most Pipe fishes the fertilized eggs are affixed on a spongy area on the male's belly, and remain there until the young fishes hatch out."

DEAD FISH

Somali coast

s.s. *Matina*. Captain G. C. Wallis, Port Said to Kisimayu. Observers, the Master and Mr. D. Brown, Radio Officer.

26th March 1965. During the morning the vessel passed through an area some 30 miles in length where the surface was littered with the bodies of dead fish: on the average one dead fish was seen every 30 ft. They all appeared to be of the same species, silver in colour, with a deep thin body, oval shaped and about 5 in long. Attempts were made to pick one up but the ship's speed of 17 kt prevented this. The water was green but clear, and fish 10 ft or more below the surface were plainly seen. There was great activity among the fish, sharks, hammerhead sharks, dolphins and dorado being observed from the bow of the ship. There were many brown spiny fish about 8 in long which expanded their bodies on our approach. They were active on the surface and no dead ones of this type were seen. A plankton sample taken showed no undue mortality. It included copepoda, pelagic snails and dinoflagellates, including some with greatly attenuated flagella. Among the plankton was a large copepod measuring 5 mm from the head to the last segment of the thorax. It was brilliantly coloured, dark Prussian blue on the back and blue underneath: it was very active and jumped a distance of 11 in from the agglutination slide under the microscope, on to the radio-room desk, after it had broken the surface tension of the water. Also in this sample were transparent creatures, which we could not identify. They were very active and powerful and were thought to be the fry of a larger species, but their caudal fins were horizontal instead of being vertical. There were no dead ones amongst them. To get this plankton sample, 50 gallons of sea water had been filtered.

The area traversed was 2 miles off shore, the water depth varying between 16 and 40 fm. Air temp. 82°F, sea 84°.

Position of ship at 0800 LMT: 3° 41'N, 47° 21'E.

Note 1. Dr. P. H. Greenwood comments:

"It is impossible to identify the silvery fish with certainty; the brown spiny fish are undoubtedly species of Puffer or Swell fish. These are in the habit of filling the stomach with water or air and thus blowing themselves up to quite a considerable extent, presumably as a defence mechanism.

"I am afraid I cannot put forward any suggestions to explain the cause of the mortality, unless it was due to some toxic substance produced by some member of the plankton. Since there was such a vast bloom of plankton the amount of toxin liberated could be quite considerable. It is undoubtedly significant that apparently only one species of fish was affected; perhaps this species was feeding on the plankton and acquired its toxin in that way."

Note 2. Mr. P. M. David, of the National Institute of Oceanography, comments:

"The two animals shown in the sketch are Chaetognaths, the larger one is almost certainly *Pterosagitta draco*, the smaller one is a species of *Sagitta*, but I could not say which species without making a microscopic examination of actual specimen.

The large blue copepod mentioned is very probably *Pontella securifer*, which is a common surface living species; the habit of jumping out of the water has been observed in a number of these Pontellids."

LUMINESCENCE

(For many years the term Phosphorescence has been used in "The Marine Observers' Log" to describe this phenomenon. The proper scientific word Luminescence will now be used; this word or its alternative, Bioluminescence, is already used in most works on the subject.

The old word was chosen for obvious reasons in the days when it was thought that the phenomenon was manifest only in substances containing phosphorus. Since then chemi-luminescence has been investigated in many substances other than phosphorus.)

Northern Arabian Ocean

m.v. *Trewidden*. Captain E. D. Stewart. Sydney to Bandar Shapur. Observer, Mr. I. Smith, 2nd Officer.

8th January 1965. At 2330 GMT the vessel traversed areas of discoloured water consisting of parallel bands approximately 5–20 ft wide. They were a pale white in colour and stationary. Later, at 2345 the vessel passed through areas of luminescence seen only in the bow wake, the sea being relatively calm at the time. The areas of discoloured water were still visible and had no effect on the luminescence. The bow wave was a fiery green in colour and at times thin green streaks appeared in the water which were caused by flying fish in the vicinity. When the Aldis lamp was shone on the sea it had no effect on the luminescence, neither did the radar when it was switched on and off. Sea temp. 71.0°F. Wind light airs.

Position of ship: 21° 42'N, 60° 48'E.

South Arabian Sea

m.v. *City of Johannesburg*. Captain J. W. E. Caffyn. Aden to Singapore. Observers, Mr. E. S. M. Kitching, Junior 2nd Officer and Mr. Ion Ionescu, Quartermaster.

28th February 1965 at 2130 GMT (1st March 0200 SMT). Numerous small luminous objects were seen around the ship at this time. On shining the Aldis lamp on the water, they were found to be small patches of luminescent weed, and the following observations were made as suggested in *The Marine Observer*.

(1) There was a slight increase in brilliance of the existing luminescence which lasted from 12 to 15 sec after the lamp was switched off.

(2) On shining the lamp on a particular patch of previously dark water, it was seen to 'explode' into an area of light between 50 and 80 ft in diameter. The maximum brightness occurred 2 to 3 sec after the lamp was switched on, and it seemed to extend a considerable distance below the sea surface. The brilliance appeared to decrease slightly after this, though it may have been an optical effect after the sudden increase of light. When the lamp was switched off the glow persisted for about 20 sec. Sometimes no effect was noticed on a particular patch of water at all, suggesting that the organisms producing the luminescence were themselves patchily distributed. While the lamp was directed upon the water small objects about $\frac{1}{2}$ to 1 in in diameter glittered like red sequins where the beam touched the surface. These shone only when the beam was on them.

(3) The lamp was effective in initiating a glow for a distance of up to about 600 ft.

(4) The lamp was trained on particular patches of water for varying periods, all with the same effect. When it was held steady with respect to the ship, the beam travelling over the surface produced a strip of luminescence where it touched the water. There was no effect outside the direct beam, unlike the effect in (2). Sea temp. 78.2°F. Wind NE'E, force 4. Sky cloudless. Sea moderate, with low swell from ENE. Output of lamp 36 watts.

Position of ship at 2130 GMT: 10° 21'N, 60° 46'E.

Northern Indian Ocean

m.v. *Breconshire*. Captain D. D. McIntosh. Aden to Penang. Observers, Mr. R. L. Bowyer, 3rd Officer, Mr. A. Warren, 4th Officer and Mr. B. Minter, Officer Cadet.

21st March 1965. At about 1445 GMT patches of luminescence were seen around the ship, but they were not particularly bright until the Aldis lamp was shone on to the water. Red flecks appeared in the beam similar in appearance to glowing cigarette ends, the numbers varying from 2 to about 5 per square foot. These red specks were also visible when the Aldis was not being played on the water, but not so frequently.

In previously dark parts of the sea the patches of light spread out greatly after the Aldis lamp had been switched off; the luminescence then began to dim uniformly and was not visible after 20 sec. Nearer the ship if the Aldis light was played on the water for 1 sec, the brightness still lasted for 15 sec. It was possible to light up patches at the extreme range of the Aldis and these behaved in the same way and lasted for the same time. When the light was shone on existing patches they became approximately twice as bright.

The radar was switched on but no effects could be seen. A sample of sea water was taken in a bucket and the water agitated by hand—this was done in a dark part of the bridge—but nothing became visible. The sample was examined in a bright light and only a few 'hair-like twigs' were visible, an actual count revealed 5 in half a pint of water.

The results were very similar to those reported in *The Marine Observer* of October 1964 by *Diomed* and *Glenogle*.

Sea temp. 79.8°F. Sky starlit. Wind E, force 2. Sea slight. The experiments continued over a period of 2½ hours.

Position of ship at 1445: 9° 30'N, 65° 29'E.

Vicinity of Galapagos Islands

m.v. *Gloucester*. Captain J. D. Hellings. Auckland to Balboa.

22nd February 1965. At 0500 GMT small patches of luminescence were seen in the disturbed water along the ship's side. Experiments were made with the Aldis lamp (60 watts) and the radar, to stimulate further activity but with no success. Sea temp. at 0600, 76.8°F (at 0000 it was 82.8°). Wind calm. Weather fair. Visibility excellent.

Position of ship at 0600: 1° 42'S, 88° 06'W.

Note. Dr. R. H. Kay, of the University Laboratory of Physiology, Oxford, writes:

"Good observations on the effect of light and radar, like those above, continue to arrive in very satisfactory numbers. It may be possible to publish soon a short account of what is emerging from these experiments when the many observations received, but not published here for lack of space, can be given some of the credit they deserve. Negative results with the Aldis are as important as positive effects."

ABNORMAL REFRACTION

off N.W. Spain

m.v. *Apapa*. Captain R. McWilliam. Liverpool to Bathurst.

28th March 1965, 1830–1850 GMT. A small coaster, at a distance of about 7½ miles had a distorted appearance, the midship section being a lot higher and the vessel a good deal shorter than it actually was. Ten min afterwards, at a distance of 10 miles, it had assumed its normal shape. A false horizon which was visible from 1830 until 1940, was much better defined than the true one. The following phenomenon was seen between 1855 and 1905. As the sun's upper limb set under the horizon, another sun similar in shape and colour appeared to rise half way between the ship and the horizon. This image persisted for about 3 min but as it rose its upper limb was cut off (or did not show) when it reached the actual horizon. At 1800: Air temp. 59.4°F,

wet bulb 56.1° , sea 56.2° . Wind NE'N, force 3. Swell from WNW, approx. 10 ft high.
Position of ship: $42^{\circ} 28'N$, $10^{\circ} 20'W$.

Note. Conditions of abnormal refraction of the type which brought about the distortion of the coaster and gave rise to the false horizon are liable to occur when the air at the surface is relatively cold compared with air above. Such conditions favour the formation of a 'blind strip' along the horizon which could cause the sun to appear to set before reaching the true horizon. Another type of refraction can result when there is a shallow layer of warm air on the surface. In these conditions a flattened 'counter-sun' may be seen rising from the apparent horizon as the sun is setting: the two unite at the point where the sun is about to disappear. Both types of refraction appear to have been present in this instance, and it is reasonable to suppose that they were produced by the irregular intermixing, both horizontally and vertically, of the warm air from over N.W. Spain, with the cool sea air off the coast. The air at the time was being carried from the land to the sea.

Bass Strait

m.v. *Middlesex*. Captain R. E. Baker. Port Kembla to Melbourne. Observers, the Master and all officers.

21st February 1965. Abnormal refraction was observed on this coastal passage at 0200 GMT when the ship was just south of Citadel Island. Over an arc of the horizon of approx. 90° , from 045° on the port bow to 045° on the starboard bow, the refraction produced the appearance of a land mass to such a degree that Cape Liptrap, which lay 30° on the starboard bow, could not be distinguished. Just forward of the starboard beam, the refraction gave rise to the illusion of hundreds of small water spouts reaching upwards from the sea surface. Air temp. $69^{\circ}F$, wet bulb 66.5° , sea 65° . Wind NE'N, force 4.

Position of ship: $39^{\circ} 11'S$, $146^{\circ} 19'E$.

Note. During February it is usual for sea and air temperatures in the given position (in the Bass Strait) to be roughly the same—about 63° – $64^{\circ}F$. In this case the reported air temperature is certainly well above normal, probably due to the intense midday heat ashore to the north, and the difference between air and sea temperature is large enough to result in abnormal refraction—a mirage, in fact. Such optical distortion often produces—and this may well be a case in point—an inverted image of the distant object, the direct view being completely obliterated.

AURORA

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

"Listed briefly below are the observations of aurora made by observers in ships during the first three months of 1965, which have been received at the Balfour Stewart Auroral Laboratory in the University of Edinburgh. We regret that the necessarily brief summary of the data in the list gives no indication of the obvious care taken when recording the details of auroral displays.

"It will be noticed that the observations are still from ships in high latitudes. While an occasional out-burst of activity is now being seen as far south as northern England, the solar activity chart shows no sign yet of build-up towards the next maximum. The periods of increased geomagnetic activity are well reflected by the dates and times of the reports listed, and at no time during the three months did the index figure go above 6.

"In the last issue of *The Marine Observer* we welcomed reports by observers in the *Stella Leonis*. This time we are pleased to have the name of another trawler—*St. Giles*—in the list, and are grateful for the carefully detailed report. While regretting that the observer should be disillusioned about the idea that active aurora precedes strong winds, may we offer the consolation that there is a link with solar wind, with the advantage that this will not rock the boat.

"The displays reported by observers in Weather Ships were also recorded effectively by means of paintings and line drawings. Auroral forms seen in the higher latitudes are often quite different from the regular arcs and bands more commonly seen in U.K. latitudes, and the difficulty of aptly describing them and of correctly interpreting the descriptions is made appreciably easier when there is an accompanying sketch.

“Our grateful thanks once again for the help of all concerned. We hope for your continued co-operation.”

DATE (1965)	SHIP	GEOGRAPHIC POSITION	Λ	Φ	I	TIME (GMT)	FORMS
1st Jan.	Weather Surveyor	51°50'N 19°40'W	060	59	+ 69	2330	N
8th	St. Giles	73°48'N 18°20'E	120	71	+ 70	1700-1910	HA, HB, RA, RB, P
14th	Weather Surveyor	52°35'N 20°00'W	060	59	+ 69	0001	N
19th	Weather Reporter	62°00'N 33°00'W	060	70	+ 76	0155-0230	HB, RB, RA, RR, P
27th	Weather Adviser	59°00'N 19°11'W	070	65	+ 72	2100, 2245	N
28th	Weather Adviser	58°58'N 19°10'W	070	65	+ 72	2335-0045	N
29th	Weather Adviser	59°00'N 19°00'W	070	65	+ 72	0600-0800	N
30th	Weather Reporter	62°08'N 32°58'W	060	70	+ 76	0045-0450	HA, P, V
	Weather Reporter	62°10'N 33°03'W	060	70	+ 76	2225-2250	N
	Weather Adviser	59°04'N 18°34'W	070	65	+ 72	2335	N
31st	Weather Adviser	59°08'N 19°09'W	070	65	+ 72	2000-2330	RA, RR, N
1st Feb.	Weather Adviser	59°06'N 19°07'W	070	65	+ 72	0400, 0550	N
7th	Weather Adviser	59°02'N 18°54'W	070	65	+ 72	2330-2350	HA, N
8th	Weather Adviser	58°58'N 19°00'W	070	65	+ 72	0200-0640	HA, RA, RR, N
10th	Weather Adviser	59°04'N 18°45'W	070	65	+ 72	0150	N
11th	Weather Adviser	58°54'N 19°11'W	070	65	+ 72	0555, 0650	N
17th	Weather Surveyor	61°55'N 32°40'W	060	70	+ 76	0001	N
18th	Weather Surveyor	61°50'N 33°05'W	060	70	+ 76	0001	N
19th	Bishopsgate	71°15'N 27°45'E	120	67	+ 78	2000-2020	HA
21st	Weather Surveyor	62°01'N 33°34'W	060	70	+ 76	2330-0005	N
22nd	Weather Surveyor	62°00'N 33°30'W	060	70	+ 76	0045-0400	HB, V, N
23rd	Weather Surveyor	62°00'N 33°20'W	060	70	+ 76	0100	N
	Weather Monitor	58°50'N 19°25'W	070	65	+ 72	2200-2330	RB, N
24th	Weather Surveyor	62°00'N 32°50'W	060	70	+ 76	0001	N
	Weather Monitor	58°50'N 19°40'W	070	65	+ 72	2100-0400	HA, N
	Weather Surveyor	62°10'N 32°55'W	060	70	+ 76	2205-0600	All forms
25th	Weather Surveyor	62°25'N 33°10'W	060	70	+ 76	2100-0500	All forms
	Weather Monitor	58°55'N 20°00'W	070	65	+ 72	2300-0200	N
27th	Weather Surveyor	62°05'N 32°30'W	060	70	+ 76	0200-0500	HA, HB
	Weather Surveyor	61°55'N 32°25'W	060	70	+ 76	2200	RR
28th	Weather Surveyor	61°35'N 32°30'W	060	70	+ 76	2320-2330	N
1st Mar.	Weather Surveyor	61°50'N 32°35'W	060	70	+ 76	0400-0600	RR, N
	Weather Surveyor	61°55'N 33°00'W	060	70	+ 76	2245-0700	HA, HB, P, N
2nd	Weather Surveyor	61°55'N 32°20'W	060	70	+ 76	2325-0030	HA, RB, RR, V
3rd	Weather Surveyor	62°00'N 32°20'W	060	70	+ 76	0445	N
	Weather Surveyor	61°55'N 32°30'W	060	70	+ 76	2200-0200	RR, P, N
4th	Weather Surveyor	61°55'N 32°30'W	060	70	+ 76	0500	N
5th	Weather Surveyor	62°00'N 32°50'W	060	70	+ 76	0400, 0700	N
	Weather Surveyor	62°00'N 31°30'W	060	70	+ 76	2245, 0300	HA, HB, RB, RR, N
6th	Weather Surveyor	61°35'N 30°20'W	060	70	+ 76	0645	N
22nd	Weather Reporter	59°05'N 18°58'W	070	65	+ 72	2145-2200	RB
25th	Weather Reporter	59°01'N 19°24'W	070	65	+ 72	2350-0100	RB, V

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; N = unidentified auroral form.

535.37:57(26)

Marine Bioluminescence

By R. J. TURNER

(National Institute of Oceanography)

Bioluminescence may be defined as the emission of light by living animals and plants. A familiar example to countrymen is the glow-worm, a wingless beetle, numbers of which may be seen on July evenings as bright yellow points of light scattered along the hedgerows. Seafarers, and particularly those who have sailed in tropical waters, are perhaps better acquainted with the streaks and flashes of 'fire' seen in breaking waves and known widely, if not strictly accurately, as phosphorescence.

It is not generally recognized that the terms 'marine bioluminescence' and 'phosphorescence' cover a large number of very distinct luminous phenomena. Over the years, numerous reports of the various types of display have been sent into the Meteorological Office from ships of the Voluntary Observing Fleet; many hundreds of these reports were collected together by the late Mr. E. W. Barlow during his work in the Marine Division of the Meteorological Office from 1927 to 1958, with the hope that they might eventually be classified, but up to now no attempt has been made to do this. It is upon these observations that this note is based.

The 'quality' of a phosphorescent light—whether diffuse or sparkling or in discrete spots—is determined by the nature of the organisms which generate it.

But in addition to this, the appearance of a display can be influenced by the type of stimulus which triggers off the organisms: most creatures with a photogenic ability emit light only in intermittent flashes when excited by some specific outside agency. It therefore seems logical to classify luminescent phenomena initially on the basis of the types of organism responsible and secondly according to the mechanism by which the latter are stimulated to produce a display. Table 1 shows a suggested scheme along these lines, and the different categories will be dealt with more fully below.

Examples have, wherever possible, been taken from *The Marine Observer*, at least the recent numbers of which, it is hoped, will be available to many readers of this article. References have thus, unless otherwise stated, been given by the name of the ship, followed by the volume number, year and page number of the issue concerned.

Table 1. Suggested classification of marine bioluminescent phenomena

SITE	ORGANISMS	STIMULUS	APPEARANCE
1. Sea	1. Bacteria (?)		'White water'
	2. Dinoflagellates } Copepods } Ostracods etc. }	1. Mechanical	1. Apparently constant illumination a. Extended bands b. Blooms over large areas c. Limited patches
			2. Flashing patches
			3. Fluctuating patches
			4. Disturbed water luminescence
		2. Seismic	1. Erupting luminescence 2. Phosphorescent wheels
		3. Photic	Light-stimulated phosphorescence
		4. Miscellaneous	Travelling luminescence
	3. Jellyfish } Ctenophores } Pyrosoma etc. }		Luminescence of larger planktonic organisms
	4. Fish } Squid }		Luminous nektonic animals
2. Air			Aerial luminescence

1.1 'Milky sea' or 'white water'

This is a very distinctive form and appears as a bright, even, opaque white glow often extending over vast areas of sea. Several reports refer to the effect as similar to 'a bowl of milk' or 'a field of snow' (m.v. *British Respect*, 21, 1951, p. 156; m.v. *Glengyle*, 33, 1963, p. 16). As a result of the intense, unvarying luminosity, which may be bright enough to be tiring to the eyes, the apparent visibility can be reduced (s.s. *Ballarat*, 10, 1933, p. 86) and features such as ships' lights and breaking waves masked (m.v. *Glenartney*, 24, 1954, p. 136). While the latter undoubtedly explains many of the reported instances of 'calming of the sea' in white water areas, in some cases a definite moderation does seem to ensue (m.v. *Trevince*, 29, 1959, p. 111) and it has been suggested that large quantities of plankton may have an effect similar to 'oil on troubled water'. Quite sudden changes in sea temperature have been noted

as a ship enters or leaves one of these patches, but as both increases and decreases apparently occur, some or all of these may be coincidental.

'White water' is a particularly interesting type of luminescence in that it has a rather restricted distribution, both seasonal and geographical, whereas most forms occur throughout the world and at all times of the year. In this case about 85 per cent of our reports come from the Arabian Sea, and of these, 65 per cent refer to the month of August.

Perhaps surprisingly, the identity of the organisms responsible for this phenomenon is still only conjectural. The 'quality' of the light seems very different from that of all other forms of phosphorescence and because it is very constant and not brightened by agitation of the water it has been attributed to luminous bacteria, one of the few groups that luminesce continuously and spontaneously. We are reduced to hypotheses as no observer has yet brought back an adequately preserved sample for scientific analysis*. A number of reports mention thin luminous threads seen in a bucket of sea water drawn in the area (e.g. s.s. *Carthage*, 10, 1933, p. 86) but there is no proof that these were the cause of the primary luminescence, and as the description is insufficient for identification and the samples were not kept, this is of passing interest only. It is possible that the organisms involved are not actually present at the surface, making the collection of specimens more difficult, but information on this point is conflicting (compare e.g. s.s. *Clan Macphee*, 9, 1932, p. 219 and s.s. *Clan Chattan*, 21, 1951, p. 156). The accumulation of luminous plankton at a depth of a fathom or so might account in part for the characteristic diffuseness of the light.

1.211 Apparently constantly illuminated patches

There are many reports of well-defined patches of sea exhibiting a general overall luminescence. The light is, however, of quite a different quality to that of the last, being usually described as greenish or bluish, sparkling, and intensified by any disturbance of the water.

The species responsible for these, and indeed the majority of phosphorescent phenomena, are of two main types. The first belong to the Dinoflagellata, a group of microscopic organisms with characteristics of both plants and animals. Many dinoflagellates are recognized to be luminescent, the best known being the comparatively large and widespread *Noctiluca miliaris*. The second group are members of the class Crustacea and include certain small copepods and ostracods which are common constituents of the zooplankton. Both these types of organism can occur in very high concentrations in the sea, and both respond to mechanical stimulation by flashing. It is hence usually impossible to determine from a report the exact identity of those involved in a display, and all these smaller plankton must be considered together.

It has already been mentioned that bacteria are the only organisms to give a truly uninterrupted luminescence. The explanation for the apparent evenness in the present case is probably that the luminous plankton is very abundant and evenly distributed over areas seen to be phosphorescent, and that at any instant a sufficient proportion of them will be flashing to impart a general but scintillating glow to the water. The stimulus causing them to light may be the general movement of the water, collisions with other organisms or a combination of factors.

Different 'patterns' of phosphorescence may be observed related to the distribution of plankton in the sea. It is well known that the latter may become concentrated by winds and currents into distinct belts varying in width from a foot or two to many yards; if many of the constituent organisms are luminescent, the bands will show up at night as long streaks of light (e.g. s.s. *Kenuta*, 32, 1962, p. 19; m.v. *Cape Franklin*, 34, 1964, p. 178). Small patches and, on occasions, whole areas of sea may similarly display an overall luminosity (e.g. s.s. *Baron Maclay*, 28, 1958, p. 71).

* *Editor's note.* Suitable bottles and a supply of formalin for preserving specimens are obtainable from any Port Meteorological Officer in the United Kingdom.

1.212 Flashing patches

This phenomenon is similar to the last except that the patches are not continuously illuminated, but are intermittently affected by some stimulus causing the organisms throughout to flash simultaneously. Areas, usually of quite small size—around 20–30 feet diameter—may be seen to light up once only or repeatedly. The stimuli involved are not known for certain and several may be effective on different occasions. In one case (s.s. *Empire Orwell*, 27, 1957, p. 142) the flashing patches were apparently distributed along the leading edge of a rain shower, while in another (m.v. *Malaita*, 31, 1961, p. 184) they were seen to be pulsating in time with the ship's engines. Certain other phenomena may appear as flashing patches from a distance.

1.213 Fluctuating patches

This is an uncommon form and its appearance is best illustrated by an example. s.s. *Mataran* (7, 1930, p. 203) encountered near the Solomon Islands “about 50 large patches of very bright phosphorescence. . . . Each appeared as one large glow, not as numbers of small luminous particles. . . . When the ship approached near to or over them they appeared to expand and contract”. Such irregularities may occasionally be due to optical illusion, but in any event the fluctuations do not appear to be very great and random variations in the type of stimulus mentioned under 1.211 would probably be sufficient to explain them.

1.214 Disturbed water luminescence

This is the commonest and best known of all phosphorescence phenomena, and as such requires little description. The light appears wherever the water is agitated, that is, wherever the planktonic organisms are subjected to direct mechanical stimulation; the category thus covers the luminescence seen momentarily in breaking wavecrests, the bow waves and wakes of ships, the tracks of porpoises and shoals of fish, or in the broken water over reefs. It is usually due to dinoflagellates, but in British waters the copepod *Metridia lucens* is frequently responsible.

This type of luminescence can be useful to seamen in indicating the position of submerged obstructions since it is induced wherever moving water comes into contact with a solid object. Care must be taken, however, to distinguish between ordinary wavecrest phosphorescence and the surf over a reef; many of the pseudo-shoals reported by early voyagers are probably the result of such a misconception.

1.221 ‘Erupting’ luminescence

This heading covers all those phenomena where luminous water appears to swirl up from under the sea surface. In simple cases (e.g. s.s. *Elpenor*, 9, 1932, p. 166) it seems to be a general breakthrough of large masses of water, but frequently it takes a more regular form. Luminous ‘balls’ several feet in diameter are seen to shoot up at great speed from the depths; at the surface they ‘explode’ and spread out to form great circular patches of light 100 yards or more in diameter. A typical report is that of s.s. *Yoma* (32, 1962, p. 59).

An explanation of this type and the next has been put forward by Dr. Kurt Kalle¹. He suggests that shockwaves from a submarine earthquake rise in a narrow cone to the surface, on reaching which they are deflected out radially, stimulating any luminescent plankton which may be present. It is, however, not certain whether the organisms themselves are carried up from the depths (see note to m.v. *Dagmar Salén*, 27, 1957, p. 93) or whether the plankton distributed in different layers is stimulated in turn by the ascending shock wave, producing the effect of the upwelling of a distinct mass of water.

Reports of suddenly exploding patches without any reference to the rise of sub-surface water are probably occasioned by the same phenomenon seen from a distance or less accurately described.

1.222 'Phosphorescent wheels'

These rare occurrences have mystified both seamen and scientists for many years. Numerous variations in appearance and behaviour have been recorded, but in general they may be depicted as systems of luminous 'waves' passing at great speed over the surface of the water, certainly fast enough to preclude any possibility of their being due to the movement of luminous organisms or water masses. While in some cases the 'waves' move in perfectly parallel formations (m.v. *Graig*, 29, 1959, p. 176), in the 'wheel' proper they appear to rotate about a hub which may be visible (s.s. *Smoky Hill*, 27, 1957, p. 90) but which more often is described vaguely as being "on the horizon" (s.s. *Burnside*, 31, 1961, p. 184). A third variety involves expanding concentric circles of light (s.s. *British Energy*, 31, 1961, p. 184). Several wheels may be seen simultaneously, and the direction of rotation may remain constant or may change several times during the period of observation.

Previous attempts to explain this phenomenon in terms of regular sea-wave systems and optical illusions² are most unsatisfactory. Kalle has demonstrated that while 'erupting' luminescence occurs in deep water, wheel phenomena are almost entirely confined to shelf areas bordering the Indian Ocean such as the Straits of Hormuz and Malacca. He suggests that the two types have a common origin, but that in shallow water reflections of the main set of seismic waves from the surface and sea bottom may give rise to two or more adjacent sources of radially-spreading shock waves. These will supplement each other (in their effect on luminescent plankton) where they are in phase and cancel out where they are not. It can easily be shown that the resulting 'interference pattern' will be a system of spokes radiating from a hub situated between the two emission centres, and that the variations of movement, curved beams and expanding circles can be explained in terms of slight modifications to the original waves during reflection.

This theory requires that there be mirror symmetry of the two halves of a wheel, with the line joining the primary and secondary emission centres as the axis of symmetry. The direction of rotation should therefore be different for each half. While some reports do confirm this point (s.s. *Smoky Hill*, 27, 1957, p. 90: "It appeared . . . to be turning anticlockwise, with some distant bars turning clockwise."), most make no mention of it, doubtless assuming, quite understandably, that it all revolves in the same direction.

1.23 Light-stimulated phosphorescence

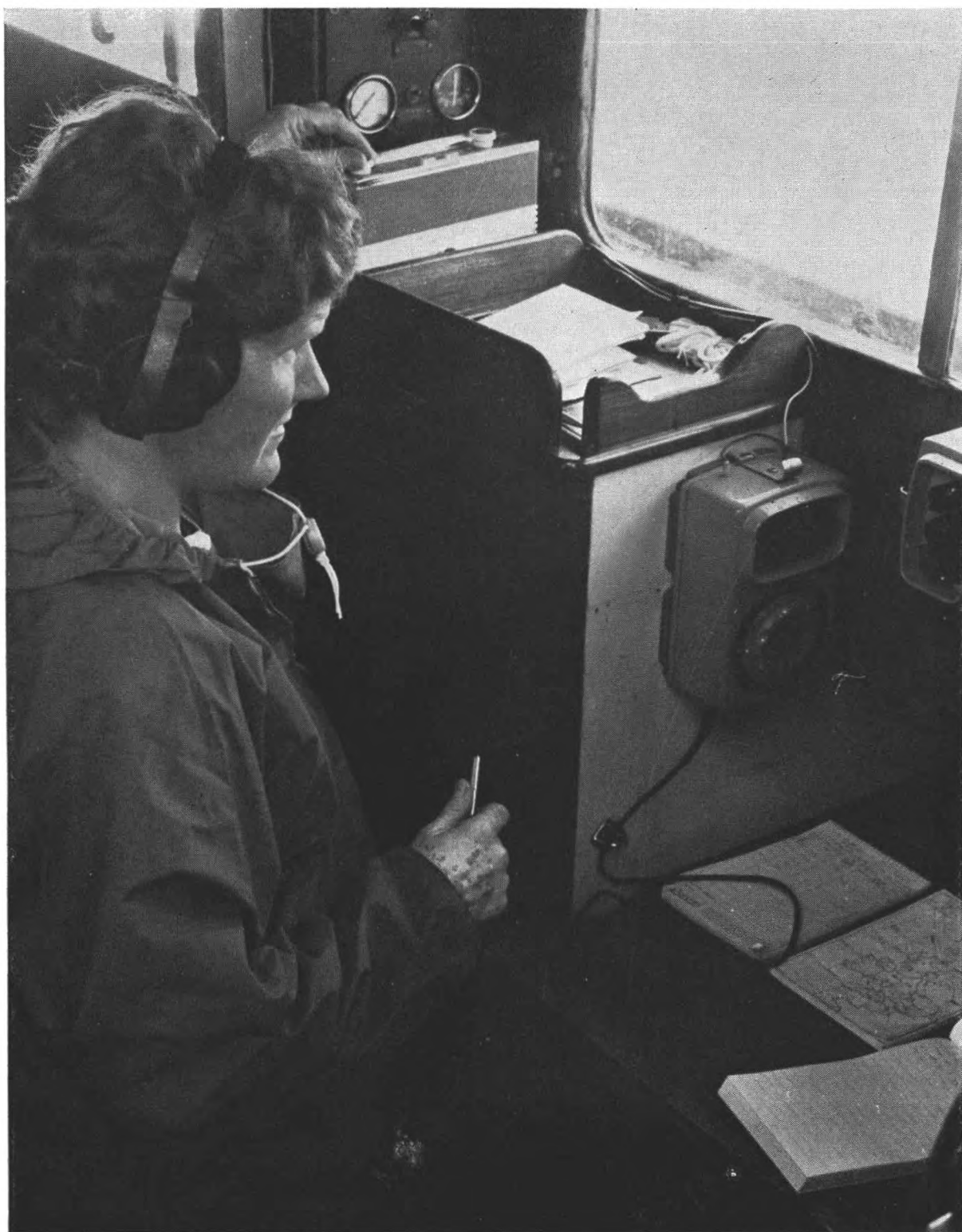
This may be observed either in the reflections on the water of cabin lights and the like (s.s. *Muristan*, 28, 1958, p. 72) or, more spectacularly, when a signalling lamp is shone onto the sea. Several ships have observed that streaks and patterns of fire can be traced on the surface with an Aldis lamp, and numerous reports have been published in recent numbers of "The Marine Observers' Log".

Not all photogenic organisms flash in response to light, and indeed with some it is a luminescence inhibitor. Haneda³ has noted an ostracod, *Cypridina noctiluca*, which reacts thus, but it is impossible to identify the creatures responsible in a particular instance unless samples are taken.

1.24 'Travelling' luminescence

A number of ships have reported moving luminescent patches whose characteristics do not appear to fit any theory of stimulation by submarine earthquakes (e.g. m.v. *British Caution*, 27, 1957, p. 92; m.v. *Tremeadow*, 32, 1962, p. 181). They may move at the same high speeds (estimated in one case⁴ to be between 80 and 120 knots) but without the same pattern of regular waves. This type of phenomenon is little known and probably there are different factors operative in different instances. Slow-moving patches, for example, might be due to compact shoals of fish moving through a potentially luminous sea and seen from a distance, but this obviously does not account for all 'travelling' luminescence.

A most interesting case was that seen by m.v. *British Premier* (22, 1952, p. 190)



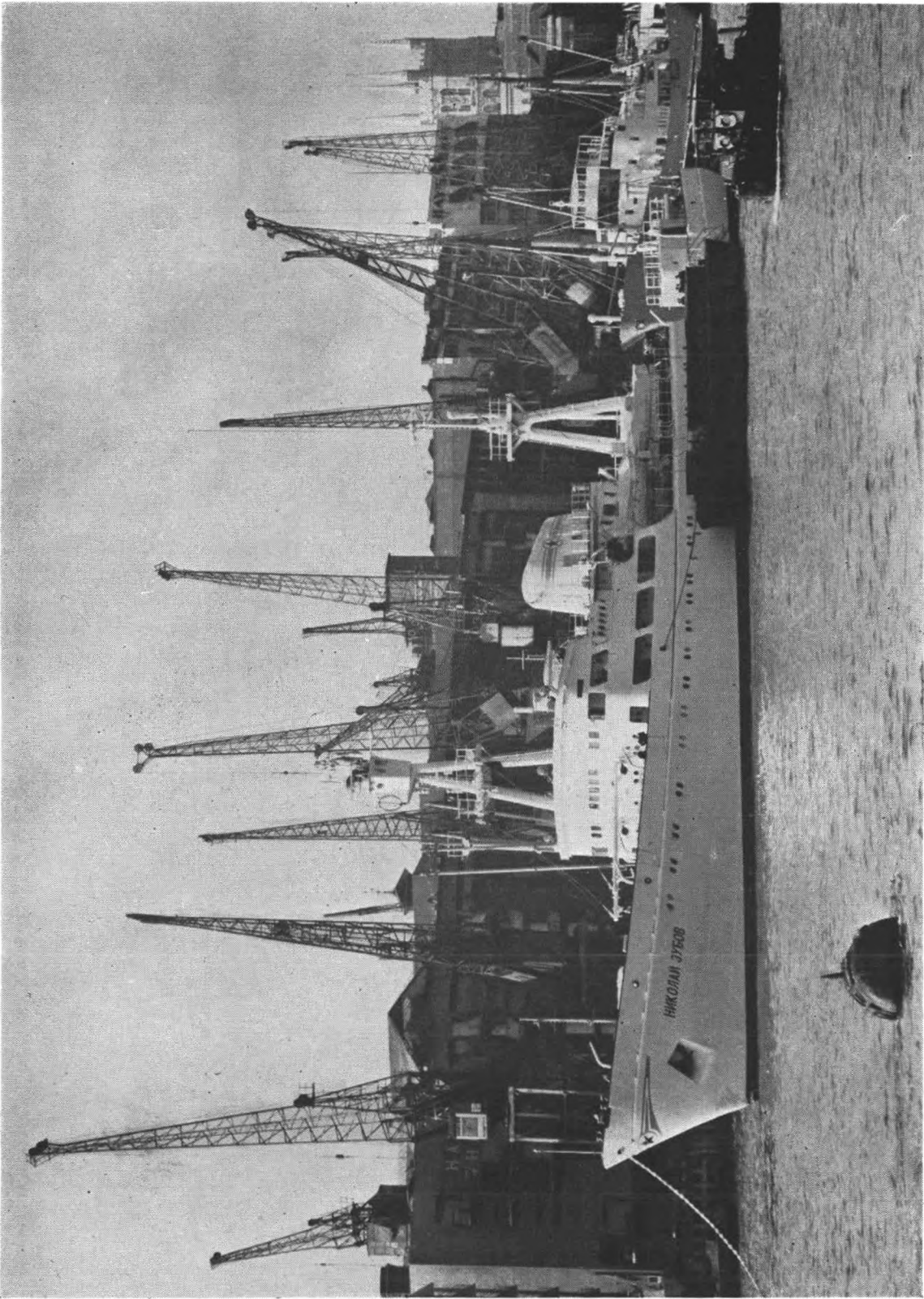
Photograph by E. F. Haylock

Waiting for the 0645 pips!

(See page 32.)

In many cruising yachts the women take down the shipping forecasts. This is not always easy; noises off—the wind, the waves and the ship, to say nothing of atmospherics—add to their difficulties. Then if the announcer is in a hurry . . . Hence the worried look.

(Opposite page 25)



Photograph by Central Press Photos Ltd.

The Russian oceanographic research ship **Nickolay Zubov** (see page 33)

where revolving boomerang-shaped patches of light swept in towards the ship from points on either bow and fell away to similar points on each quarter, *the display only lasting while the radar apparatus was in use*. There have been other isolated allusions to the possible stimulatory effect of radar on phosphorescence (e.g. m.v. *Malaita*, 31, 1961, p. 184) but it is difficult to imagine organisms sensitive enough to react to such low intensity electric fields and more observations are needed to resolve the issue. One way or the other, the phenomenon seen by *British Premier* is a very puzzling case.

1.3 Luminescence of larger planktonic organisms

This is a straightforward category and covers all instances of phosphorescence in small spots and patches which are obviously distinguishable as individual organisms. One of the commonest forms, particularly in the South Pacific and equatorial Atlantic, appears as masses of brilliant cylindrical objects a few inches long; this is almost certainly the colonial tunicate *Pyrosoma*, a good likeness of which appears under the observation of m.v. *Sagamore* (35, 1965, p. 120). Other 'blobs' and 'globules' (e.g. m.v. *Raeburn*, 34, 1964, p. 14) may be attributed to various species of jellyfish and ctenophores, but exact identification is impossible without specimens. Luminescence of this kind is quite frequently seen.

1.4 Luminous nektonic animals

The term 'nekton' is applied to those creatures which have manifest powers of movement through the water, as distinct from 'plankton' which is largely passively floating. Several species of fish and squid are luminescent and are occasionally seen from ships (m.v. *Weybridge*, 34, 1964, p. 123) but care must be taken to distinguish these from fish which only appear luminous because of the phosphorescent water they are swimming in.

2. Aerial luminescence

The last category of the classification is reserved for the remarkable phenomenon of luminescence of the air. This is quite distinct from the reflections of phosphorescence of the sea occasionally noted on mist layers near the sea surface; in nearly all cases observers are emphatic that nothing comparable was present in the water. The appearance is one of luminous 'waves' flashing through the air above the sea surface, either in parallel formation or rotating about a hub (W.M.S. *Olympic Challenger*, 24, 1954, p. 233). Outwardly, the phenomenon is thus clearly similar to forms of the phosphorescent wheel, a conclusion substantiated by the fact that the two occur in precisely the same restricted localities. However, the difference in the medium through which the waves pass is surely fundamental enough to warrant a separate category.

If it is accepted that the waves are not reflections from the sea, then the organisms themselves must be present in the air. This theory was first proposed by Dr. M. Rodewald⁵; in simple terms, it is suggested that when particles of water are taken up into the atmosphere either by evaporation or as spindrift, luminescent micro-organisms may be taken up with them and may thus be present in appreciable numbers in mist layers above the surface. In support of this we have a number of accounts of phosphorescence seen in spray blowing across a ship's deck, and the very interesting report of s.s. *Tweed* (29, 1959, p. 14) which recounts how "what appeared to be phosphorescence in the air was observed. Small phosphorescent particles passed upwards from the sea to a height of about 3½ feet all round the ship."

Having considered the various types of bioluminescence, we may now review briefly what is known of the distribution of the phenomenon as a whole. There have been several estimates in the past of the relative prevalence of luminous waters in different areas of the world, notably that of Smith⁶. Data for these estimates have

been the reports of merchant vessels such as those making up the Voluntary Observing Fleet, but this means inevitably that in areas where shipping is dense, bioluminescence will appear disproportionately common, and vice versa. This is clearly demonstrated in Fig. 1, which shows the distribution by Marsden squares of approximately 4,500 phosphorescence reports from the Meteorological Office Phenomena Index for 1854-1956. The latter is a list of references to meteorological logbooks mentioning various natural phenomena, and gives date, log number and position to the nearest degree. It would indeed be coincidence if, as would appear from the chart, bioluminescence were most prevalent along the Atlantic and Indian Ocean shipping routes and in the vicinity of certain major ports such as Cape Town.

To eliminate as far as possible the above distortion, and also the effect of the land/sea ratio in each square, a coefficient has been devised which may be defined as

$$\frac{\text{per cent of world total of reports which come from an area}}{\text{per cent of world total of observing ships which occur in the area.}}$$

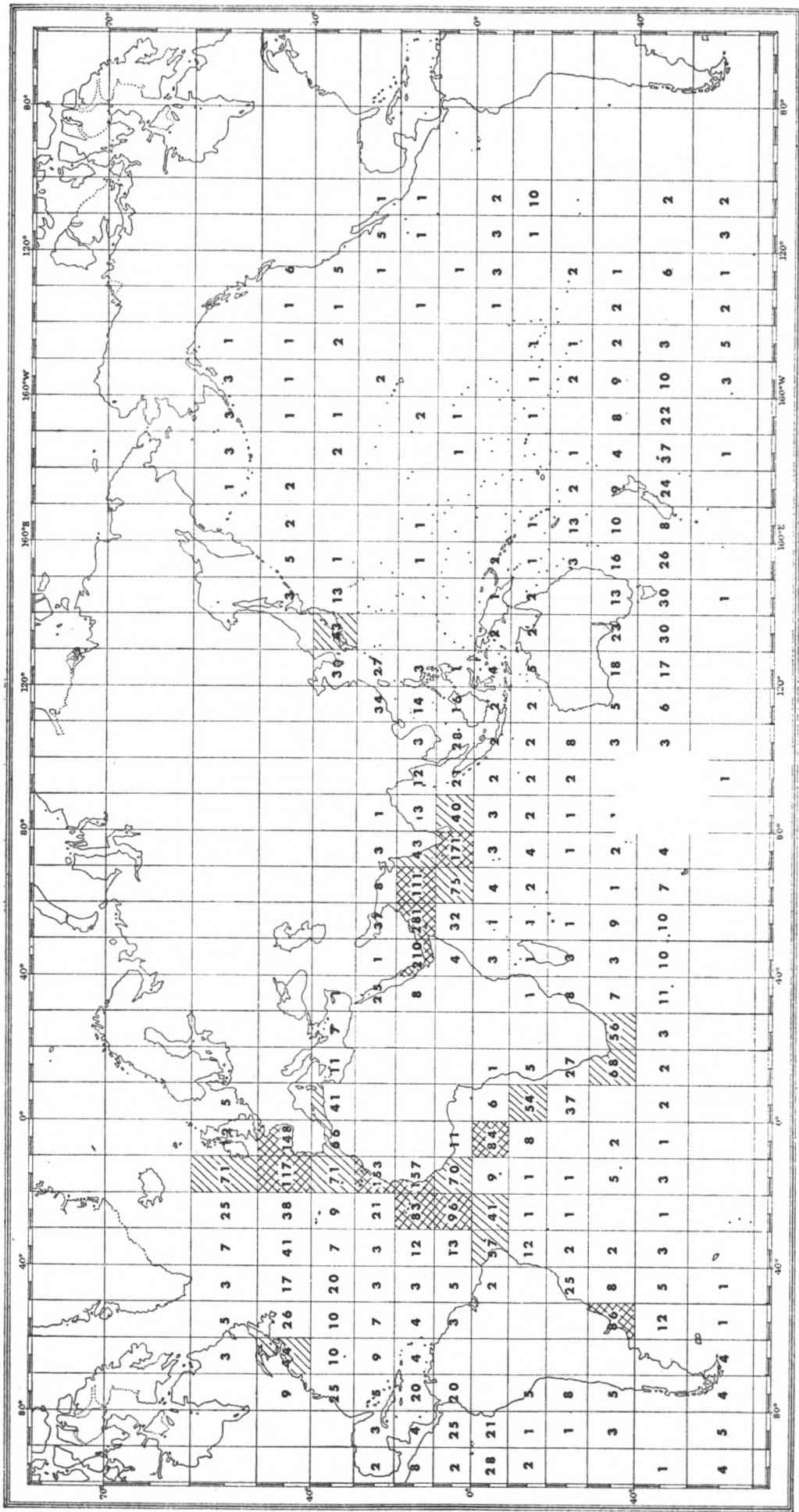
The denominator of this expression was calculated in each case from a chart of the number of 'sets of observations' sent in by ships between 1920 and 1938⁷, which may be taken to give a reasonably accurate picture of the general distribution of the Voluntary Observing Fleet; the numerator was derived from the Phenomena Index for the same period. The relevant figures for the whole of the last hundred years are unfortunately unavailable, but the total of 2,620 phosphorescence reports ensures a reasonable estimate.

Fig. 2 shows the effect of taking shipping density into account. It will be seen that the whole of the Arabian Sea boasts a very high coefficient and that phosphorescence is still reasonably, but proportionately less, common in the equatorial Atlantic and in certain other individual squares. Prevalence in particular areas is probably attributable to the suitability of the latter for plankton development; this in turn may be due to upwelling or current convergence which may concentrate quantities of organic and mineral nutrients in the surface waters of such regions. These factors are at any rate probably significant off the west coast of Africa, in the Arabian Sea and off Argentina.

There remains an unfortunate lack of positive information about much of the Pacific and the southern hemisphere in general. A meaningful coefficient is dependent upon a reliable figure for phosphorescence: in a square from which no reports were made in the period considered, the coefficient must be zero irrespective of whether the lack of records was due to the absence of phosphorescence or of observing ships. Equally, where the figure for shipping is very low, a single chance observation can produce a laughably high coefficient, as in square 056. The ratings should always be interpreted with due regard to the actual number of sightings of the phenomenon.

Attempts to prove that seasonal variations in the occurrence of phosphorescence exist and are the result of various external influences are mostly based on statistically unreliable evidence. The exception appears to be in the Arabian Sea where Smith⁶ and others have found a definite peak around the time of the south-west monsoon. The exact cause of this annual increase is not known but it is quite possible that it affects only the organisms responsible for 'white water', for this is the phenomenon most characteristic of the area and season. There is some evidence for a spring maximum in certain northern waters, attributable to the usual annual increase in the plankton of these regions, but in general 'ordinary' phosphorescence appears equally prevalent throughout the year.

Statistically adequate quantities of observations from ships take a very long time to accumulate, and a more accurate picture of the overall distribution of the phenomenon will probably have to await the development of the automatic luminescence recorder, experimental versions of which are already being used by scientists. In the meantime, however, there is still much to be learned about individual forms





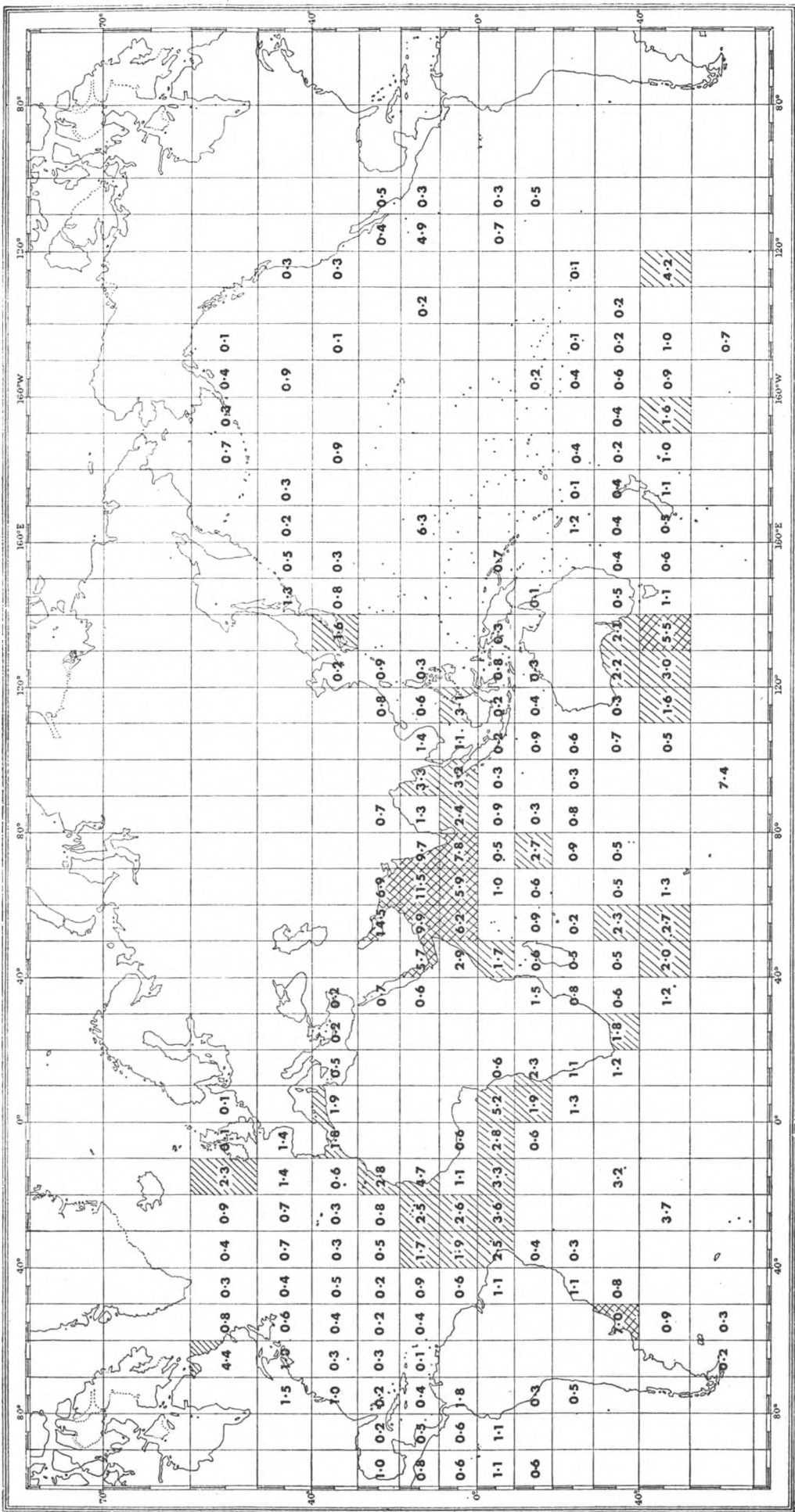
 greater than 40 reports per 10° square
 greater than 80 reports per 10° square

Fig. 1. Distribution of bioluminescence reports received by the Meteorological Office between 1854 and 1956





 coefficient greater than 1.5
 coefficient greater than 5.5

Fig. 2. Frequency coefficients for bioluminescence in each 10° Marsden square
 All squares with only one report are unshaded.

from detailed reports and, perhaps even more, from preserved water samples. It is hoped that the above account will encourage observers in the collection of this information.

I would like here to acknowledge gratefully the work of the late Mr. E. W. Barlow, previously mentioned, and to thank Lt.-Cdr. L. B. Philpott of the Meteorological Office and Mr. R. I. Currie and many others at the National Institute of Oceanography, particularly the Library, for all their help and advice.

Note. Some of the unsolved problems in the study of marine bioluminescence have already been indicated. Often they are due merely to the absence, in reports, of some detail, apparently trivial or too obvious to record, but nevertheless essential in the true interpretation of the phenomenon. Perhaps the following may give some idea of the type of observation we would like to receive, at any rate in the case of the lesser-known forms.

(a) *General information*: date; time (GMT); duration; position (lat. and long.); course; wind; state of sea; general weather conditions; visibility.

(b) *Extent of luminescence*, as seen from ship: estimated size of area or patches; orientation if in bands.

(c) *Colour and intensity*.

(d) *'Quality' of luminescence* (see article).

(e) *Change of form* (if any), e.g. movement, or spread from a centre or across an area.

(f) *Possible stimuli*.

(g) *Accompanying phenomena*, e.g. smells, calming or change of sea temperature.

Any other observations, and particularly preserved water samples, are of course welcome.

REFERENCES

1. KALLE, K.; Die ratselhafte und "unheimliche" Naturerscheinung des "explodierenden" und des "rotierenden" Meeresleuchtens—eine Folge lokaler Seebeben? *Dt. hydrogr. Z.*, Hamburg, 13, No. 2, 1960, pp. 49–77. (Review: *Mar. Obs.*, London, 31, 1961, pp. 148–149.)
2. TERMIJTELEN, J. W.; Phosphorescent wheels. *Mar. Obs.*, London, 20, 1950, pp. 229–232.
3. HANEDA, Y.—Quoted in HARVEY, E. N.; Bioluminescence. Academic Press, New York, p. 302.
4. DERBEK, F. D.—Quoted in TARASOV, N. I.; Luminescence of the sea. Acad. Sci. SSSR, Moscow, pp. 61–66.
5. RODEWALD, M.; Phosphorescent wheel. *Mar. Obs.*, London, 24, 1954, pp. 233–234.
6. SMITH, H. T.; Phosphorescence of the sea. *Mar. Obs.*, London, 8, 1931, pp. 230–234.
7. London, Meteorological Office. Work of the year—Marsden Chart I. *Mar. Obs.*, London, 15, No. 131, 1938.

551.509.58:654.19:797.14

The Yachtsman and the Shipping Forecast Broadcast by the BBC

By GROUP-CAPTAIN E. F. HAYLOCK

(Until recently Editor of *Yachting World*, he is President of the International Cadet Class, Admiral of the Royal Air Force Yacht Club and a member of the General Purposes Divisional Committee of the Royal Yachting Association.)

From early April until the end of October yachtsmen are vitally interested in shipping forecasts. When I use the term yachtsmen I mean it to be all-embracing, and to include the man, or youngster, sailing the smallest dinghy to the owner of an ocean racer or a 50-ton motor yacht. I can speak with authority, and perhaps some feeling, for all of them because, at the end of the Second World War, after 30 years of flying in the Royal Flying Corps and Royal Air Force, I became the Editor of a yachting journal. I soon found myself taking part in all kinds of yachting from dinghy racing to long-distance cruising and ocean racing.

I had learned during my Service career to rely upon the forecasts of the Meteorological Officers attached to the RAF. Then, accurate meteorological information was often a matter of life or death, particularly during the Second World War when aircraft had to be sent on long operational-flights and brought safely back to a clear landing-ground.

The requirements of the yachtsman are, in some ways, similar to those of the

airman. He likes to have an accurate forecast of the weather to be expected within the next 12 hours or so, but information as to what to expect within the next 2 or 3 days is also important to all who make open-sea passages, whether under sail or power.

Let us first look at the picture from the point of view of inshore racing which may embrace anything from a single race to a major regatta such as Cowes Week. Here is one aspect of it. Just after the war I started a class for youngsters up to the age of 18, the sole aim of which was racing. Naturally the competitors want to know what to expect in the way of weather, but the officials organizing the race also have a responsibility. They want to know whether it is safe to send off perhaps 50 boats crewed by 100 youngsters for a contest lasting 2 or 3 hours. During that period, as we all know, the weather anywhere round the coast of Great Britain can change a good deal. The organizers don't want to have to cope with 20 or 30 capsized boats and double that number of boys and girls in the water.

This applies equally to any dinghy or small-boat class, although sailed by adults. Of course they all wear life-jackets nowadays, but there is always the spectre of exposure, especially early in the year when the water is cold. Apart from the safety aspect, race committees confronted by a thick fog, or a flat calm, are anxious to know when it is likely to clear, or whether to expect a breeze later in the day. Should they cancel the race or postpone it? Much the same information is required by the man pottering about, day sailing, fishing or taking his family for a trip in comparatively sheltered waters. Even the Solent can be a nasty place for a small boat caught out only a few miles from home.

During the yachting season, yachts of all sizes, some very small, are engaged in coastal cruising. For instance, a yacht on passage from Poole to the West Country has to round Portland Bill, rightly dreaded for its treacherous race and roaring tidal streams. The prevailing south-westerly then entails a beat to windward of some 40 miles across Lyme Bay. This is quite an undertaking for a small yacht, the crew of which may consist of two men and their wives, or even a man, his wife and a couple of teenage children.

Needless to say the shipping forecasts play a great part in ventures of this kind. I well remember making passages such as those mentioned above in the days before the radio became part of our normal lives. We studied the weather portents, such as they were, and if one's judgement proved wrong, then it was a case of either sticking it out or running for shelter. In those days it was unusual to find women aboard cruising yachts, now we accept their presence as a matter of course. It may therefore safely be said that the shipping forecasts have made possible family cruising in small craft.

When cruising further afield, the shipping forecasts take the yachtsman to the delights of the Brittany coast, to the Bay of Biscay and the north coast of Spain in the south, and to Norway, the Faeroes or even Iceland in the north. I have crossed the North Sea many a time, and I have no hesitation in saying that for small craft (even big yachts are really small craft), it can be very unpleasant. I always breathe a sigh of relief when I am safely on the other side. I should never dream of starting without a favourable weather forecast.

Finally we come to ocean racing. If yachts are entered for a race, usually over 200 miles, their owners and crews must be prepared to spend at least 48 hours at sea. The organizers of ocean races therefore start the race whatever the weather conditions, and leave it up to the skippers of the yachts to decide whether they start or not. Having done so, it is up to them to decide whether they continue the race, having regard to the meteorological information received over the radio and their own knowledge and judgement of conditions as they see them. A forecast of what weather is likely to be expected within the next 2 or 3 days is, therefore, of the greatest value to such yachtsmen. I am glad to be able to say, that general information about the further outlook, in addition to the 24 hour forecast is available nowadays thanks to the Meteorological Office shipping forecasts as broadcast by the BBC.

As a result of cruising and ocean racing in the years immediately following the war it became apparent to me that the shipping forecasts, as then broadcast, although accurate enough, could be improved, particularly as regards presentation. As the representative of the Royal Yachting Association I was fortunate to be able to attend conferences at which all interests including the Meteorological Office and BBC were represented and where I was able to make my views known. I discovered that yachtsmen had much in common with coastal shipmasters and other users of the shipping forecasts and I received a great deal of support for my ideas.

It was unusual, 20 years ago, for a shipping forecast to be preceded by a general synopsis. Most seamen would agree that this should invariably be done, as it is at present, so that a listener, whoever he is, can thus have a picture of the general weather pattern. This I have always found a great help, because sometimes one is actually experiencing the conditions being forecast. It is important then to take note of forecasts of weather in adjacent areas so that one knows what to expect.

More than once I have realized that bad weather was on the way, although rightly not specifically forecast for the area in which I happened to be. On one occasion, when passing through the Alderney Race bound for Belle Ile (Bay of Biscay) the windward area forecast told me that I was heading for really bad weather. It was midnight, and I decided that the best thing to do was to make for St. Peter Port, which I entered at 0530 in a south-westerly wind of Force 7 which, within a few hours, increased to Gale Force 8 and 9. I was stormbound there for three days.

On other occasions a grasp of the general weather picture has enabled me to slip into some port of refuge instead of having to claw off a lee-shore, or to ride it out at sea which is not much fun. Force 6 is rightly known as a 'yachtsmans' gale', and it is too much for many small cruisers especially those which may be somewhat lightly manned either by a family crew, or perhaps by an inexperienced complement. The weather is thus doubly important to such craft.

In the early days of post-war shipping forecasts, it was customary to group the areas which had similar weather regardless of their position. This was very off-putting for the listener. After a meeting attended by representatives of all concerned it was agreed that only adjoining areas should be grouped such as Cromarty, Forth, Tyne; or Wight, Portland, Plymouth. This was a useful step forward.

At that time the announcer would begin reading in no particular order, and the listener had therefore to be extremely alert to catch the desired information. The suggestion was then made that shipping forecasts should always be read clockwise starting from the North; this appeared to be sound sense to everyone and it has since been the accepted practice.

At that time the BBC shipping forecasts were also broadcast on the medium wave and it was difficult and sometimes impossible for them to be received in some of the more distant areas. As a result of a further general conference, which was a very fruitful one, the wavelength of 1500 metres was adopted by the BBC for broadcasting the shipping forecasts. It was also agreed that actual reports of wind, weather and pressure from a selection of light vessels and meteorological reporting stations on the coast should be included in the bulletin. This arrangement is very useful; it is often illuminating when, for instance, approaching Portland Bill from the eastward to hear what the weather is like there and, if need be to let discretion be the better part of valour and put into a Solent port or into Poole until conditions improve.

The Meteorological Office has always been under a certain amount of pressure from the BBC to keep the weather bulletins as brief as possible because they tend to interfere with popular broadcast programmes and are only of interest to a relatively small group of listeners. The forecasters' difficulty in condensing complicated weather situations for the whole country into a relatively few words has led to these bulletins being read somewhat fast at times, with the result that it is difficult to write down, even in an abbreviated form, the required information which may prove vital to the yachtsman (*see* photograph opposite page 24).

The recent arrangement whereby certain repetitive words are cut out of the bulletin has helped both the broadcaster and listener. It is not everyone who can do shorthand, and not every shorthand writer can take 120 words per minute. I therefore bought a cheap tape-recorder. Although this meant another piece of apparatus, it is a great help. An alternative method* is, of course, to make out a table under the headings of the various forecast areas around the coast, with columns for setting down, in some simple pre-arranged abbreviations, various elements of the forecasts as they are read out.

Another useful item aboard a yacht is a reliable alarm clock. It is so easy to look at the clock at say 1745 and to think that there is no need to switch on the radio for another 10 minutes, only to look again at 1805 to realize that it is too late, that night is coming on, and that the last shipping forecast was at midday. If the weather appears to be getting worse, the skipper on passage is then in a dilemma as to whether he should make for some convenient port, or to press on regardless.

It is before sailing on a long passage that forecasts are so important. I usually start listening at home 24 hours beforehand, and, as it is a motor run of some 2½ hours from my home to my yacht, it pays to have a wireless set in the car. If, before going on board, I am at all uncertain I telephone the nearest Meteorological Office for a special forecast. I explain what I propose to do, and I have always found the forecasters, both men and women, very co-operative. Occasionally, at a place like Southampton, he or she, is also interested in yachting which is a great help. These special forecasts are extremely valuable because they are up to the minute; but, once at sea, one has to rely upon what comes over the air.

There is one forecast, in particular, that is very important. That is the latest one at night upon which the cruising man has to make up his mind, before turning in, whether to start his passage at 0500 or perhaps earlier on the following morning. It was therefore with consternation that we heard that the midnight shipping forecast would, in future, be put on to 0200. Fortunately my idea of a coastal forecast commended itself both to the BBC and the Meteorological Office and we now have a quick survey of coastal weather at 2345 which is enough to enable yachtsmen to decide whether to make an early start or to wait for the 0645 bulletin. How much better this would be if we could have it at 2230 to allow 6 hours sleep before a 0500 start. That would be a great boon to yachtsmen and perhaps one day we may get it.

The R/T forecasts broadcast by the GPO coastal stations primarily for merchant shipping are substantially similar to those of the BBC but, being transmitted at different times, they fill some of the gaps. The weather bulletins at 2003 or 2033 GMT are a great help to the early starter. A special type of radio receiver, which many yachts have on board, is necessary in order to receive them.

There are many occasions when an intelligent interpretation of shipping forecasts can be put to good use, particularly when ocean racing. I well remember, on a Channel race, realizing, from the 1800 forecast, that a change of wind might be expected in about 8 hours' time. I therefore told my navigator to make sure that we were in position to take full advantage of it. This was regarded as something of a gamble, but, in the event, it paid off. We got our free wind and won the race, or shall I say the Meteorological Office won it for us. It so happened that no other skipper had spotted it.

While cruising in my yacht, whether in harbour or at sea, we seldom miss a shipping forecast. We thus always have in our minds the general trend of the weather, and it is the trend that is so important. In other words, is the weather going to get better or worse? That is putting it in the simplest possible terms. If it is going to get better, is there going to be any wind? Of course the owner of a motor yacht does not have to worry about wind unless it is very strong, but, for every motor yacht, there are a dozen or more which rely upon sail. If it is going to get worse, it does not

* PHILPOTT, L. B.; On the Recording of the Weather Bulletins for Shipping, Broadcast by the B.B.C. on 1500 m. in the Light Programme. *Mar. Obs.*, London, 34, 1964, p. 87.

matter whether power or sail—how much worse is it going to be, what should be done about it and when? The answer is probably to be found in the next shipping forecast. It is very important, therefore, that shipping forecasts should be broadcast at about 6-hourly intervals.

In these latitudes the weather can change a good deal in 6 hours, and it is no uncommon thing to hear the announcer say "Here is the shipping forecast for the next 24 hours", and in 6 hours' time come up with something different. That does not mean to say that the first broadcast was wrong; it means that the meteorological picture has changed since the last synoptic chart.

It has given me great pleasure, as a yachtsman, to have this opportunity to write this article. I have been able to pay a tribute to the wonderful service given by the Meteorological Office day in, day out, year in, year out. Occasionally, due to freak conditions, the forecast may, locally, be wrong. The 999 times when it is right are forgotten by the few who, hoping to enhance their stature, seize upon the slenderest opportunity to gloat over any apparent failure. The Meteorological Office has one consolation; the ignorant blame the BBC! All honour to the BBC who, come hell come high water, get the forecast to us—for the brilliant work of the announcers and for the uncanny reliability of their transmitters.

551.507.25 : 551.46

THE VISIT OF THE RUSSIAN OCEANOGRAPHIC RESEARCH SHIP "NIKOLAY ZUBOV" TO THE THAMES

On 23rd September 1965, as members of the Meteorological Office staff working on radiation and on ocean currents and ice respectively, we had the pleasure of visiting the Russian oceanographic research vessel *Nikolay Zubov* when she was anchored in the Pool of London (*see* photograph opposite page 25). The visit was organized by the Hydrographer of the Navy and we were taken aboard by the motor launch of H.M. Survey Ship *Vidal*.

On arrival aboard we were impressed with the ship's spacious wooden decks and the quality of her specialized equipment such as current meters, oceanographic winches and navigational gear. Cabins, laboratories and chart rooms all had a very orderly and restful atmosphere which was rather impressive. Electrical and hand calculating-machines were provided for working-up data.

The navigational equipment was similar to that which would be found in a British ship doing similar work. There were three echo sounders. The instrument sounding down to 500 metres was accurate to within a metre and there was a deep sounder that went down to 5,000 metres. The ship was equipped with twin variable-pitch propellers which were particularly useful when manœuvring for oceanographic soundings; she did not however have a transverse thrust propeller in the bows as fitted in R.R.S. *Discovery*.

We were shown a Russian designed wave recorder which observed waves by a pressure element beneath the sea surface but the manner in which allowance was made for the ship's own motion was not clear. We saw well-designed current meters for working at great oceanic depths and for shallow water and rivers; these instruments have a magnetic coupling between a digital recorder and the impeller. We also saw a very strongly made bathythermograph of the Spilhaus-Miller type but which was apparently lowered vertically and did not 'swim' as the American instrument does.

Sea surface temperature, wet and dry-bulb temperatures, and wind force and direction are recorded electrically in a meteorological laboratory which was also provided with Russian-designed facsimile apparatus, and a radio teletype for receiving meteorological transmissions. Complete synoptic charts can thus be readily available aboard the ship. The wet and dry-bulb thermometers are exposed in a

screen of the Stevenson type placed centrally, well forward of the bridge and about 12 feet above the deck. The relative surface wind speed and direction are measured at about the same height some 10 feet forward of the thermometer screen. The cup anemometer is very light and sensitive but can be protected against the worst weather by a remotely controlled retractable shield. To measure the relative wind direction a windmill type instrument is used; the wind turns two opposing windmills which in turn rotate the housing until the plane of the windmill vanes is parallel to the wind direction. This device is useful in a ship since it smooths out many of the quicker oscillations shown by a wind vane.

For radiosonde ascents a compact transistorized instrument is provided. For inflating the balloons helium or hydrogen is used and the cylinders—on this occasion filled with helium—were kept in a steel chamber near the stern of the ship and the gas was piped to external taps situated in a canvas covered shelter.

There were instruments for measuring the intensity of solar radiation on a horizontal surface and also the intensity of the direct radiation but there was no evidence that routine recording was attempted. It was also stated that measurements of the radiation balance could be made but there were no instruments for this on board during the present cruise.

R.H.C. and G.A.T.

Editor's note. The *Nikolay Zubov*, named after the Soviet oceanographer Professor N. N. Zubov (1886–1960) was built in 1964. She has a length of 90 metres and a displacement of 3,020 tons. She has twin screw and diesel engines, her maximum speed being 16.7 knots.

The ship has laboratories for hydrographic, computational and meteorological work, chemical analysis, hydrology, photography and aerologic observations. She is also equipped with air conditioning and distilling plants. Her total complement is 108 crew and scientists.

These details were supplied by the Hydrographer.

551.326.7(261)

NOTES ON ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM JULY TO SEPTEMBER 1965

JULY

Canadian Arctic Archipelago. Although there was more open water than usual in the extreme west, off Banks Island, conditions elsewhere were roughly normal.

Baffin Bay. In the extreme north and north-west with generally lower than average temperatures there was rather more close pack-ice than usual but in the south of the area both air and sea temperatures being about 2°C above normal, melting continued slowly.

Foxe Basin and Hudson Bay. Conditions generally were normal over both these areas although at the beginning of the month break-up of ice was slightly behind in the extreme north of Foxe Basin and ahead in the north-west of Hudson Bay.

Hudson Strait. With sea slightly warmer than usual break-up was ahead of normal.

Davis Strait, Labrador Sea, Great Bank and East Newfoundland Coast. Over most of this area south-westerly winds predominated and both air and sea temperatures were 1–2°C above normal—in some places, e.g. just off the south-west of Greenland, up to 4°C warmer than usual. As a result there was, apart from a little pack-ice early in the month in the north of the Davis Strait and some icebergs off the Greenland and Canadian coasts, practically no ice.

Greenland Sea and Denmark Strait. A strong northerly wind persisted over this area especially near the north-east coast of Greenland. There was much more pack-ice than usual particularly between the latitudes 75° and 66°N. The sea to the north-west of Iceland had unusually large concentrations of ice.

Spitsbergen. Here the southern edge of the ice was perhaps 120 n. miles further south than usual. Sea temperatures were 2°C below normal.

Barents Sea. Mostly normal conditions were experienced here.

AUGUST

Canadian Arctic Archipelago. West of 125°W there was throughout more open water than usual with temperatures about 2°C above average but elsewhere the break-up of ice started slowly. By the end of the month however conditions became normal.

Baffin Bay. Temperatures, especially in the north, being below normal, many areas which in August could be expected to be ice-free, retained a large area of open to very close pack-ice.

Foxe Basin. Although the area generally was 2–3°C cooler than usual, break-up of ice probably due to rather strong winds from the north-east, proceeded at the usual rate with large areas of open water evident on the east coast by the end of the month.

Hudson Bay and Hudson Strait. Some pack-ice entered the Hudson Bay from the Foxe Basin under the influence of the strong north-north-east winds. Strong north-easterly winds caused more ice than usual to persist in the south of the Hudson Bay. In the Hudson Strait melting was slightly ahead. There were a few icebergs.

Davis Strait. Temperatures, both air and sea, being generally above average, especially away from the coasts, pack-ice was less than usual and such as there was mostly cleared by the end of the month. However icebergs were present on the west Greenland coast (land stations reported 16–50 in places) but on the Canadian side of the Davis Strait numbers were small.

Labrador Sea, Great Bank and East Newfoundland Coast. In much of this area sea temperatures were at least 2°C higher than usual—in some places more than this—and there was little or no pack-ice and very few icebergs. One berg in isolation, however, was reported during the middle of the month at 54°N, 47°W—almost as far east as ever recorded in this latitude at this period of the year and close to the Belle Isle/Inishtrahull Great Circle route.*

Greenland Sea, Denmark Strait and Spitsbergen. Very much more pack-ice than usual was reported over the whole of this area as far south as 66°N in the Denmark Strait and also near Spitsbergen.

Barents Sea. There was rather more ice than usual northward of Novaya Zemlya but otherwise conditions were roughly normal.

Table 1. Icebergs sighted by merchant ships in the North Atlantic
(This does not include growlers or radar targets)

LIMITS OF LATITUDE		DEGREES NORTH										
		66	64	62	60	58	56	54	52	50	48	46
Number of bergs reported south of limit	JULY	*	*	*	*	*	> 126	> 46	> 20	2	0	0
	AUGUST	*	*	81	74	55	39	12	2	0	0	0
	SEPTEMBER	*	*	*	16	14	9	4	3	0	0	0
	Total	*	*	*	*	*	> 174	> 62	> 34	2	0	0
LIMITS OF LONGITUDE		DEGREES WEST										
		66	64	62	60	58	56	54	52	50	48	46
Number of bergs reported east of limit	JULY	*	*	*	> 126	> 76	39	3	2	0	0	0
	AUGUST	81	77	62	41	24	14	5	4	1	1	0
	SEPTEMBER	*	16	15	8	5	4	0	0	0	0	0
	Total	*	*	*	> 175	> 105	57	8	6	1	1	0
Extreme southern limit	JULY	49° 52'N 50° 37'W on 2.7.65										
	AUGUST	50° 55'N 54° 46'W on 17.8.65										
	SEPTEMBER	51° 47'N 56° 01'W on 8.9.65										
Extreme eastern limit	JULY	49° 52'N 50° 37'W on 2.7.65										
	AUGUST	54° 24'N 47° 48'W on 17.8.65										
	SEPTEMBER	51° 51'N 55° 50'W on 7.9.65										

* Probably large numbers, but none sighted in excess of those reported in further south positions or in further east positions.

> ("greater than") has been inserted where there is some doubt as to the actual number of icebergs at some of the sightings, but the true value is probably greater than the value given.

Extreme limits during the 3-month period are underlined.

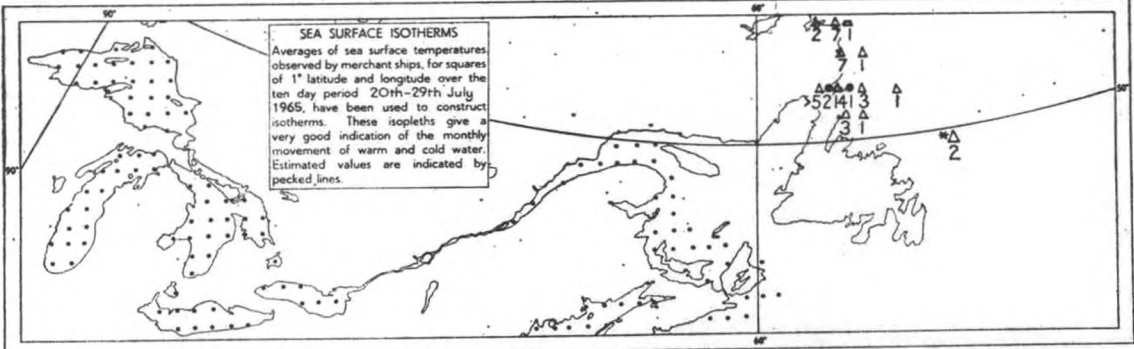
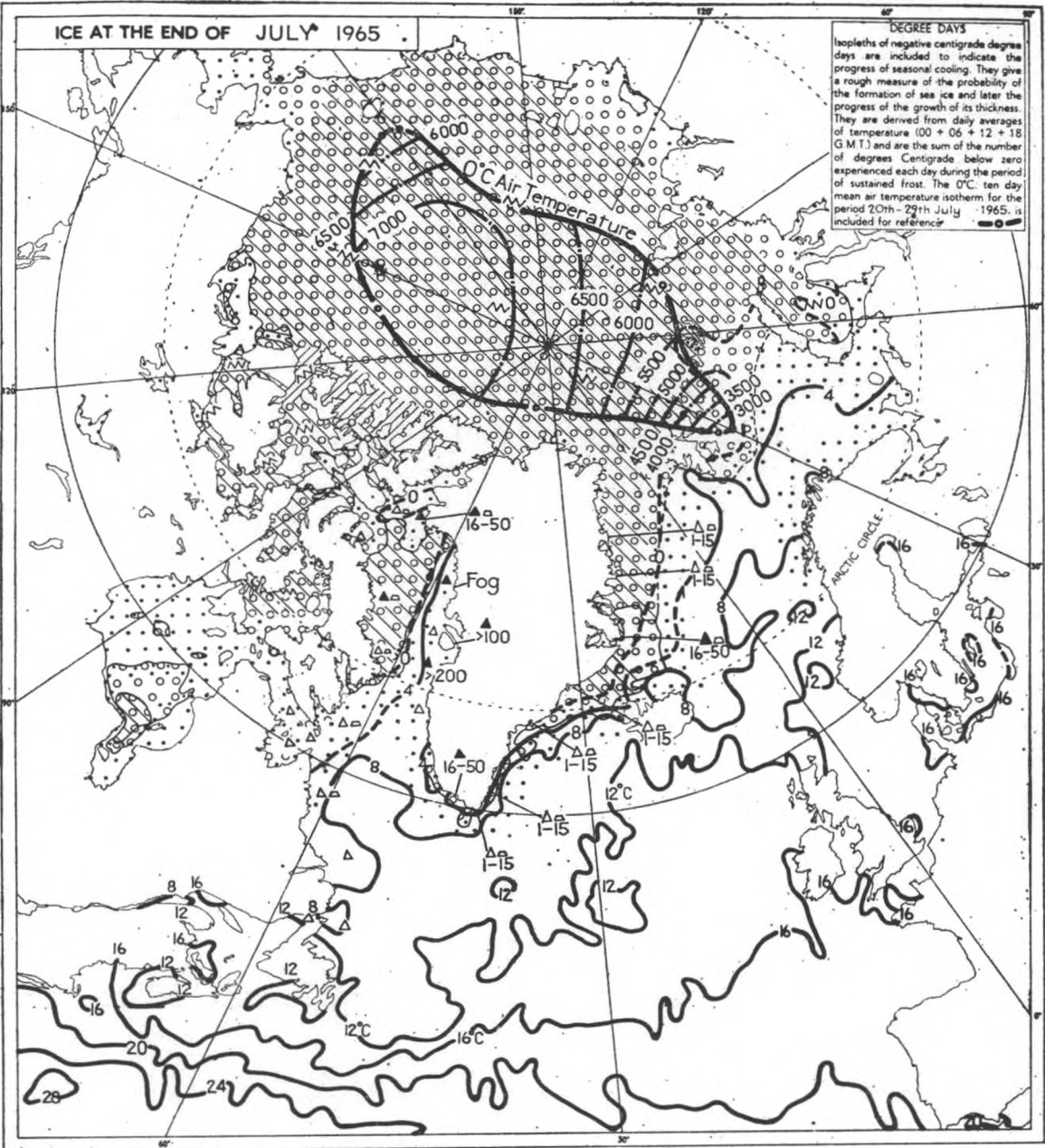
SEPTEMBER

Canadian Arctic Archipelago. Although in the extreme west (i.e. west of 125°W) there was more than average open water, over most of this area freezing proceeded rapidly with new-ice formation ahead of normal by the end of the month.

Baffin Bay and Davis Strait. Over much of this area conditions were roughly normal but in the north-west, with sea temperatures on the low side, there was an unusually large area of ice, particularly off Baffin Island. This area is normally free of pack-ice in September. A large number of icebergs were also reported in the extreme south just off the Greenland coast; land stations reported more than 100.

Foxe Basin, Hudson Bay and Hudson Strait. A strong north to north-westerly wind persisted over these areas throughout the month and had the effect of driving pack from the south of the Foxe Basin into the northern parts of Hudson Bay and the Hudson Strait, over which both sea and air temperatures were about 2°C below normal. No pack-ice, however, was reported in the Hudson Bay or Strait apart from that drifting south from Foxe Basin.

* Editor's note. It shows that you never know with icebergs on this trade!



<p>Open water</p> <p>Lead</p> <p>Polynya</p> <p>New or degenerate ice</p> <p>Very open pack-ice (1/10 - 3/10 inc.)</p> <p>Open pack-ice (4/10 - 6/10 inc.)</p> <p>Close or very close pack-ice (7/10 - 9+/10 inc.)</p> <p>Land-fast or continuous field ice (10/10) (no open water)</p>	<p>Ridged ice</p> <p>Rafted ice</p> <p>Puddled ice</p> <p>Hummocked ice</p> <p>(The symbols for hummocked and rafted ice etc., are superimposed on those giving concentration)</p> <p>* Extreme southern or eastern iceberg sighting</p> <p>Ice depths in centimetres</p> <p>Snow depths in centimetres</p>	<p>Y Young ice (2" - 6" thick)</p> <p>W Winter ice (6" - 61" thick)</p> <p>P Polar ice (> 61" thick)</p> <p>A suffix to YWP indicates the predominating size of ice floes</p> <p>s small (11 - 220yd.)</p> <p>m medium (220 - 880yd.)</p> <p>b big (4 - 5miles)</p> <p>v vast (> 5miles)</p> <p>c ice cake (< 11yd.)</p> <p>Known boundary</p>	<p>△ Few bergs (< 20)</p> <p>▲ Many bergs (> 20)</p> <p>▽ Few growlers (< 100)</p> <p>■ Many growlers (> 100)</p> <p>● Radar target (probable ice)</p> <p>Against iceberg, growler or radar target symbols the date of observation may be put above and the number observed below</p> <p>■ Position of reporting station</p>	<p>--- Radar boundary</p> <p>--- Assumed boundary</p> <p>--- Limit of visibility or observed data</p> <p>--- Undercast</p> <p>++++ Cracks</p> <p>++++ Isoleths of degree days</p> <p>--- 0°C air temperature isotherm</p> <p>--- Max. limit of all known ice</p> <p>--- Max. limit of close pack ice</p> <p>--- Min. limit of close pack ice</p>	<p>Estimated general iceberg track. Very approximate rate of drift may be entered</p> <p>Observed track of individual iceberg.</p> <p>Approximate daily drift is entered in nautical miles beside arrow shaft</p> <p>Note:- The plotted symbols indicate predominating conditions within the given boundary. Data represented by shading with no boundary are estimated.</p>
---	---	---	--	--	--

Labrador Sea, Great Bank and East Newfoundland Coast. No pack-ice was reported from any of these areas and only scattered icebergs were apparent. Sea temperatures were beginning to fall rapidly and by the end of the month were generally below normal, perhaps 1–2°C but off Newfoundland were as much as 4°C below the average.

Greenland Sea and Denmark Strait. A strong north-easterly gradient was maintained during the month with air temperatures falling well ahead of the seasonal timetable. North of about 70°N, however, ice amounts were pretty much as usual but off the north-west of Iceland by the end of the month the south-eastwards extent of the ice was probably the greatest for September recorded this century. Many bergs were also reported off the south-east Greenland coast north of 64°N, though the numbers were generally normal.

Spitsbergen. Near the west Spitsbergen coast very open pack-ice moved at about 77°N. Both air and sea temperatures were about 2–3°C below the normal.

Barents Sea. In the north-west near Spitsbergen there was more ice than usual but elsewhere and as far east as Novaya Zemlya conditions were normal or even slightly warmer than the average with no ice reported at all.

Note. The notes in this article are based on information plotted on ice charts each month similar to the map opposite, but on a much larger scale (39 in × 27 in). They are available at the price of reproduction on application to the Director-General, Meteorological Office (Met.O.1), Eastern Road, Bracknell, Berks. Alternatively, they may be seen at any Port Meteorological Office or Merchant Navy Agency.

N. B. M.

AUSTRALIAN EXCELLENCE AWARDS

(From the Director of Meteorology, Commonwealth Bureau of Meteorology, Australia)

In keeping with their continually expanding Voluntary Observing Fleet, the Australian Bureau of Meteorology has allocated an increased number of Excellence Awards for the year 1964. Three awards, now to be granted annually, have been presented to m.v. *Port Melbourne* of the Port Line Ltd., m.v. *Bulolo* of Burns Philp Ltd. and m.v. *Koolama* of Western Australian State Shipping Service. The awards take the form of framed and inscribed pictures of Australian scenes.

The three award-winning vessels give a representative cross-section of the Australian Voluntary Observing Fleet as m.v. *Port Melbourne* operates on the Australia—Great Britain—Continent run, m.v. *Bulolo* plies from eastern Australia to New Guinea and adjacent Pacific Islands and m.v. *Koolama* is engaged in the Australian coastal trade.

The number of ship's reports being received by the Commonwealth Bureau of Meteorology has increased dramatically over the past few years, and much more rapidly than increase in numbers of recruited ships. Ship's officers appear to have a growing appreciation of the usefulness of these reports, particularly since the inception of Australian Port Meteorological Agents five years ago.

Book Reviews

The Physical Geography of the Oceans by C. H. Cotter. 8½ in × 5½ in, pp. 317, illus., Hollis & Carter Ltd., 10 Earlham Street, Cambridge Circus, London, W.C.2, 1965. Price: 35s.

It is strange to reflect that, though more than three-quarters of the world's surface is covered by sea, man, in his preoccupation with finding his way across and around it for the furtherance of trade, has until comparatively recently, done little to study what lies beneath it, except to cast nets for fish or to hide his death carrying submarines there.

The Physical Geography of the Oceans is a concise introduction to oceanography written, the author tells us, principally for sixth-form students, first-year university undergraduates reading geography and candidates preparing for Board of Trade examinations. The author's triple qualifications of Master Mariner, Nautical Teacher and Graduate in Geography have given him the happy ability of writing a technical book in readable fashion and there is little doubt that his work will find favour with the mariner who wants to learn as well as to read.

Going right back to the account of the Creation as documented by Moses, the author spends a few pages on some of the early ideas of the structure of the Universe; it is surprising to read that the belief that the earth was spherical was born as early as the 6th Century B.C. and in the following century the famous Pythagoras had actually proved this, to his own satisfaction. He also is credited with being the first thinker to be interested in the possibility that the earth revolved around the sun. From there we read through chapters on the distribution of land and sea over the globe, the origin and character of coastal and island formations and the nature of the ocean bed. The last named is particularly interesting for, though in a somewhat oblique way, the ships officer is often interested in the nature of the bottom when in soundings. The author quotes an 18th Century manual concerning the navigation of the English Channel as saying "Black stones are to be found near the Scilly and nowhere else in the Channel . . . fine sand interspersed with black specks and hake's teeth are to be found in the fairway up-Channel". Such knowledge is probably of much less practical value to the mariner today than it would have been in the days of sail and the deep sea lead, but the nature of the sea bed is still of vital interest to the marine biologist in respect of its role as a habitat for certain forms of marine life. The story of the laying down of the ocean bed is a fascinating one and one finds that in this vast project winds and temperature have played, and are still playing, no small part: the floor of the deep in the vicinity of the Cape Verde Islands, for instance, is largely Sahara sand blown out to sea by the north-east trade wind and the banks off the north-east coast of North America probably owe their existence to material brought down in the Labrador current by southbound icebergs and released when warmer water was met.

The two chapters on the constitution of sea water and life in the sea also make fascinating reading and here again there is a connection with the everyday life of a shipmaster, be it ever so tenuous; the former in connection with the Load-line Regulations and the latter with the incidence of discoloured water so familiar to mariners in tropical waters. "The sea", the author tells us "in terms of potential food production, acre for acre, is capable of producing almost as much organic material as that produced by the land" and on the conservation of life in the sea and the systematic farming of the sea and the harvesting of plankton, future generations may well be largely dependent for their food supply, a point which we, on behalf of the National Institute of Oceanography, have so often mentioned in our letters to shipmasters.

The chapter "Weather and Climate over the Oceans" could, of itself, form a very competent introduction to maritime meteorology for the various factors which affect the pressure and wind systems of the world, the distribution of air and sea temperatures over the oceans, evaporation, precipitation, fog, air masses and fronts are all concisely treated in 24 pages which also include short descriptions of the world's major wind systems.

Of particular interest to the Voluntary Marine Observer will also be the chapter on "The Causes and Effects of Ocean Currents" for here are described in masterly fashion the relationship between winds and surface currents and the roles played by friction between adjacent water masses, upwelling, subsidence and the configuration of the land and the sea bed. One can thus grasp the three-dimensional nature of an ocean current.

Tides and related phenomena are also treated in a very useful chapter.

A brief review of the instruments used in oceanographical research, from the hand lead and the 15th Century bathometer to the present day electronic current meter and the underwater television camera is given and the author concludes with a chapter "The History and Progress of the Science of the Sea" which gives a brief survey of the oceanographical work which has been done up to date; its beginning goes back little further than Captain Cook and it did not really get underway until the famous 4-year voyage of the *Challenger*, 1872-76.

This last chapter appears not to have been given the same meticulous attention

as was given to the main body of the work. For instance, Captain Scott's last ship is called *Discovery* instead of *Terra Nova* (a common mistake amongst the laity); the Royal Research Ship *William Scoresby* is referred to as R.S.S. *Scoresby* and we are told that seven ocean weather stations were established in the North Atlantic in 1947 to which Great Britain contributed two ships. Actually 13 stations were established and Great Britain maintained two of them with four ships. Perhaps also, the author should have mentioned that five ocean weather stations were set up in the North Pacific about the same time; two manned by Japan, two by the U.S.A. and one by Canada. The number of North Atlantic stations has since been reduced to nine, though Great Britain's contribution remains the same, whilst the North Pacific stations are now three in number with a fourth during the hurricane season only.

One would like to have seen also, in the last chapter, some mention of the band of enthusiastic amateurs, known collectively as the Corps of Voluntary Marine Observers, who by entering in their meteorological logbooks observations of luminescence, discoloured water and marine life and collecting specimens for analysis are making a valuable, though unspectacular, contribution to the science of oceanography.

These, however, are but minor irritations and should not be allowed to detract from the undoubted interest and readability of the book.

L. B. P.

Physics of the Marine Atmosphere by H. U. Roll. Vol. 7 of International Geophysics series, edited by J. Van Mieghem. 9½ in × 6½ in, pp. viii + 426, *illus.*, Academic Press Inc., New York (London Office: Academic Press Inc. (London) Ltd., Berkeley Square House, London, W.1), 1965. Price: £5 7s. 6d.

In view of the rapid increase of interest in marine weather the recent publication of this excellent book is most opportune. Mariners, meteorologists and, now, landlubbers professionally marooned on oil drilling rigs in the North Sea, not to mention the ever expanding number of scientifically minded yachtsmen and ocean racers, will welcome this comprehensive yet highly readable monograph of the physics of the marine atmosphere. Once again we profit from the experience of the Seewetteramt at Hamburg as the author, so long associated with it, describes the physical processes at the ocean-atmosphere boundary.

In his preface Professor Roll give his reasons for emphasizing physical rather than geographical aspects of the subject. He discusses the influence of the sea surface on the properties of the atmosphere above it and devotes some considerable attention to the thermodynamics of the problem as well as to the chemistry, electricity and radio-activity of the marine atmosphere. Inevitably he makes no attempt to avoid mathematical methods in developing his arguments but since the results of such analyses are very clearly set out in the many graphs, diagrams and tables, laymen need not, therefore, be put off.

Early chapters deal with the basic problems of meteorological observations at sea and of the difficulties of instrumentation, the pros and cons of the various methods of obtaining sea temperatures being freely discussed. In an extended treatment of the content of the marine atmosphere the author pays very generous tribute to the work of brother meteorologists, especially those from Britain. A feature of the whole book is its wealth of reference—no fewer than 600 separate papers and books are mentioned in the index.

The section on the geometry of the sea surface and of the inter-action between wind profiles and wave formation is lucidly written and should be of special value to those forecasters engaged in weather watch for the oil companies now operating in the North Sea and should also enlarge the background knowledge of those preparing more traditional 'shipping bulletins'. An exhaustive exposition of the wind

variations over the sea surface follows and here the author almost enters the realm of climatology.

A very large proportion of the book is devoted to the thermodynamic processes involved and of particular interest in this connection is the author's treatment of cloud structures in relation to irregularities in sea surface temperatures. In his dealing with the physics of sea fog he convincingly challenges earlier but incomplete theories of the necessary heat exchanges and later explains both diurnal and annual variations in air and sea temperatures and their differences.

The general turnout of the book is excellent and, as has been indicated above, the set out of the graphical work is first class. It is, however, a pity that the reproduction of the few photographs included is not quite up to this high standard. The English throughout is impeccable, the author in his preface paying a warm tribute to his wife for her help in this connection.

The reviewer considers himself fortunate to have had the opportunity of studying such a worthwhile publication during his first days in the Marine Division of the Meteorological Office.

N. B. M.

Personalities

OBITUARY.—We regret to record the death in Wellington, New Zealand, of CAPTAIN D. B. BRITTAIN, master of the *Turakina*.

Dean Barrie Brittain was born in Hull in August 1912 and joined the New Zealand Shipping Company as 4th Officer of their *Piako* on 10th December 1937 having previously served with Messrs. H. Hogarth and Sons. He passed for Master in May 1943 and was appointed to his first command, the *Paparoa* in January 1953.

During the war Captain Brittain was 3rd Officer of the *Remuera* when she was attacked and sunk by a torpedo-carrying aircraft off Kinnaird Head on the morning of 26th August 1940.

His record of voluntary observing goes back to 1938 when he sent us his first meteorological logbook from the *Ruahine*. Thereafter, in 11 years, he sent us 16 logbooks, 13 of which were classed 'excellent'.

He was nominated for Excellent Awards in 1954 and 1965. Unhappily he did not live to receive the latter but his widow has received it for their daughter, Jane Catharine, who was baptised from the bell of her father's first command, the *Paparoa*.

We extend our sincere sympathy to them both.

L. B. P.

OBITUARY.—The death of CAPTAIN GORDON RAMAGE on Wednesday, 23rd June 1965, whilst in command of the *Cilicia*, owned by the Anchor Line, is noted with deepest regret.

Captain Ramage died on the bridge of his ship whilst she was on passage from Glasgow to New York only nine days after he had volunteered to have the *Cilicia* recruited as a Selected Ship.

A native of Dumfries, Gordon Ramage first went to sea in 1922, sailing out of Ayr aboard the *Ussa*. On obtaining his 2nd Mate's Certificate in 1930 he joined Messrs. McLay & McIntyre Ltd., being appointed 3rd Officer of their *Ingola*, and in 1934 was transferred to the *Uganda* as 2nd Officer. He was promoted to Chief Officer of that ship in the same year and obtained his Master's Certificate in 1935. In 1937 he joined the Anchor Line in which service he remained until the outbreak of war, when he was appointed to the Armed Merchant Cruiser *Transylvania* as Lieutenant R.N.R., remaining aboard that ship until she was sunk by enemy action in August 1940. He was then posted to the Royal Air Force as Navigation Instructor.

In December 1945, he was released from the RAF and rejoined the Anchor Line as Chief Officer. Captain Ramage was appointed to the command of the *Tarantia* in 1956, and from then onwards commanded several of the Anchor Line's ships.

Captain Ramage was a keen voluntary observer, and no matter how busy he was with ship's business he was always ready to give a few minutes of his time to discuss the work of observing. His record as a voluntary observer dates back to 1938, when he sent a logbook from the *California*. Since that year 30 logbooks bearing his name have been classified as 'excellent'. His name appears in the Excellent Award lists for the years 1939, 1957 and 1963 for observations made aboard the *Caledonia*, *Tarantia* and *Eucadia*.

We extend our condolences to his widow and family in their sad bereavement.

R. R.

RETIREMENT.—CAPTAIN T. W. F. BOLLAND, who was appointed Commodore of the Royal Mail Lines during his last voyage in command of the *Arlanza*, retired from the sea when he arrived in London on 27th August 1965.

Thomas William Fearne Bolland came from a seafaring family, his father, Captain L. W. Bolland having commanded various ships of the Royal Mail fleet, whilst his uncle was the Company's first special River Plate pilot. Captain Bolland served his apprenticeship with the Royal Mail and became 4th Officer in October 1924. He was appointed to his first command, the *Teviot*, on 5th December 1949 and commanded various ships in the fleet until his last command, the *Arlanza* in May 1961.

When 2nd Officer of the *Alcantara* in 1939, he transferred to Admiralty service when the ship was requisitioned as an armed merchant cruiser. In March 1942 he transferred to the Royal Naval Reserve and was later promoted to Lieutenant-Commander.

Captain Bolland's association with the Meteorological Office goes back to 1925 when he was serving in the *Darro* and in 20 years he has forwarded 43 logbooks, 12 of which were classed 'excellent'. He received an Excellent Award in 1958.

We wish him health and happiness in his retirement.

J. C. M.

RETIREMENT.—CAPTAIN W. K. HOLE retired in July 1965 when he brought the *Glenlyon* into London.

William Kenneth Hole was born in 1905 and received his early training in H.M.S. *Conway* which he joined in May 1920. He signed indentures with Messrs. Alfred Holt & Co. in May 1922 and was appointed to their s.s. *Eumaeus*. He remained in the Company for the whole of his 43 years' service.

He passed for Second Mate in July 1925 and was appointed 4th Officer of the *Protesilaus*.

He obtained his Master's Certificate in November 1930 and in July 1948 was appointed to his first command, the *Pydeus*.

Captain Hole sailed unharmed through the Second World War, in his own words "I never even got my feet wet", though he played his part in the landings in North Africa and Malaya. His association with the Meteorological Office goes back to 1928 when he sent us his first meteorological logbook from the *Euryades*; subsequently, in 13 years, he sent us a total of 45 meteorological logbooks and received Excellent Awards in 1933, 1961 and 1962.

We wish him health and happiness in his retirement.

L. B. P.

RETIREMENT.—CAPTAIN D. I. JONES, D.S.C., R.D., retired after 46 years at sea, 38 of them spent with the Pacific Steam Navigation Co., when the *Kenuta* arrived in Liverpool on 30th August last.

David Idris Jones first went to sea as an apprentice in the *Western*, owned by J. Mathias & Sons of Aberystwyth in October 1919 and passed for 2nd Mate in 1925. After short periods in the service in the Hain Steamship Co. and J. A. Billmeir, he joined the Pacific Steam Navigation Co. as 4th Officer of the *Orduna* in 1927, a ship in which he served in every capacity from 4th to Chief Officer. Obtaining his Master's Certificate in 1930 he was appointed to his first command, the *Albermarle* in 1935. He subsequently commanded many of the Company's ships, *Santander*, *Potosi*, *Cotopaxi*, *Reina del Mar* and the 50,000-ton tanker *William Wheelwright*, before his last command, the *Kenuta*. He was appointed Commodore Master of the Company in April 1962.

On the outbreak of war in 1939, Captain Jones was called-up to serve in mine-sweepers in the Bristol Channel area and detonated the first magnetic mine to be swept. He remained two years on these duties for which he was awarded the D.S.C. for "skill and determination during minesweeping operations". After a period at the RN Staff College, Greenwich, he became Staff Officer (Operations) to Sir Hugh Binney at Cardiff, engaged with preparations for the Normandy landings.

Captain Jones was honoured during the latter part of his career by being made an honorary pilot for the Panama Canal, a distinction given to only 30, including Presidents Roosevelt and Kennedy, during the past half-century; he has passed through the Canal 72 times. At Cartagena in Columbia he was the first Master Mariner to receive that country's Silver Scroll of Honour.

Captain Jones' record with the Meteorological Office dates back to 1933 when he sent us his first meteorological logbook from the *Orcoma*. In 18 years he has sent in 34 meteorological logbooks of which 7 have been classed 'excellent'.

We wish him health and happiness at his new home in Swiss Valley, Llanelly, overlooking Carmarthen Bay.

J. R. R.

RETIREMENT.—COMMODORE W. S. THOMAS retired from the sea last August when he brought the *Aragon* into London.

William Shephard Thomas was born in 1904 and received his pre-sea training in H.M.S. *Worcester*. In 1921 he signed indentures with the Glen and Shire Line and went to sea in their *Glenade*. He passed for 2nd Mate in 1924 and joined the Royal Mail Steam Packet Company, later to become the Royal Mail Lines, as 4th Officer of their *Desna*.

He passed for Master in 1930, sailed unharmed through the Second World War and was appointed to his first command, the *Lombardy*, in 1949. In 1964 he was appointed Commodore of the Royal Mail Lines.

Commodore Thomas' association with the Meteorological Office goes back to 1925 when he sent us his first meteorological logbook from the *Desna*. Thereafter, in 19 years, he has sent us 41 meteorological logbooks from 12 different ships. He received an Excellent Award in 1954 when he was in command of the *Paraguay*.

We wish him health and happiness in his retirement.

L. B. P.

Notices to Marine Observers

CHANGE OF TELEPHONE NUMBER

The Meteorological Office Headquarters telephone number was changed on 15th December 1965. The new number is Bracknell 20242 (STD code OEH4).

NEW TRANSMISSION PROCEDURE FOR RADIO WEATHER MESSAGES

The following are extracts from the Resolutions of the World Meteorological Organization (WMO) concerning the new plan for collection and dissemination of radio weather messages from ships (see the Editorial of this number), which comes into force in January 1966.

1. Plan for the Collection of Dissemination of Ships' Weather Reports

The procedures given below are designed to ensure transmission of ships' reports to coastal radio stations and provide a degree of freedom to overcome difficulties in clearing weather messages. The plan also takes into account the WMO meteorological telecommunications system through which the reports received at coastal radio stations should be retransmitted in territorial and subregional transmissions for international exchanges.

(1) Weather reports from mobile stations (i.e. Voluntary Observing Ships) should (without special request) be transmitted from the ship to the nearest convenient coastal radio stations situated in the zone in which the ship is navigating. The expression "nearest *convenient* coastal radio station" implies that a ship's weather report should be transmitted to the nearest coastal radio station in the zone unless radio propagation conditions or other circumstances make it necessary to transmit the report to another station which is then considered the nearest convenient station in the zone.

(2) If a radio officer finds difficulties in contacting promptly the nearest convenient coastal radio station in the zone in which the ship is navigating, he should endeavour to clear his weather message by applying the following procedures in the order given below:

(a) transmission to any other coastal radio station in the zone in which the ship is navigating;

(b) transmission to any coastal radio station in an adjacent zone within the same Region;

(c) transmission to any coastal radio station in any other zone within the same Region; or

(d) transmission to a coastal radio station in any adjacent zone in a neighbouring Region or, failing that, to any other station in a neighbouring Region.

(3) All reports received from ships at coastal radio stations in one territory should be promptly collected at the territorial broadcast or similar centre of the territory and retransmitted to the subregional centre(s) concerned, for further international dissemination.

(4) Coastal radio stations will, for the purpose of receiving ships' reports:

(a) keep a continuous 24-hour watch; or

(b) keep a watch for at least 30 minutes, beginning at 0000, 0600, 1200 and 1800 GMT daily.

At type (b) stations it is understood that at these periods and other hours the order of priority will be maintained, which, according to Article 37 of the Radio Regulations, is to be given to the transmission of ships' weather reports in the mobile service and that watch will also be kept for a similar minimum time at the beginning of the nearest 'single-operator period' following those standard synoptic hours; or

(c) keep watch for shorter periods (stations with limited hours of operation) than those mentioned under (b) above but when these stations are considered of particular value because they are located in an area where coastal radio stations are sparse.

Stations of type (c) above should be included in Volume D only with the agreement of the President of the Commission for Maritime Meteorology.

(5) The meteorological authority of the country in which a coastal radio station is situated will be responsible for ensuring that all radio weather messages from ships received at the station are speedily disseminated, including (by regional agreement) 'delayed' reports up to 24-hours old.

(6) If any particular coastal radio station is shown consistently to fail to accept promptly ships' weather reports or if the subsequent retransmission is deficient, the president of the regional association concerned should take steps with a view to improving the situation, and if such action does not succeed, he should take steps with a view to removing that station from the list concerned.

2. Transmission of Weather Messages by 'Single-operator' Ships

'Single-operator' ships, in making weather observations and transmitting messages, should be guided by the procedures in the order given below.

(i) As a general principle, observations should be made and transmitted at the main standard synoptic times, 0000, 0600, 1200 and 1800 GMT.

(ii) When operational difficulties on board ship make it impracticable to make and/or transmit a surface synoptic observation at a main standard time (0000, 0600, 1200 and 1800 GMT), to ensure transmission of a message to a coastal station before the radio officer goes off duty, the actual time of observation should be as near as possible to the main standard time. Alternatively, in special cases, observations may be taken one full hour earlier than the main standard time and be timed accordingly (i.e. 2300, 0500, 1100 or 1700 GMT respectively). However, it is emphasized that these departures should be regarded only as an exception when the instructions given in (i) above cannot be followed.

(iii) When it is impracticable to follow instructions given in (i) and (ii) above, the observations should be taken and transmitted at 0300, 0900, 1500 or 2100 GMT respectively. For example, if the radio officer is scheduled to complete his watch by 2200 GMT, the observation should be taken and the message transmitted at 2100 GMT.

(iv) When an observation is made at 0300, 0900, 1500 or 2100 GMT in order to ensure its transmission to a coastal station, it is desirable that the observation at the next main standard synoptic time, i.e. 0600, 1200, 1800 or 0000 GMT, should be made for climatological purposes and if possible transmitted as indicated in (v) below.

(v) Observations made at any of the standard times 0000, 0600, 1200 and 1800 GMT can be transmitted up to four hours after the time of observation if this arrangement will fit in with the radio officer's watch hours. (*Note.* An observation received four hours late is much better than receiving no weather message at all.) In the southern hemisphere and other areas where few reports are received from ships, an observation message may be transmitted as much as 12 hours after the time of the observation.

BRACKNELL (GFE) RADIO FACSIMILE BROADCAST

With effect from 1st November 1965, changes are being made in the use of radio frequencies for the Bracknell meteorological facsimile broadcast.

The revised programme is as follows:

2655 Kc/s—1st October–31st March—1800–0800 GMT

1st April–30 June—1900–0700 GMT

1st July–30th September—2100–0500 GMT

4782 Kc/s—continuous

9485 Kc/s—continuous

13761 Kc/s—continuous

18261 Kc/s—1st October–31st March—0800–1800 GMT

1st April–30th June—0700–1900 GMT

1st July–30th September—0500–2100 GMT.

In addition to operating with increased power on all frequencies, it is expected that the use of 2655 Kc/s will give better coverage during the hours of U.K. darkness.

Shipmasters are invited to report on this new coverage to:

The Director-General,
Meteorological Office, Met.O.1,
Eastern Road,
Bracknell,
Berkshire.

FACSIMILE TRANSMISSION OF SEA-ICE CHARTS

Commencing 3rd January 1966, 10-day ice charts are being transmitted by radio facsimile from Bracknell. The ice chart has been divided into three sections—Fax. 1, 2 and 3—as follows:

- Fax. 1—North Atlantic, including the Gulf of St. Lawrence, Hudson Bay, Davis Strait and Denmark Strait.
Fax. 2—(i) Great Lakes and St. Lawrence River
(ii) Gulf of St. Lawrence and Grand Banks
(iii) Baltic and White Seas.
Fax. 3—Polar basin, Canadian Arctic Archipelago, Foxe Basin, Baffin Bay, Greenland and Barents Seas.

The time of transmission is 1228 GMT daily. Fax. 1 is transmitted on Tuesday and Friday, Fax. 2 on Monday, Wednesday and Saturday (Saturday's issue being a repeat of Wednesday's chart) and Fax. 3 on Thursday and Sunday (Sunday's issue being a repeat of Thursday's chart).

Fleet Lists

Corrections to the lists published in the July 1965 numbers of *The Marine Observer* are printed below.

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 10.10.65)

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

NAME OF VESSEL	CAPTAIN	OWNER/MANAGER
<i>Fingal</i>	R. McEachern	Northern Lighthouse Board
<i>Hamble</i>	H. Jack	Shell-Mex & B.P. Ltd.
<i>Harrogate</i>	H. Hughes	British Railways Board
<i>Lord Tedder</i>	J. Russel	Lord Line Ltd.
<i>Selby</i>	B. Kitchen	British Railways Board
<i>Shell Director</i>	G. Sayers	Shell-Mex & B.P. Ltd.
<i>Yarvic</i>	F. Williams	East Anglian Shipping Co. Ltd.

The following vessels have been deleted:
B.P. Transporter, Corfen, Corncrake, Fauvic, Peregrine, Princess Maud.

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

SKIPPER	RADIO OPERATOR	TRAWLER OWNER/MANAGER
G. Atherton	E. Smith	Hudson Bros. Trawlers Ltd.
E. Calvert	J. E. Robinson	Hudson Bros. Trawlers Ltd.
B. J. Lee	A. J. Nettleship	Hellyer Bros. Ltd.
A. Osler	J. K. Fenwick	Kingston Steam Trawling Co. Ltd.
G. Phillips	A. J. Nettleship	Hellyer Bros. Ltd.

The following ships have been recruited as Selected Ships:

NAME OF VESSEL	DATE OF RECRUITMENT	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
<i>Athelbeach</i> ..	1.7.65	J. G. Roberts	D. Cronk, D. Sharp, S. Thacker	R. Hindmarch	Athel Line Ltd.
<i>Beaverbrook</i> ..	9.9.65	B. Ford	D. J. F. Bruce, P. Hansell, B. Duncan	V. Merriot	Canadian Pacific Line
<i>Boniface</i> ..	1.6.65	J. Whayman, C.B.E., D.S.C.	T. M. Hunter, T. McCutcheon, L. Dart	W. Ormrod	Booth Line
<i>Cairnesk</i> ..	2.4.65	J. S. Watson	A. Milroy, T. Mitchell, J. Williamson	J. McCafferty	Cairn Line
<i>Cairnglen</i> ..	9.4.65	J. Rushworth	C. McLean, F. Briggs, C. Spence	W. Mill-Irving	Cairn Line
<i>Cicilia</i> ..	14.6.65	R. W. L. Crawford	R. R. Watt, T. C. McDowall	O. Riches	Anchor Line
<i>Fourah Bay</i> ..	18.8.65	R. G. Williams	C. Weaver, R. Stange, C. Woodward	M. Smallman	Elder Dempster Lines
<i>Inishoven Head</i> ..	4.8.65	A. Fee	J. MacParland, R. Copeland, R. Maxwell	C. Irving	Head Line
<i>Indus</i> ..	3.6.65	L. Lennox	F. J. Dowman, T. C. Kelsey, J. Macleod	F. Bridgman	Hain Nourse Ltd.
<i>Manchester Engineer</i> ..	20.5.65	—, Lobban	W. Banks, R. Andrews, W. Bowden	J. MacDonald	Manchester Liners
<i>Manchester Exporter</i> ..	8.4.65	—, Taylor	D. Perry, D. Smith, T. Reid	—, Berry	Manchester Liners
<i>Manchester Freighter</i> ..	29.4.65	D. Aitchison	G. R. Murray, G. Mackay, A. Quinan	J. Buchanan	Manchester Liners
<i>Nakva River</i> ..	19.5.65	A. Aitel	M. Hanreck, N. O. Onudha, D. Gilpin	R. De-Jager	Black Star Line
<i>Nova Scotia</i> ..	2.6.65	J. H. Williams	C. Townsley, J. Waite, N. Land	L. Foster	Furness Lines
<i>Rapallo</i> ..	4.6.65	F. Metham	P. Blud, L. Gibson, A. Markham	R. Stringer	Ellerman's Wilson Line
<i>Regent Pembroke</i> ..	19.6.65	I. D. Pederson	N. M. Brown, I. E. McVicar, R. W. Warren	J. Miller	Regent Petroleum Tankship Co. [Ltd.
<i>Tower Bridge</i> ..	22.7.65	W. F. E. Smith	C. Harrison, J. Bates, R. Jenkins		Silver Line

The following ships have been recruited as Supplementary Ships:

<i>Athelbeach</i> ..	20.8.65	T. Gorst	—, Bolton, M. Quirk, M. E. Hughes	I. Keyser	Athel Line Ltd.
<i>Baltic Importer</i> ..	26.5.65	W. Forbes	K. Camp, P. Wearing, W. Matthew	W. Goddan	United Baltic Co. Ltd.
<i>British Robin</i> ..	26.4.65	S. C. Davies	J. C. Beak, J. Hutchinson, R. Arms	B. Ford	B.P. Tanker Co. Ltd.
<i>Cape Kennedy</i> ..	28.4.65	K. Neilson	J. Renfrew	J. Renfrew	Hudson Bros., Trawlers Ltd.
<i>Ebro</i> ..	2.9.65	C. N. Wightman	R. L. Few, J. S. Wisden, B. Darling	J. K. Lynch	Royal Mail Lines
<i>Eso Westminster</i> ..	3.5.65	C. Drever	J. McCarroll	J. McCarroll	Eso Petroleum Co. Ltd.
<i>Kirkella</i> ..	27.8.65	N. Longthorp	J. Bickwood	J. Bickwood	J. Marr & Sons Ltd.
<i>Lord Nelson</i> ..	1.7.65	W. S. Atkinson	P. Redfern, R. Fowler, D. Rose		Hellyer Bros. Ltd.
<i>Methane Princess</i> ..	1.9.65	J. S. Munday	R. I. Wallace, M. Laws, F. Kingston	R. Taylor	Shell Tankers (U.K.) Ltd.
<i>Methane Progress</i> ..	29.9.65	F. L. Curtis	A. F. Marston, J. R. Enston, J. W. S. Armstrong	V. McBride	Shell Tankers (U.K.) Ltd.
<i>Mobil Endeavour</i> ..	25.9.65	M. G. Pirie	A. P. Wallbank, L. P. Jones, A. Simpson	J. Brown	Mobil Shipping Co. Ltd.
<i>Sea Captain</i> ..	17.5.65	—, Davies	P. T. Teban, R. I. Morrison, J. Harvey	P. J. F. Shelton	Vergocean S.S. Co. Ltd.

The following Selected and Supplementary ships have been deleted:

Athelviscount, *Athlone Castle*, *Avon Ranger*, *Benlawers*, *Cairnforth*, *Cairngowan*, *Cortona*, *Debrett*, *Drina*, *London Pride*, *Malmo*, *Manchester Faith*, *Manchester Fame*, *New Zealand Star*, *Papanui*, *Potaro*, *Riseley*, *River Afton*, *Scottish Hawk*, *Silverbeck*, *Sneaton*, *Socotra*, *Sydney Star*, *Westbank*.

BRITISH COMMONWEALTH

AUSTRALIA (Information dated 1.10.65)

The following vessels have been recruited as Selected Ships:

Iron Flinders (Broken Hill Proprietary Co. Ltd.)
Iron Kimberly (Broken Hill Proprietary Co. Ltd.)
Koorunga (Associated S.S. Ltd.).

CANADA (Information dated 3.9.65)

The following vessels have been recruited as Selected Ships:

Bridgepool (Pacific Export Lines, Vancouver—Agent)
G. B. Reed (Government of Canada)
John Cabot (Government of Canada)

Kristin Bakke (Knutsen Line, Norway)
Thorshope (A. S. Thor Dahl, Sandefjord, Norway).

The following vessels have been recruited as Supplementary Ships:

Alaska (Courtney Agencies, Vancouver—Agent)

Lloyd Bakke (Knutsen Line, Norway).

The following vessels have been deleted:

Athelduke, Octavia.

Canada has 26 ocean-going Auxiliary Ships and 36 Auxiliary Ships operating on the Great Lakes and St. Lawrence River.

HONG KONG (Information dated 14.10.65)

The following vessel has changed her name:

Kwangtung to *Norman* (China Navigation Co. Ltd.).

The following vessels have been deleted:

Foochow, Fukien, Waikelo.

INDIA (Information dated 14.10.65)

The following vessel has been recruited as a Supplementary Ship:

Jalapankhi (Scindia S.N. Co. Ltd.).

The following vessel has been deleted:

Jag Laadki.

NEW ZEALAND (Information dated 15.10.65)

The following vessel has been recruited as a Selected Ship:

Katea (Union S.S. Co. of New Zealand Ltd.).

The following vessel has been recruited as a Supplementary Ship:

Aramoana (New Zealand Railways).

The following vessels have been deleted:

Karitane, Kareia, Waitaki.

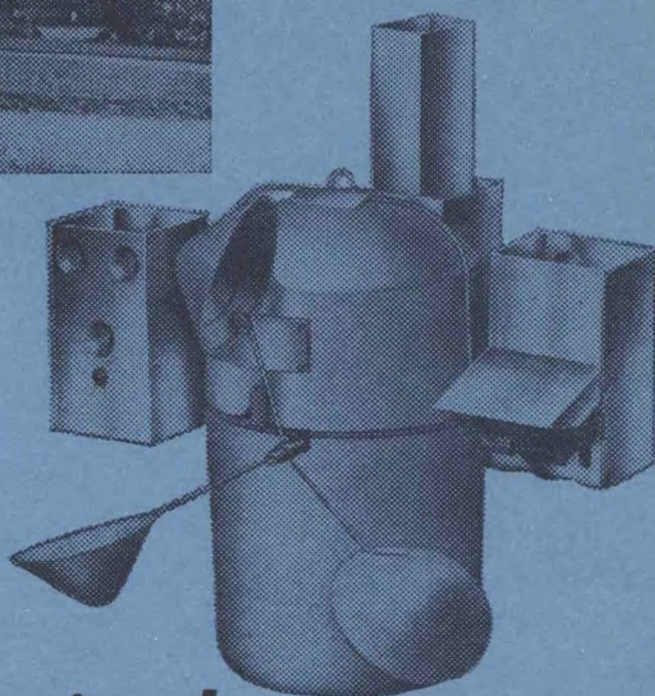
SINGAPORE (Information dated 9.10.65)

NAME OF VESSEL	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
<i>Bidor</i> ..	Yahya bin Bachok	Chew Joo Kim ..	K. Kumaran ..	Straits S.S. & Co. Ltd.
<i>Cable Enterprise</i> ..	P. B. Henderson	G. Ayrton, M. Watson, R. Veno ..	G. O'Brien ..	Cable & Wireless Ltd.
<i>Hoti Houw</i> ..	O. Utseth	Overa, Fritz Lorek, Ivar Storstein ..	Pieter Joubert ..	Houstead & Co. Ltd.
<i>Kah Poh</i> ..	S. J. Harvey	Budin bin Ahmad, Mohd. Noor bin Lanang ..	Nik Ismail bin Nik Sar. ..	Ho Chiang Shipping Co. Ltd.
<i>Katong</i> ..	I. M. MacNaughton	R. E. Dyason, R. Gomes ..	Low Yok Kwai ..	Straits S.S. & Co. Ltd.
<i>Kemingau</i> ..	N. R. Murray	H. P. Davies, Tony Chan ..	K. A. Menon ..	Straits S.S. & Co. Ltd.
<i>Kimians</i> ..	W. G. Bradshaw	E. G. L. Small ..	Sheri R. Bharucha ..	Straits S.S. & Co. Ltd.
<i>Kim Hock</i> ..	L. W. Evans	B. Harries ..	M. Moazzamadal ..	Guan Guan Ltd.
<i>Kinabalu</i> ..	G. Coupar	A. J. Phillips ..	Lee Yeun Fatt ..	Straits S.S. & Co. Ltd.
<i>Kuda Mas</i> ..	A. B. Durrant	Z. A. McCarthy, Mohd. Sar bin Derus ..	Leung Chi Chung ..	Guan Guan Ltd.
<i>Kunak</i> ..	R. E. Davies	Peter Ho, Kia Tuang ..	Tan Yee Fang ..	Straits S.S. & Co. Ltd.
<i>Letong</i> ..	A. Apiturey	Yaacob bin Mohd., Omar Yahya ..	Jalil ..	K.P.M. (Far East) Ltd.
<i>Perak</i> ..	R. W. Reeve	Ahmad Mokhtar bin Hamzah ..	Ismail bin Manak ..	Straits S.S. & Co. Ltd.
<i>Pertis</i> ..	K. L. Edwards	C. F. Theocira ..	Anwar bin Adam ..	Straits S.S. & Co. Ltd.



*As supplied to
the British
Meteorological
Office
and many
foreign
governments*

RADIO SONDE



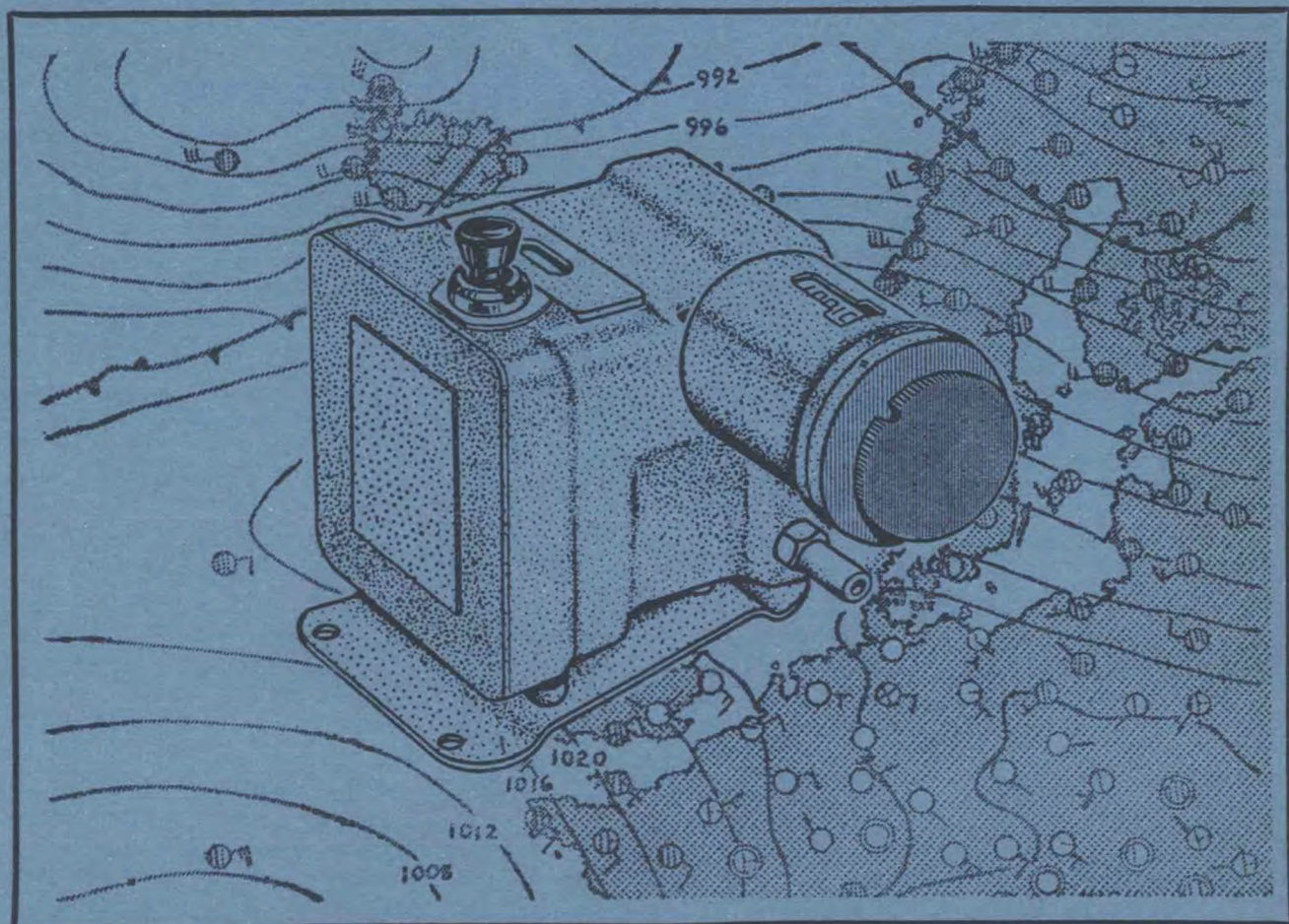
Meteorological Transmitter

The WB Radio Sonde can be supplied either complete with battery, aerial parachute, radar reflector and battery, or the transmitter with met. elements can be supplied as a single unit.

**WHITELEY ELECTRICAL
RADIO COMPANY LTD.**

MANSFIELD - NOTTS - ENGLAND

MECHANISM PRECISION ANEROID BAROMETERS WITH DIGITAL READOUT FACILITATE WEATHER REPORTING



A large quantity of these instruments has been ordered by the METEOROLOGICAL OFFICE for use in ships responsible for making official weather reports where their ROBUSTNESS, PORTABILITY, and ACCURACY under adverse conditions make them the ideal choice.

RANGE: 900 to 1050 mb.

DISCRIMINATION: 0.02 mb.

ACCURACY: At 20°C, ± 0.3 mb. At 5°C & 35°C, ± 0.5 mb. Max. change.



MECHANISM LIMITED

73-77 LANSDOWNE RD • CROYDON • SURREY • ENGLAND

Telephone • CROYdon 3426-9 Telegrams • GYROMEK • CROYDON

S.O. Code No. 40-38-66-1