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The Marine Observer

A quarterly journal of Maritime Meteorology

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prepared by the Marine Division of the
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Editorial

At this time of the year, together with the festivities associated with Christmas and Hogmanay, it has long been the custom to make new resolutions. Even though it is said 'the road to hell is paved with good intentions', it is equally true to say that 'saints are only sinners who keep on trying'. Many resolutions, of course, founder within a short time of their conception; others are retained to grow into habit to our own personal good or, better still, to the benefit of others. For the benefit of others, there are few better activities than Voluntary Meteorological Observing at sea. The weather has always been important to the seafarer and despite modern powerful ships equipped with complicated electronic devices, he is still dependent on the elements for his own comfort and safety. Almost unconsciously over the years, the mariner develops an acute awareness of his surrounding weather conditions and no ship's officer would consider himself to be efficient if he were not 'weather-wise'.

This is as true today as it was in 1854 when the British Meteorological Office was established under a sailor, Admiral Robert FitzRoy as a result of the initiative of another sailor, M. F. Maury, an American Naval Officer, who realized the commercial and scientific value of weather information collected from ships. Six years later Admiral FitzRoy wrote:

'Recent series of simultaneous observations have proved that nearly similar pressure, and even (though less nearly similar) temperature, with analogous weather, prevail over wider areas than was supposed formerly, to be the case. Therefore, by intercomparison, and knowledge of normal or mean states, or conditions, at various places, weather may even now be predicted approximately. And such approximations may save some agriculturalist's crops—ships—even lives.

'No personal anxiety, no trouble ought to be spared in such a cause.'

From these small beginnings, over the years more and more countries established their own meteorological services until in 1947 the World Meteorological Organization (WMO) was created to promote international uniformity of practice in the science of the weather.

The observer at sea would perhaps be surprised to learn of the many uses to which his observations are put. In addition to forecasting, various branches of the Meteorological Office specialize in climatology, agricultural meteorology, hydrology, cloud and upper-air physics to name but a few. All these branches have ready access to the data bank of the Meteorological Office computer where each and every observation is permanently stored and can be retrieved in seconds.

Despite the introduction over the past few years of weather satellites and the current development of meteorological data buoys, the observations from ships continue to be of the utmost importance and are likely to remain so for the foreseeable future. Ships' observations are of particular importance to the forecaster not only because they enable him to complete his charts over the oceans, but also because weather sequences over the sea are simpler than those over land. They are therefore more characteristic of the air masses and hence more useful in the air-mass analysis that must precede the preparation of forecast charts. Numerous instances occur in which the presence or absence of adequate ships' reports has made all the difference between a good and bad weather forecast. A thought to be constantly borne in mind is that a lone ship's observation from a relatively sparse area might be the key to what would otherwise be an obscure meteorological situation. However it is better to have no observation at all than one that is inaccurate. An inaccurate observation may mislead the forecaster and, directly or indirectly, as a result of that inaccuracy, a small ship or aircraft may be endangered. An observer should never forget that his individual effort, his particular observation, may supply the information required to resolve a forecasting problem many miles away.

Attention has been drawn, within the last few years, to incidents of 'freak' waves being encountered at sea and ships sustaining considerable damage. As a consequence of this, the President of the Commission for Marine Meteorology agreed with a suggestion originating from the International Chamber of Shipping and following an approach by the Secretary-General of WMO, the British Meteorological Office in Bracknell accepted the responsibility as a collecting centre for all data and observations received of this dangerous phenomenon. Sea lore abounds with stories of monstrous waves and every sailor has his own tale of how a great wave arose from nowhere and swept his ship's decks leaving a trail of destruction in its wake. Amongst the reports of 'freak' waves received, waves estimated to be in excess of 30 metres high are on record and although the highest wave recorded scientifically with proper instruments aboard ship is 25·31 metres, we must by no means claim that the others are exaggerated. Many 'freak' wave observations have been made off the coast of South Africa between the Cape of Good Hope and East London, and only a short time ago the writer experienced such a wave in this area which appeared to come from nowhere to buckle the forecastle rails and crush flat a steel winch cab. Although speed was immediately reduced, the precaution proved unnecessary as the moderate conditions which had prevailed before returned immediately. Who knows but that the *Waratah*, lost without trace in these waters in 1908, might have met with such a wave of even greater dimensions and was instantly overwhelmed. Whilst, as stated above, the majority of 'freak' wave observations have been received from the Cape Agulhas area there is no reason to suppose that they cannot occur elsewhere. Although the phenomenon occurs comparatively rarely, this does not mean to say that the likelihood is not predictable. It is for this purpose and to gain further knowledge of 'freak' waves that all relative information concerning them from world-wide sources is to be collected and collated at Bracknell. In the forthcoming 10th Edition of the *Marine Observer's Handbook*, *inter alia*, the text relating to 'freak' waves has been revised and extended to cover the data requested from ships that have had the misfortune to encounter this phenomena.

In the January edition of the *Marine Observer*, it is our practice to send New Year greetings to all our readers. Despite our apparent preoccupation with monster waves, we take this opportunity to wish smooth passages to all who go to sea in 1976 and good fortune to you all, whether at sea or ashore.

C.R.D.

January, February, March

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

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

TROPICAL STORM 'CAMILLE'

Moçambique Channel

m.v. *Wild Avocet*. Captain L. E. Quigley. Durban to Khorramshahr, Iran. Observers, the Master, Mr C. T. Huntley, 3rd Officer and ship's company.

16 January 1975. The following observations were made whilst the vessel was in the vicinity of cyclone Camille.

GMT

0000: Position of ship 18° 36′S, 41°36′E. Wind SE, force 7. Pressure 1008·3 mb. Air temp. 26·2°C, wet bulb 24·0, sea 25·6. Overcast. Visibility 5 n.mile.

0800: Position of ship 16° 18′S, 42° 06′E. Wind E'S, force 10. Pressure 1004·8 mb. Air temp. 25·0°C, wet bulb 25·0. Violent rain showers, visibility 1 n.mile—deteriorating. Vessel at reduced speed, pitching heavily.

0900: Vessel hove to at 16° 18′S, 42° 12′E. Wind ENE, force 12. Pressure 1000·9 mb. Spray reducing visibility to less than 200 m. The 'eye' of the storm was visible on the radar directly ahead on a bearing of 340°T at about 15 miles.

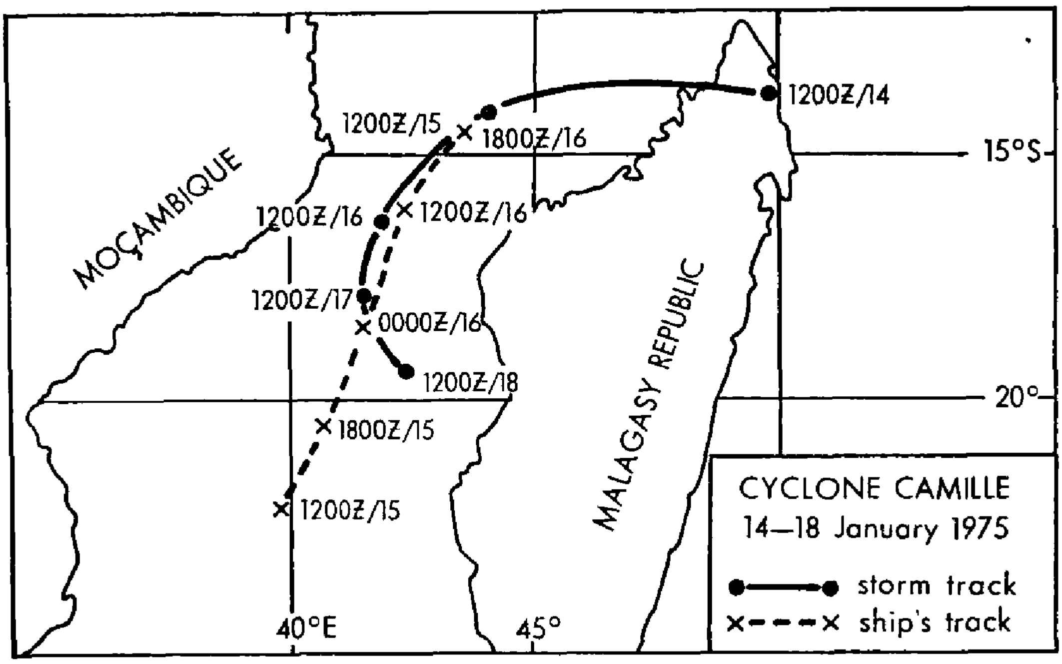
0930 (approx.): Vessel hove-to. Wind ENE, force 12. Pressure 999·4 mb. Shipping water over all, visibility nil. Eye of storm was seen to pass down port side of vessel at a distance of 17 miles by radar.

1000: Position of ship 16° 24′S, 42° 30′E. Wind NE, force 12. Pressure 1000·9 mb, rising. Air temp. 25·0°C, wet bulb 25·0. Vessel still hove-to in poor visibility and heavy precipitation.

1100: Wind N'E, force 10. Pressure 1002·3 mb. Air temp. 25·0°C, wet bulb 24·5. Visibility improving to ½ n.mile. Vessel proceeding at half speed, still in heavy seas.

1200: Position of ship 16° 12′S, 42° 24′E. Wind N'ly, force 9–10. Pressure 1004·2 mb. Air temp. 24·5°C, wet bulb 23·9. Visibility 2 n.mile.

1800: Position of ship 14° 24′S, 43° 36′E. Wind N'ly, force 6. Pressure 1009·5 mb. Air temp. 27·5°C, wet bulb 25·0, sea 28·8. Visibility 5 n.mile. Vessel resuming normal sea speed.



Note. The tracks of Camille and the *Wild Avocet* are shown on the accompanying chart. The *Africa Pilot*, Volume III (N.P.3) illustrates erratic behaviour of tropical cyclones in the area. In this case recurvature brought Camille into close proximity with the ship and the *Wild Avocet* experienced severe weather associated with the dangerous semicircle.

TROPICAL STORM 'DEBORAH'

Indian Ocean

s.s. *Benreoch*. Captain A. D. Hay. Durban to Singapore. Observers, the Master, Mr A. C. Skilton, 2nd Officer and ship's company.

24–25 January 1975. At 1810 GMT on the 24th the vessel received a warning from Mauritius Radio of severe tropical depression Deborah, centred (at 1200 GMT on the 24th) within 60 miles' radius of 24° 30'S, 53° 00'E, moving WSW at about 10 knots. Storm-force winds and rough seas were forecast near the centre with strong winds and rough seas extending to 90 miles from the centre, especially in southern sectors.

The following are selected extracts from the meteorological logbook and the deck log:

24th
GMT

1800: Position of ship 25° 18'S, 46° 48'E. Wind E'S, force 5. Pressure 1015·2 mb. Air temp. 26·7°C, wet bulb 24·8, sea 26·3. Vessel, which had been steaming at full revs. since previous evening in order to avoid cyclone Deborah, was now at reduced speed.

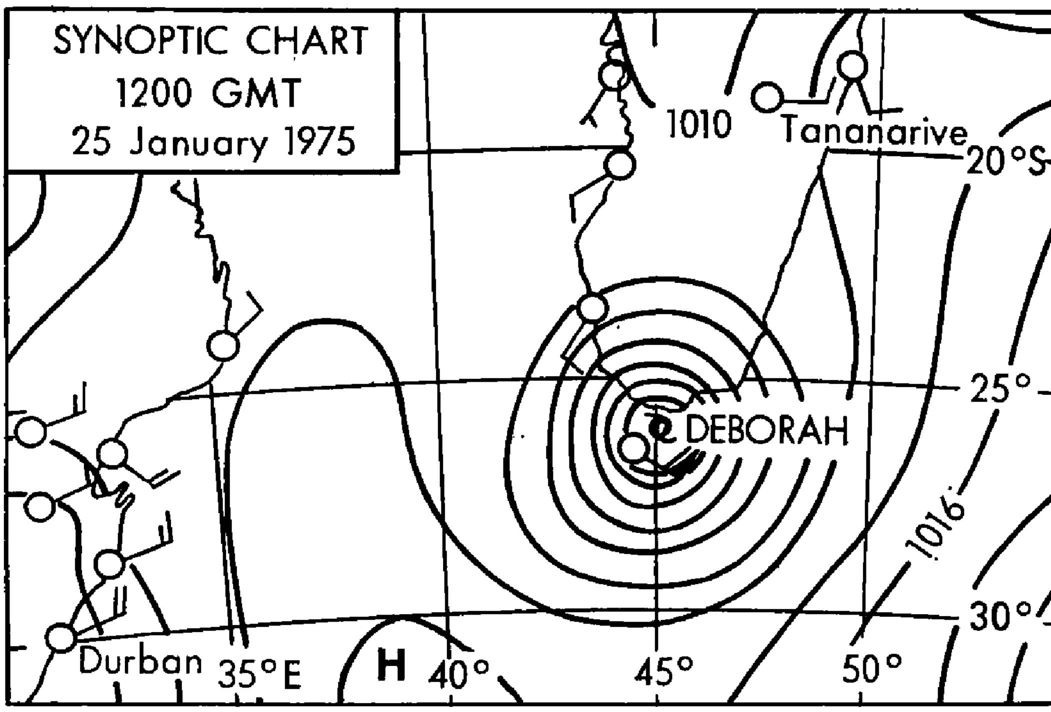
2000: Vents turned 'back to wind'; spraying heavily over all.

2100: Course 060°T. Wind SE'S, force 7–8. Pressure 1011·5 mb. Air temp. 27·2°C. Mainly overcast with frequent flurries of light rain. Vessel pitching and rolling heavily in rough beam sea and heavy swell. Spraying frequently over all. Visibility 5 n.mile.

2200: Wind SE, force 9. Pressure 1005·0 mb. Not possible to obtain temperatures due to wind and spray. Screen removed to chart room.

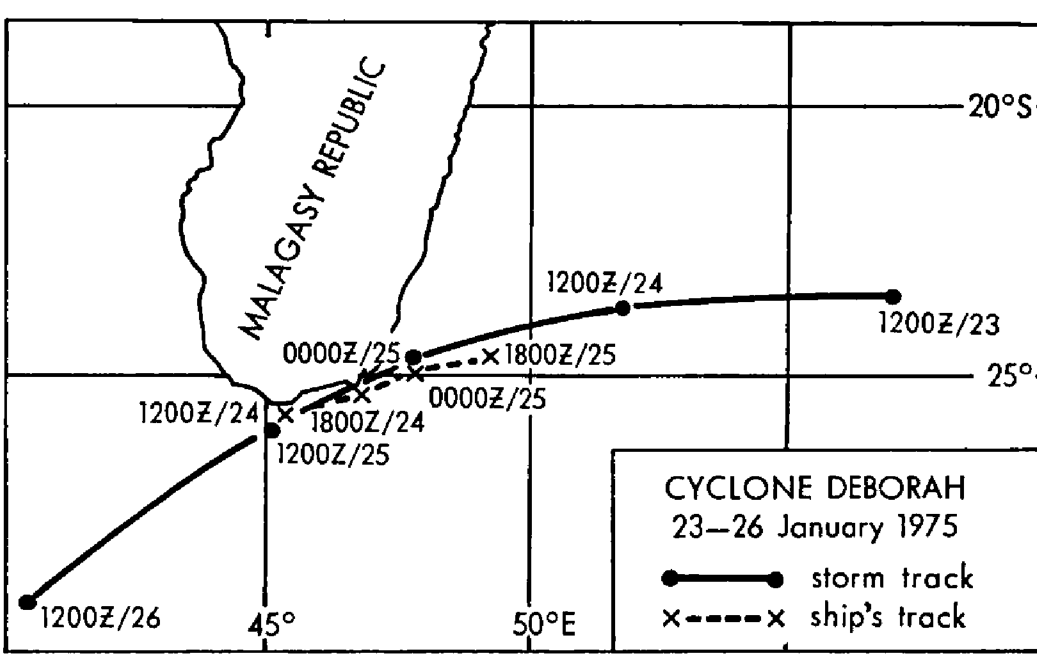
2215: Visibility less than 50 m. Master called and radar switched on.

2230: Position of ship 24° 47'S, 47° 57'E. Vessel put into manual steering and at 2231 engines on stand-by.



With the vessel hove-to and the storm increasing in severity the following misfortunes were experienced:

Timber from the monkey-island bulwark coming adrift. Aerial insulators breaking and aerials adrift. Foremast light adrift. Deck cargo shifting and timber awnings on boat deck breaking up. Standard compass and gyro-repeater covers damaged and adrift. Standard compass unreadable. Various electrical flashes and sparking seen from main deck. Radar out of commission. Derrick broke loose from crutch on after-deck; 22-ton boiler washed overboard, damaging main-deck bulwark. Starboard-side accommodation ladder broken loose. All navigation lights out of commission. Electrical circuits in wheel-house shorting to earth, producing sparks and flashes. Water cascading through engine-room skylights and landing in front of main switchboard. Tarpaulin rigged over switchboard. Most of the engine-room lights off.



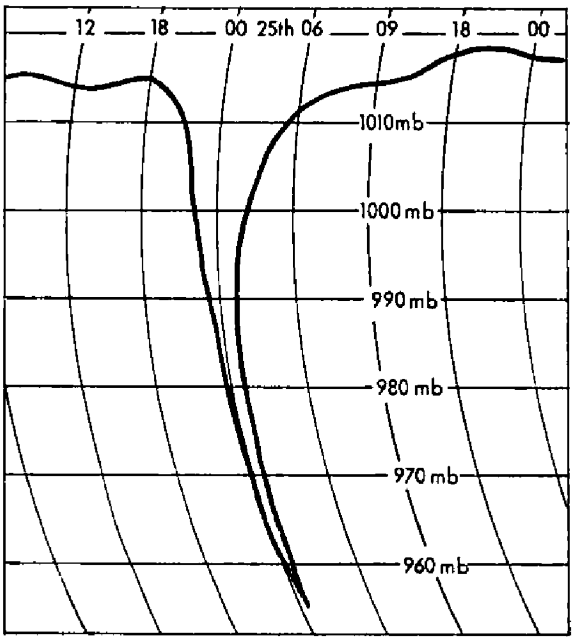
25th

0000: Position of ship 25°00′S, 47° 48′E. Wind E'ly, force 12+. Pressure 960·0 mb. Intermittent heavy rain. Visibility less than 50 m.

0030: Pressure 954·9 mb, lowest recorded (see barograph trace).

0100: Wind ENE, force 12+. Pressure 960·0 mb. Overcast with rain and heavy spray giving very poor visibility. Vessel rolling and pitching heavily to a very rough sea and very heavy swell. Shipping water forward.

From 0100 onwards the barograph rose sharply and conditions began to ease slowly.



Sea and swell conditions had been far worse than anything indicated on met. charts or in textbooks. At the height of the storm, an estimate put the wind in excess of 100 knots and rolls of 35°–40° were indicated on the bridge clinometer.

0600: Position of ship 25° 18′S, 47° 42′E. Wind NE, force 9. Pressure 1011·0 mb. Air temp. 26·7°C. Vessel hove to in moderating weather conditions. Carrying out repairs and resecuring cargo.

1200: Position of ship 25° 18′S, 47° 54′E. Wind NE, force 5–6. Pressure 1015·2 mb. Visibility 5 n.mile.

Note 1. The paths of Deborah and the *Benreoch* are shown on the chart. The storm was positioned on the north-west limit of the area indicated by the Mauritius warning and subsequently accelerated to 15 knots, passing just north of the *Benreoch.* Thus the ship was for a time in the dangerous quadrant of the dangerous semicircle (see N.P. 100, page 69). After the 26th Deborah recurved south-eastwards and weakened.

Note 2. A section of the synoptic weather map, extracted from the South African Daily Weather Bulletin, shows the position of Deborah at 1200 GMT on the 25th.

BALL LIGHTNING

Eastern North Atlantic

m.v. *Clan Maclean.* Captain R. E. Todd. Dar-es-Salaam to Avonmouth. Observers, the Master and Mr J. R. Gilbert, 3rd Officer.

10 February 1975. At 2140 GMT during an intense and violent squall, with wind gusting to gale force and visibility reduced by very heavy rain, 'ball lightning' was seen. The 'ball' had an estimated track of SW to NE (the direction of the wind and

prevailing weather) over a distance of between ½ and 1 km. The ball, intense white/blue in colour, was travelling horizontally and left no trail of light in its path. It passed directly over the ship's course forward of the vessel so was clearly visible. The duration of the phenomenon was about 5–7 seconds after which it terminated in a violent flash of light and an extremely loud thunder-clap. The light intensity was such that it illuminated the surrounding sea and also another ship which was about 3 n.mile distant (by radar).

Weather details at the time of the occurrence were as follows: wind SW, force 5, gusting 7–8. Air temp. 14°C. Cloud, cumulonimbus, estimated base 1500–2000 feet.

Position of ship: 41′ 21°N, 10° 37′W.

Note. This report by the *Clan Maclean* of the mysterious ball lightning was forwarded to the Department of Physics, University of Manchester, but to date we have received no comment Little is known about this comparatively rare phenomenon.

SUBMARINE EARTHQUAKE

Eastern South Pacific

m.v. *Australind.* Captain D. A. Dickinson. Panama to San Antonio. Observers, the Master, Mr S. Turner, 2nd Officer, Mr R. Lorne, 3rd Officer, and the ship's company.

13 March 1975. At 1428 GMT violent vibrations were experienced which were assumed to be due to a submarine earthquake. The sensation lasted approximately 20–30 seconds and was as if the ship had struck a sandbank, or something had fouled the propeller. No difference in the 'state of sea' was observed, and the chart depth gave 600–900 fathoms. This phenomenon was also felt by a vessel 10 nautical miles to the south-west of us.

Later, reports from Valparaiso gave 'violent earthquake, magnitude 8, with epicentre Coquimbo' at the same time. On arrival at Antofagasta we heard that damage was done at Coquimbo and La Serena, resulting in the deaths of three persons.

Position of ship: 29° 34′S, 71° 47′W.

Note 1. Mr G. Neilson of the Institute of Geological Sciences, Edinburgh comments:

'This report probably refers to an earthquake off the Chilean coast. Source details from the United States Geological Survey are: 13.3.75. Near coast of central Chile, 29·9S, 71·3W. Depth = 4 km. Magnitudes M_B = 6·2 M_S = 6·9. Origin time = 15 h 26 min 42·5 s GMT.

'Two persons were killed and 25 injured by this earthquake. Damage was caused in Coquimbo/La Serena area and it was felt in San Juan province, Argentina.'

Note 2. As the *Australind* was not keeping a log of meteorological observations during this particular stage of her voyage, we are unable to attempt to resolve the time discrepancy of one hour between the ship's report and the time quoted by the U.S. Geological Survey. As regards the magnitudes quoted, M_S equates with the Richter scale.

DOLPHINS

off Portuguese Guinea, West Africa

m.v. *Shahristan.* Captain G. L. Andrews. Cape Town to U.K. Observers, the Master, and Mr M. E. McGahan, 3rd Officer.

19 January 1975. At 1630 GMT, when approximately 180 nautical miles south of Dakar, the vessel sailed through many hundreds of dolphins for over 20 minutes.

The dolphins had slightly pointed noses with light patches on sides of body which joined across the back on either side of the dorsal fin. The lower under-belly was pink. Most appeared to have some kind of sucker fish attached to them. One was thought to have an identity disc at the after end, base of dorsal fin.

Approximate position of ship: 11° 30′N, 17° 00′W.

Note. Mr Sidney G. Brown of the Whale Research Unit, Institute of Oceanographical Sciences, comments:

'It is not possible to identify the species of dolphins in the large school sighted on 19 January but the record is interesting because of the observation of sucker fishes attached to many of the animals, and the "identity disc" on the base of the dorsal fin of one animal.

'The whalesucker fish, *Remilegia australis* (Bennett), a member of the remora (sucker-fish) family, has been recorded on the common dolphin (*Delphinus delphis*) and the spotted dolphin (*Stenella plagiodon*). These fish are widely distributed in temperate and tropical seas. Other fishes found on whales are species of sea lamprey and it may be that these were the fishes seen on the dolphins. In contrast to the whalesucker fish which simply attaches itself to the whale with the sucker on the top of its head, the sea lampreys bite the skin and blubber of the whales, leaving wounds which eventually heal as disc-shaped scars paler than the surrounding skin. It is possible that such a scar on the dorsal fin could be mistaken for an "identity disc", but there have been experiments in recent years by biologists in marking some species of dolphins with plastic discs bearing letters and numbers, which were attached to the dorsal fin. Some of these marked dolphins were sighted more than a year after marking. This method of marking dolphins has now been discontinued in favour of a "spaghetti" tag, a plastic strip about 12 inches long which can be attached to a free-swimming dolphin.

'Various other experiments in marking whales and dolphins with visible markers have been and are being tried, and if observers see whales or dolphins which appear to bear any marking devices, it will be very helpful to have information about the date and position etc. of the sighting, together with as many details as possible of the type of mark involved and its position on the animal.'

FISH

Peruvian waters

s.s. *Bendoran.* Captain A. Addison. Malta to Callao. Observers, the Master, Mr J. M. Groat, 2nd Officer and Mr H. S. Jeffrey, 4th Officer.

24 February 1975. At 2000 GMT large numbers of rays were seen jumping from the water. The rays varied in size from about 60–120 cm upwards to 240–300 cm across the wings. They were black on top with a white belly, and 'jaws' could be clearly seen. The jumps from the water appeared haphazard and some of the landings were quite spectacular. They did not appear to be in pursuit of fish. The ship passed through these rays for 20 minutes steaming at 15 knots and they were visible on both sides of the vessel for a distance of at least 2 nautical miles.

Position of ship: 4° 30′S, 81° 36′W.

m.v. *Australind.* Captain D. A. Dickinson. Pisco to Guayaquil. Observer, Mr R. Lorne, 3rd Officer.

29 March 1975. A large shoal of ray-type fish, extending for several miles, was seen to be leaping about a metre in height out of the water, and they continued to do so as we sailed through the shoal. None of the fish was less than a metre from wing-tip to wing-tip. Is there any explanation for this behaviour, please?

Position of ship: 4° 00′S, 81′15°W.

Note. Mr A. Wheeler of the Department of Zoology, British Museum (Natural History) comments:

'The observations from s.s. *Bendoran* and m.v. *Australind* of shoals of rays both in the same area are very interesting. They were probably Eagle Rays (*Aetobatus*) one of the surface-living species, and although large shoals have been reported before, the reason for this behaviour is unknown. Presumably, they are migrating but whether it is a breeding aggregation or whether they are heading towards richer feeding grounds is unknown. No convincing explanation for their leaping has been advanced.'

MARINE LIFE

North Atlantic Ocean

s.s. *Benvannoch.* Captain I. R. Ansell. Cape Town to Ushant. Observers, the Master and all navigating officers.

21 February 1975. At about 1030 SMT dead fish in substantial numbers were observed floating on the water. The greatest number were observed in areas where a plankton-like brown scum lay on the surface. This substance was believed to be oil, as wherever it was seen the water was flat/smooth in an otherwise rippled sea.

At 1330 numerous Portuguese-men-of-war were observed amongst the dead fish, which were now at their most dense. The 'jellyfish' were alive, and it was wondered if they had killed the fish. At about 1340 the fish and 'jellyfish' became less dense and disappeared altogether at 1440. The fish were later observed passing occasionally in ones and twos. They appeared to be of the flat-fish family being dark-brown/black on top and silvery-white underneath. The body appeared rectangular and the tail was relatively small. They were of various sizes.

Position of ship at 1200 SMT: 9° 31′N, 15° 51′W.

Note. Mr A. Wheeler of the Department of Zoology, British Museum (Natural History) comments:

'The dead fish observed from s.s. *Benvannoch* were possibly killed by a local "bloom" of a poisonous dinoflagellate. The so-called "red tide" off the Florida coast is caused by this; the minute plant-like cells choke the gills of the fish and produce a toxin which is highly poisonous. The dinoflagellates are responsible for the oily appearance of the surface.'

m.v. *Silverforth.* Captain R. Sidney. Durban to Oran. Observers, Mr R. Scarff, Radio Officer and Mr P. F. Watkins, 3rd Officer.

15 March 1975. At 1100 GMT the vessel, proceeding at 12 knots, had been steaming through an array of dead fish for two hours. The fish, floating on the surface, were drifting in groups with many Portuguese-men-of-war among them. The fish appeared to have a hole in their sides, as if they had been impaled or had imploded.

Two white containers (one gallon) were observed floating in the centre of a mass of dead fish and the sea in the vicinity was polluted by a light green/brown substance. Later at 1130 GMT a vessel was sighted with a trawl down in the area.

Position of ship: 9° 24′N, 16° 29′W.

Note. Dr P. F. S. Cornelius, Head of the Coelenterate Section, British Museum (Natural History) comments:

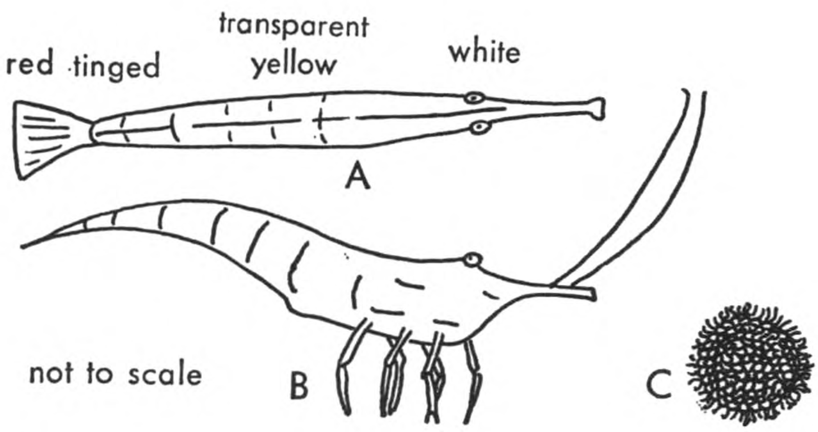
'Few reports of Portuguese-men-of-war mention dead fish floating among them. The feeding process does, however, leave holes in the fish and it seems plausible that the widespread fish-death was so caused.'

Western North Atlantic

m.v. *Piako.* Captain D. V. Harradine. Malta to Cristobal. Observers, the Master, Mr M. S. Hartfield, 3rd Officer and Mr S. Robinson, Cadet.

31 March 1975. At 1700 GMT, while the vessel was stopped at sea, a sample of Sargasso Weed was obtained. On close inspection the weed was found to be alive with small sea creatures. There were several small crustaceans which were similar to prawns and shrimps (see sketches A and B). There were also lots of water fleas at first, but they rapidly disappeared. Also found in the water was a spherical cell arrangement, which was unidentifiable, consisting of numerous cells joined together to form one layer and each one appeared to have one or more hairs sticking out. The organism was about 7 mm in diameter, transparent, and hollow (see sketch C).

Position of ship: 18°18′N, 57° 42′W.



Note 1. Dr Anthony A. Fincham, Crustacea Section, British Museum (Natural History) expressed his thanks to the *Piako* for the comprehensive samples forwarded and comments:

'These are shrimps found in Sargasso Weed. Sample A consists of juveniles of the family Palaemozidae and sample B is *Hippolyte coerulescens* (Fabricius, 1775), ovigenous female. This specimen has been incorporated into the Crustacean collection, registration number 1975:186.

'We are most grateful for the donation of this material.'

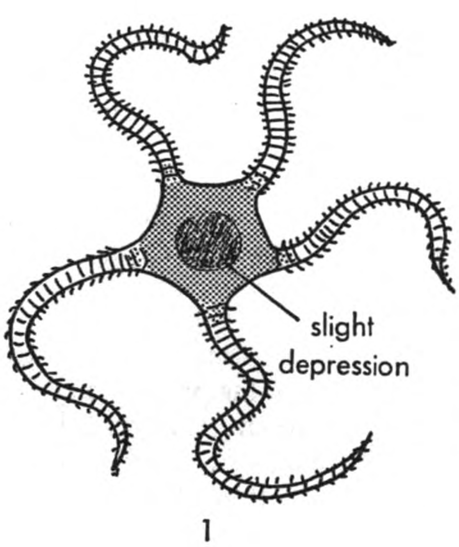
Note 2. As regards the cellular structure described above, Dr Fincham informed us that it had been passed on to another section for examination and possible identification.

Table Bay, Cape Town

m.v. *Clan Robertson*. Captain J. B. Caley. At anchor. Observers, the Master, Mr D. Colley, 2nd Officer and most of the crew.

14 February 1975. During the day, while at anchor, a lobster-pot was lowered over the side in the hope of obtaining some additional fare. No lobsters were caught, however, but two eels and numerous starfish were recovered.

There were two types of starfish. The first type had dark-brown topsides of a rubbery appearance with orange undersides. The tentacles seemed to be made of many sections, while the body was an almost perfect pentagon (see sketch 1). The largest specimen measured 19 mm across the body with 60-mm tentacles. The second type had an almost circular body, brown in colour but covered with white spines. The tentacles were red and also covered with white spines (see sketch 2). This type had a body width of 13 mm with 30-mm tentacles.



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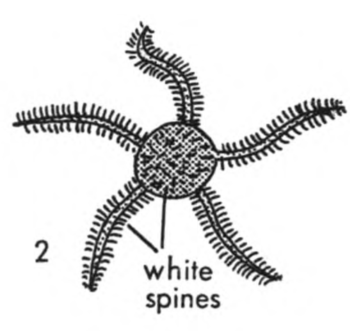

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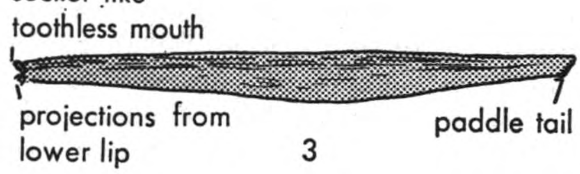


3

The specimen of the eels (see sketch 3) which was examined had a length of 440 mm and a maximum girth of 85 mm. Its head was not distinct from its body and did not appear to have any eyes. The mouth was small and sucker-like with four small projections underneath and the tail resembled a paddle. The colour of the fish was a uniform chocolate-brown above, lightening to pink below. It was observed to secrete a white sticky substance while in the lobster-pot.

Position of ship: 33° 35′S, 18° 25′E.

Note 1. As regards the starfishes described above, Miss A. M. Clarke, Echinoderm Section, British Museum (Natural History), comments:

'These are brittle-stars (ophiuroids) rather than proper starfishes (asteroids), differing in the disc-like body and constricted spaced arms. The one shown in sketch 1 is probably *Ophiomyxa vivipara capensis*, judging from the rubbery appearance (most brittle-stars have the disc scaly or covered with granules or spinelets rather than bare skin) while sketch 2 is most likely to be *Ophiothrix fragilis*, which also occurs in European waters, like several Cape species. Many species of *Ophiothrix*, including this one, are very gregarious and may form dense aggregations, for instance on coarse gravel bottoms in Torbay and other parts of the Western Channel. It would be interesting to know the depth of the lobster-pot since the minimum so far recorded for this *Ophiomyxa* is 75 metres. The *Ophiothrix* is more of a shallow-water species.

Note 2. With regard to the eels mentioned above, Mr A. Wheeler, Zoology Department, British Museum (Natural History), comments:

'The eel-like creature caught at Table Bay by the *Clan Robertson* was a hag fish, often called a "sea snake" in South Africa although it is not a snake. The only known species in the area is *Heptatretus hexapterus*, which is rather local in its distribution. It is a scavenger, and is known to attack fishes in traps or hooked on long-lines, as does the Atlantic hag fish. It is notably and revoltingly slimy.'

BIRDS

Eastern South Atlantic

m.v. *City of Liverpool*, Captain J. I. Owen. Durban to Newport (Gwent). Observers, the Master and Mrs Owen, Mr R. J. Kelly, Electrician and ship's company.

20 January 1975. At 0800 GMT a small bird was found lying on the boat deck. It was retrieved and on examination was found to be a Leach's Petrel. The bird was uninjured but had oil on its body, tail and wing-tips.

The Master, being a member of the Royal Naval Birdwatching Society and following the procedure suggested by them, had the bird wrapped up and put in a box in a warm place to rest. He was also aware that Storm-petrels feed on plankton and other very small marine life so fish feeding was useless. The suggested alternative—cod liver oil—being unobtainable, the storeroom was raided by the Purser/Catering Officer and a tin of 'Natural Pilchards' from S.W. Africa was produced together with an eye-dropper. The bird took to the oil from the pilchards immediately and opened its mouth wide to receive the eye-dropper, apparently accepting Mrs Owen as a foster-parent and the dropper as a beak supplying nourishment, *see* photograph opposite page 16. A second feed in mid morning was accompanied by a bowl of water that was sampled immediately followed by quick darting glances all around as if looking for food in the water; fresh water was preferred and salt water ignored.

The oil on its feathers was washed off after lunch using a solution of washing-up liquid at about 100:1 and rinsing off with water; various popular proprietary brands of detergent are recommended, but there being no shops in the vicinity (about 400 miles east of St Helena), we resorted to 'Sqezy' with excellent results. We were amazed at how completely drenched the bird became and it took many minutes with Mrs Owen's hair-drier to return our charge to some resemblance of a live bird.

Eventually, success was achieved and the bird was put to rest in its box. Two further feeds, in the afternoon and evening, followed. A night spent on the bathroom floor beneath the hot towel-rail ended with the bird still sitting quietly in its box. After being fed on the bridge at 0730, and on being taken out of the wheelhouse, it showed interest immediately, flapping its wings strongly whilst standing on Captain Owen's hand. On the third effort it lifted easily, flew across the ship and headed off westward, flying high and strongly in the approximate direction of St Helena/Ascension Island. The bird had spent 24 hours with us, travelled 480 miles indoors, yet appeared to have its 'radar' functioning well.

Position of ship at 0800 GMT on 20th: 15° 25'S, 1° 45'E.

Note 1. Captain G. S. Tuck, D.S.O., R.N., Chairman of the Royal Naval Birdwatching Society comments:

'This very interesting report with excellent photograph, sent in by Captain Owen, m.v. *City of Liverpool*, brings in some different points in connection with de-oiling and also feeding a Leach's Storm-petrel.'

Note 2. In other comments with reference to the treatment of oiled birds, Captain Tuck emphasizes the importance of initially keeping the bird warm and quiet and wrapped in a cloth with head and legs only protruding in order to prevent it preening and swallowing more oil. Also, suitable feeding should start at once.

Indian Ocean

m.v. *Ernebank*. Captain A. B. Osborne. Colombo to Mombasa. Observers, the Master, Mr D. W. Bunker, 2nd Officer and ship's company.

20–29 January 1975. It was noted, on our departure from Colombo on the 20th, that we had on board a number of non-paying passengers, namely 21 crows. After a couple of days out their numbers had dwindled to 5 and during the voyage they proved to be a source of great amusement to officers and crew. Each bird became an individual and had its own peculiarities. As we always considered crows to be a non-migratory bird, it seemed unusual that they should have remained with the vessel until our arrival at Mombasa on the 27th.

While waiting at the anchorage for the Pilot, the crows took off and we thought that would be the last we saw of them. However, once we had tied up at K4 buoy, it was noticed that our five crows had managed to pick us out from the other vessels in the area and had joined us again. They then remained with us until the afternoon of the 29th when they left us for good.

Position of ship at 0600 GMT on 20 January: 6° 36'N, 79° 24'E.

Position of ship on 29 January (approx.): 4° 02'S, 39° 43'E.

Note. Captain Tuck makes the following interesting comments: 'Ceylon Black Crows take an assisted Passage! This has happened twice before in our records. Some years ago four Ceylon Crows took passage from Colombo to Geelong, south Australia, but one got blown down a ventilator cowl on the way! And in July 1974 this sort of thing happened on m.v. *Flintshire* bound from Colombo to Cape Town, in which case 12 of these crows started the voyage and had to be driven away, ruthlessly, just before reaching South Africa—for fear that the ship might be fined for importing foreign birds.

'In these instances, as in the present report, this was not a case of migrating, but the sheer inquisitiveness of the species (especially around the galley); they just make themselves "at home" and become quite tame on board.

'Judging from these reports it would appear that Ceylon Black Crows enjoy package holidays at sea.'

East China Sea

m.v. *Phemius*. Captain N. A. Joyce. Keelung to Pusan. Observers, the Master and Mr M. Rudrakumar, 3rd Officer.

3 February 1975. Whilst steaming north of Taiwan, a racing pigeon, which had flown aboard the previous day in fog in the Keelung area, was captured.

On its left leg was an aluminium ring with the number 334970 KOREA (printed in Chinese) and, presumably the date, 74. On its right leg was a plastic band which was red and white horizontally striped. When this was removed, another ring made of brass was underneath, and the inscription was again in Chinese characters. The bird was quite tame and used to handling.

Position of ship at 0600 GMT on the 3rd: 26° 06′N, 122° 18′E.

Note. Major L. Lewis, M.B.E., General Manager, The Royal Pigeon Racing Association, comments:

'I was exceedingly interested in the pigeon which landed on the *Phemius*. It would appear that the pigeon emanated from Korea, as its number indicated, and that the plastic band was a "race entry-ticket" with the brass ring probably being a name-and-address ring of the owner.'

North Pacific Ocean

s.s. *London Pioneer*. Captain P. J. Cornish. Balboa to Naklodka, U.S.S.R. Observers, the Master and all deck officers.

2–12 March 1975. A group of large sea-birds, which looked like albatrosses, was sighted on the 2nd. The birds, in varying numbers, followed the vessel for almost two weeks through calm and storm, and during daylight hours gave a continuous display of low-level gliding. It is not certain whether the birds roosted on board at night as they were not heard to make any noise, even in flight, but on previous voyages they have been known to settle on board after dark. At no time were they seen to catch fish, but were quite satisfied with our not inconsiderable leftovers.

The birds had narrow pointed wings about 185 cm wide with fat bodies about 75 cm long and were of two varieties. The more numerous were brown with black or dark-grey beaks about 20 cm long. A narrow white band was sported around the beak where it joined the head. The second variety had the same brown on the upper wings and tail, but the undersides of the wings were partly white, whilst the body was wholly white with pink beak and legs. These birds seemed far less timid or, possibly, more curious than the brown variety and often came within 10 feet of the bridge wings—giving the watchkeepers most disdainful looks.

In their feeding habits, the birds were most selective, appearing to know instinctively what was edible—they were not fooled by cotton waste or empty beer cans. They finally left the vessel on the 12th when the weather turned colder.

Position of ship on 2 March: 24° 00′N, 151° 00′W.

Position of ship on 12 March: 37 °00′N, 160° 00′E.

Note 1. Captain Cornish also remarks that these birds, which never fail to appear on North Pacific passages, are seldom, if ever, reported in the *Marine Observer*.

On examining the files it was found that, out of the very considerable number of bird observations reported in the logs received from ships of the V.O.F., only three ships, prior to the *London Pioneer*, reported albatross sightings in the North Pacific during the period February 1974 to August 1975.

Note 2. Captain G. S. Tuck, D.S.O., R.N., Chairman of the Royal Naval Birdwatching Society, comments:

'There are two species of large albatross which persistently follow ships crossing the North Pacific. One is the Black-footed Albatross (*Diomedea nigripes*), the dark-brown species with a white patch above the bill, in the above report. Note that immature birds also show a whitish band above the rump. Bills and legs in both cases are dark. The other is the Laysan Albatross (*Diomedea immutabilis*) which has head, neck, rump, upper tail coverts and underbody white. Back and upper wings dark sooty-brown. White tail carries dark terminal band. Bill, greyish/yellow. Legs, flesh colour. Note that a dark spot shows in front of eye.'

Note 3. Captain Tuck also supplied the photographs opposite page 17 and the following notes on the oceanic distribution of albatrosses:

'Of the 13 species of albatross, 9 are confined to the southern oceans. One, the Waved Albatross inhabits the area around the northern end of the Humboldt Current, breeding only on the Galapagos Islands, while 3 more species are residents of the North Pacific. Of these

Mrs Owen feeding the Leach's Petrel with an eye-dropper aboard the *City of Liverpool* (*see* page 14).

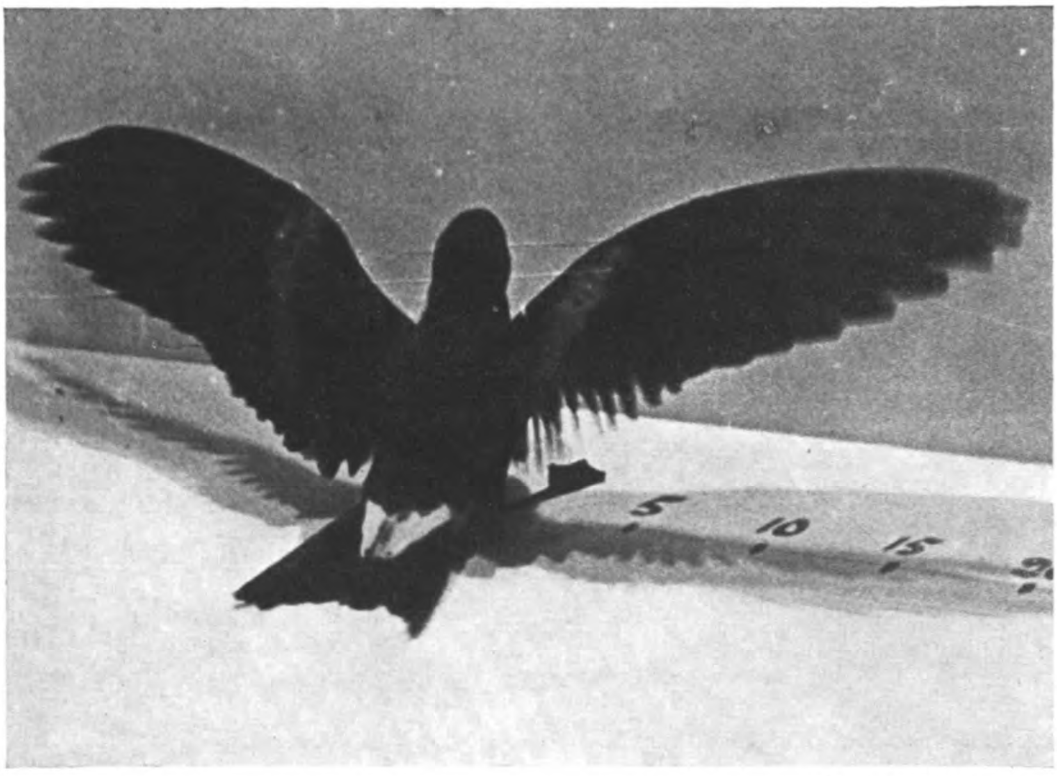
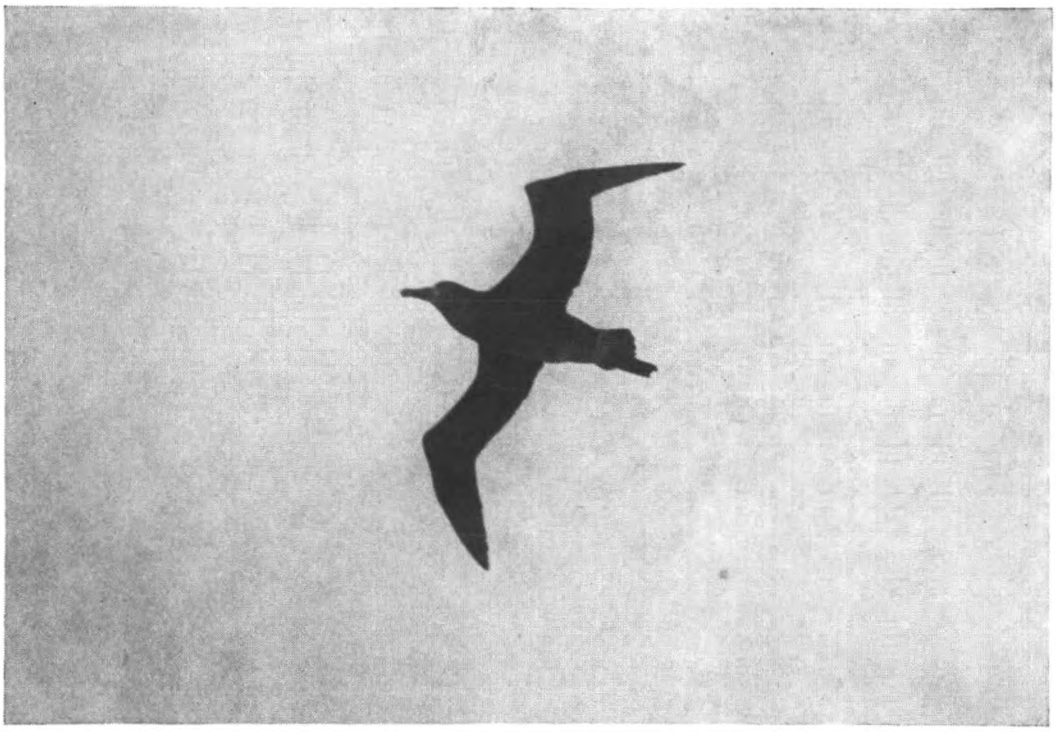


Photo by courtesy of RNBWS

Close-up of a Leach's Petrel—measurements shown are in centimetres.

(*Opposite page* 17)



Black-footed Albatross in flight (*see* page 16).

Photos by courtesy of RNBWS

Laysan Albatross (*see* page 16).

three, the all-dark-brown Black-footed Albatross (with black bill and legs) and the Laysan Albatross (a generally white species except for a completely brown upper back, upper wings and greyish bill) carry a dark terminal band on the white tail. Both breed on the Hawaiian Islands' leeward chain and are regular ship-followers across the entire width of the North Pacific. The last of these three species, the Short-tailed Albatross, is very rare. A small number breed only on Torishima Island and now seem to be holding their own although at one time they were thought to be extinct. This is a large, generally white bird (in adult plumage) with partially dark upper wings, a dark band on the tail and with pale legs and bill. The young, however, are all dark and very similar to young Black-footed Albatrosses but are distinguished by their pale bill and legs.'

North Pacific Ocean

s.s. *Benalder*. Captain R. C. Thomas. Panama to Tokyo. Observers, the Master and ship's company.

18 February 1975. For the last few days some sea-birds had been following the ship, feeding off the flying fish that rose at the bows and glided out of the ship's path. They numbered variously between a single bird to four or five but never more and had been identified eventually, with the aid of the book *Birds of the Ocean* by W. B. Alexander, as Brown Boobies. They were seen to dive down after the fish and chase them across the surface, picking them neatly out of the air, and also occasionally diving into the sea after them. The fish caught were deftly turned and swallowed head first while the bird was still in flight. The birds continually caught and swallowed large amounts of fish and did not appear to know when to stop.

Three birds had roosted on the foremast the previous night and were up early in the morning looking for breakfast. Around noon one alighted on the bridge wing-rail and started preening, thus allowing us to observe it at closer range. We were able to approach it and, if one dared, touch it. However, being of sound mind, we did not try as its beak was rather 'off-putting'. Its characteristics more or less tallied with the book description and were as follows: length 51–76 cm, wing-span 76 cm, bluish/grey beak 10–15 cm long. Legs were pale yellow. The neck looked like soft fur, light brown to off-white in colour. The body and wings were mottled brown with white underparts, and the throat was bluish in colour with bare skin on the face.

The bird perched on the rail quite unconcerned at the close attention being paid it and the clicks of cameras. Later, due to the ship altering course, it fell off the rail on to the deck and, in attempts to take off, regurgitated three large flying fish in one block. Two heads had been digested. These fish were about 23 cm long and had plenty of meat on them. The three together measured about 10 cm across which gives some indication as to how flexible the bird's throat is. Eventually the bird got airborne and regained a perch on the foremast, where it remained until evening.

Position of ship at 2100 GMT: 17° 14′N, 136° 06′W.

LUMINESCENCE

Arabian Sea

m.v. *City of London*. Captain W. S. Coutts. Durban to Dubai. Observers, Mr P. W. Underhill, 3rd Officer and Mr R. J. Clarke, Cadet.

9 February 1975. At 1800 GMT very vivid luminescence was observed. Initially this took the form of 'flashes' and 'speckles' in the ship's wash. Later the small crests on the waves (wind force 3) were visible at a great distance from the ship. The vessel passed through areas of varying density of luminescence which at times was so intense that the keeping of a 'look-out' was hindered by the glow.

At one stage two patches, perhaps 15 m in diameter, were observed stationary in the water, apparently undulating and moving in a motion similar to that of breathing. Shortly afterwards the phenomenon took the form of long streaks in the water lying along the direction of the wind. Air temp. 24·3°C, wet bulb 23·0, sea 26·2. Sky clear. Good visibility.

Position of ship: 18° 36′N, 58° 48′E.

Note. Dr P. J. Herring of the Institute of Oceanographic Sciences comments:

'The *City of London*'s observations are particularly interesting, and suggest some cause other than dinoflagellates. It is possible that the ship was in a particularly dense aggregation of ostracods, tiny (1–2 mm long) crustaceans which squirt a cloud of luminous material into the water when disturbed. Dense aggregations of these animals do occur in the Arabian Sea at the surface after dusk and produce a particularly bright glow, as we have observed from R.R.S. *Discovery* in previous years. The appearance of long streaks in the water probably results from the accumulation of the organisms in the surface wind-rows.'

Gulf of Oman

m.v. *Gambada.* Captain A. D. Copeland. Kuwait to Japan. Observers, the Master and Mr E. J. Hadfield, 3rd Officer.

14 March 1975. At 2030 GMT luminescence, in the form of parallel lines on the surface of the sea, was observed. The lines lay in a NE to SW'ly direction, were approximately 1¼ m wide and spaced about 45 m apart. The disturbed water along the ship's side was glowing a bright green colour, and, where the bow wave was breaking, there were frequent bright green flashes.

Position of ship at 1800: 25° 18′N, 57° 24′E.

Note. Dr Herring made the following comments:

'The account from the *Gambada* indicates that the vessel may have been in water containing a large number of dinoflagellates, the small organisms responsible for most occurrences of general sea surface "phosphorescence" or luminescence. But the observations of bright single flashes suggest that other animals were also present, perhaps comb-jellies or medusae (jelly-fish) some of which flash brightly when disturbed. The appearance of bands of luminescence is a common phenomenon, usually resulting from the accumulation of the organism responsible into wind-rows.'

ABNORMAL REFRACTION

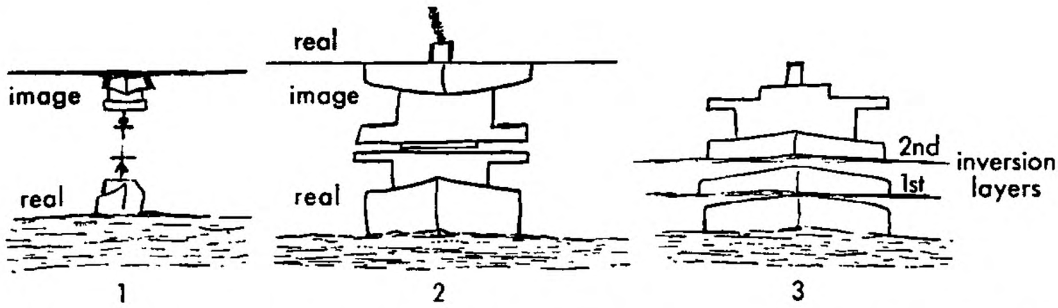
South African waters

m.v. *British Holly.* Captain N. J. Packard. Little Aden to U.K. Observers, the Master and Mr P. Knox, 3rd Officer.

15 March 1975. Between 0800 and 1200 GMT, while the vessel was proceeding from Cape of Good Hope to Table Bay, exceptional refraction was observed. The associated inversion layer appeared to be approximately 30 m above the surface and extended for the full 360° around the horizon. Visibility was very good—Table Mountain being clearly visible from a position 30 n.mile to the south.

Various effects due to the inversion, namely inverted and distorted images, and the viewing of objects geometrically below the horizon, were observed in relation to three successive ships (see sketches). Sketch 1 was a Japanese naval vessel and sketches 2 and 3 were oil tankers of 250 000 tons d.w. All vessels were first observed at a distance of approximately 8 n.mile. Weather details during the period were as follows: wind E'S, force 2. Air temp. 18·5°C, sea temp. 15·6. No cloud.

Position of ship (approx.): 34° 15′S, 18° 15′E.



Note 1. Reports of abnormal refraction off S.W. Africa have appeared in recent editions of the *Marine Observer*, from the *Priam* (October 1972) and the *Peisander* (January 1974). Warm air of continental origin moving over a relatively cold sea induces cooling of the lowest air layers and hence a low-level temperature inversion, resulting in abnormal refraction.

The complex images illustrated may be produced by further temperature discontinuities within the main inversion layer.

Note 2. Further cases of abnormal refraction in the same area were reported by the *Clan Robertson* on 12 February 1975.

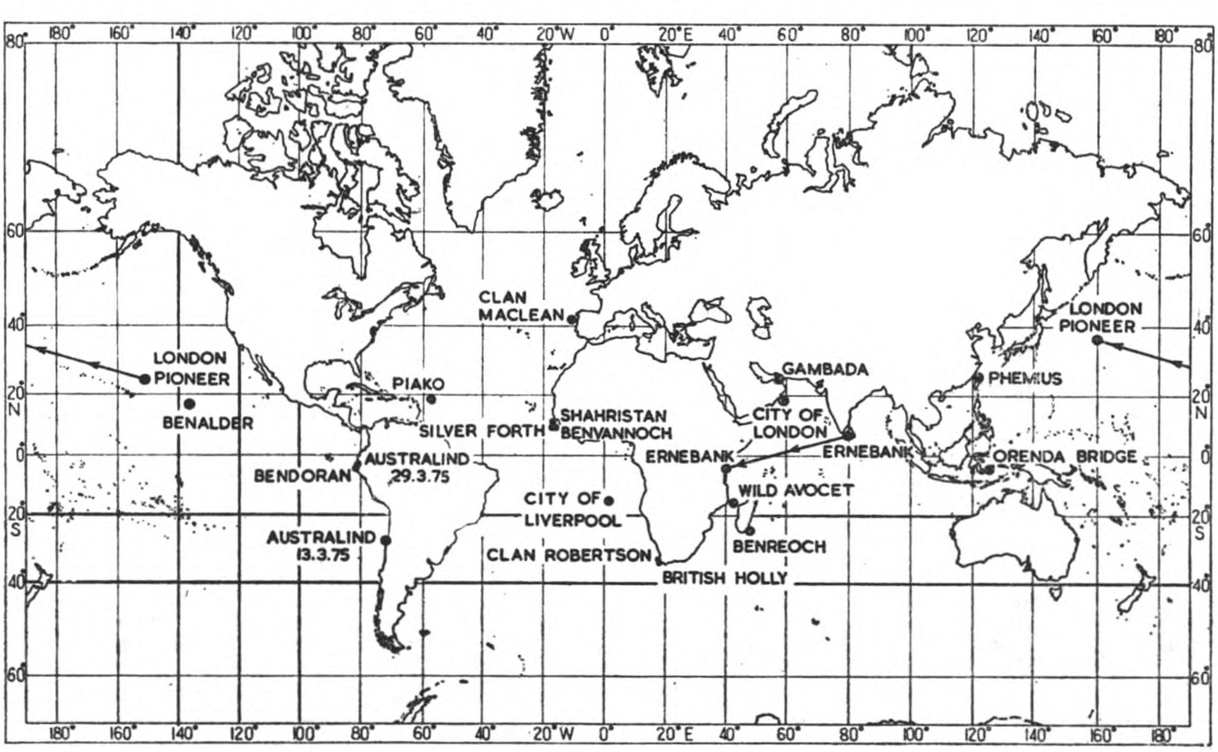
ACTIVE VOLCANO

Banda Sea

m.v. *Orenda Bridge*. Captain C. J. Welch. Port Walcott, Western Australia to Chiba, Japan. Observers, the Master, Mr R. C. Brooker, 2nd Officer and Mr L. D. George, 2nd Officer.

14 March 1975. At 1200 GMT, as the vessel was approaching Buru Island from the south, a red glow was observed at a distance of 47 nautical miles in the direction of the island. On closer inspection, the glow was distinguishable as red-hot lava pouring from a volcano at a position of 3° 03′S, 126° 20′E. Although night-time, a faint cloud of smoke could be seen billowing from the glow. No lava could be seen actually erupting from the crater, but the lava covering the slopes of the volcano was clearly visible. Wind N'ly, force 4. Pressure 1008·1 mb. Air temp. 28·4°C, sea 28·2. Mainly cloudy.

Position of ship at 1200: 4° 36′S, 125° 42′E.



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

AURORA

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

'We acknowledge with thanks the auroral reports received at the Balfour Stewart Auroral Laboratory of the University of Edinburgh and summarized very briefly in the accompanying list. These reports were logged by observers in selected British ships, or recorded by observers in weather ships during the three months January–March 1975.

'The monthly mean relative sunspot numbers maintained a low level throughout the first half of 1975, but it remains to be seen whether or not the minimum of the sunspot cycle has yet been passed. Geomagnetic activity diagrams continued to be dominated by the pattern of 27-day recurrence series. In one series a short-lived and sudden rise of activity around midnight on 6/7 January was not followed by further above-moderate occurrence until 27/28 March. A more prolonged recurring series was unremarkable 13–18 January, slightly more active 10–16 February, and generally above moderate 10–16 March.

'Aurora associated with the geomagnetic activity of 6/7 January was reported by observers in the *Cheviot*, who had a grandstand view from Vest Fjord of spectacular and colourful aurora overhead in successive bursts of activity. The display was hidden by cloud from weather ship observers, but from stations in northern Scotland aurora was visible until 0430 UT.

'Aurora australis reported by observers in the *Encounter Bay* on 8/9 January, with an arc overhead some 2° of latitude further south, was associated with moderate geomagnetic activity. Comparing the geomagnetic latitude/aurora relationship with that shown by reports of other ships in the list, there appears to be a discrepancy, but it will be noted that the "inclination" figure is similar to northern-hemisphere sightings at higher geomagnetic latitudes. Having stressed so often that stations in the same geomagnetic, as opposed to geographic, latitude have similar auroral frequency figures, we must now say that the subject is slightly more complicated than this; in fact, the global geomagnetic field does not have the regular form of a simple dipole field, and it turns out that the magnetic inclination (angle between the horizontal and the position of a dip-circle needle) is a better general measure of auroral activity than is the geomagnetic latitude, which is based on the dipole field. (In the Table positive values of inclination refer to the northern hemisphere and negative to the southern hemisphere.)

DATE (1975)	SHIP	GEOGRAPHICAL POSITION	Λ	Φ	I	TIME (GMT)	FORMS
			degrees				
5th Jan.	*Cheviot*	68°15′N 15°35′E	100	68	+77	1600 2030, 2045	HB HA, RA
6th	*Cheviot*	64°53′N 07°00′E	100	65	+75	2145–0330	All forms
8th	*Encounter Bay*	48°07′S 118°15′E	190	−59	−78	1300–1600	RR, N
9th	*Encounter Bay*	47°50′S 120°20′E	190	−59	−78	1715–1750	HA, RA
10th	*Weather Monitor*	52°43′N 20°08′W	060	59	+69	2045	N
14th	*Weather Reporter*	58°16′N 17°30′W	070	64	+72	2303–0315	N
16th	*Weather Reporter*	58°45′N 19°25′W	070	65	+72	2200–0600	HA, HB, RA, RB, P, N
17th	*Weather Reporter*	58°51′N 18°48′W	070	65	+72	2055–0300	RR, N
4th Feb.	*Weather Reporter*	59°13′N 18°55′W	070	65	+72	2200–0115	RR, N
14th	*Weather Monitor*	58°49′N 19°11′W	070	65	+72	2030–2100 2245–2325	HA, RA RR, N
15th	*Weather Monitor*	58°41′N 18°54′W	070	65	+72	2340–0100	N
16th	*Weather Monitor*	53°38′N 18°50′W	070	65	+72	0145	N
17th	*Weather Monitor*	58°35′N 19°29′W	070	65	+72	0050–0300 0450	N
	Weather Monitor	55°58′N 19°28′W	070	65	+72	1950	N
2nd Mar.	*Weather Monitor*	58°48′N 18°38′W	070	65	+72	0055	N
10th	*Weather Adviser*	59°06′N 19°00′W	070	65	+72	0200–dawn	RB, N
	Weather Reporter	52°39′N 20°05′W	060	59	+69	0300, 0400	N
	Montreal Star	38°50′S 106°39′E	170	−50	−73	1655–1725	RA, RR, N
	Weather Adviser	59°00′N 19°12′W	070	65	+72	2040–0130	All forms
11th	*Weather Adviser*	59°00′N 19°12′W	070	65	+72	0400–0700	N
14th	*Weather Adviser*	59°00′N 18°42′W	070	65	+72	0100, 0400, 0500	N
	Montreal Star	42°01′S 133°15′E	210	−52	−73	1315–1343	HA, N
	Weather Adviser	58°54′N 18°48′W	070	65	+72	2130–dawn	HA, RR, P, V, N
15th	*Montreal Star*	42°55′S 139°15′E	220	−53	−73	1128–1645	RB, RR, P, N
	Weather Adviser	59°12′N 19°18′W	070	65	+72	2100	N
17th	*Weather Adviser*	59°06′N 19°00′W	070	65	+72	0135, 0315	HB, RR

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.

'This factor is seen again in the reports made during the active period in March (10th–16th), comparing the figures for the *Montreal Star* when between Port Elizabeth and Hobart, geomagnetic latitudes $-50°$ to $-53°$, and O.W.S. *Weather Adviser*, Φ 65°, but inclination (−)73 and (+)72 respectively. From both hemispheres there were detailed descriptions of the active display of 10/11 March. We quote from the report of the observer in the *Weather Adviser*—so briefly dismissed as "all forms" in the list: "all forms of aurora . . . appeared, changed and disappeared so rapidly it would be virtually impossible to encode the display. . . . The most vivid (variation) was a rapid movement of rays from the western horizon to the zenith where they seemed to pivot in a circular motion until fading. The leading edge of this formation was a very bright and distinct mauve colour, fading through blue, red, green and white to the trailing edge."

'During the February active period (10th–16th), the peak occurred around midnight of 10/11 February, with nil aurora shown on our charts due to widespread cloudiness. From O.W.S. *Weather Monitor* colourful arcs were visible on 14/15 February during a clear period. O.W.S. *Cumulus* observers were experiencing better conditions at Station "Mike" and reported very active displays overhead on several consecutive nights.

'Thank you again for your help.'

551.508.825

Progress in the Development of Meteorological Buoy Systems and Marine Automatic Weather Stations

By G. J. Day

(Assistant Director Observational Practices—Meteorological Office)

Introduction

Increasing difficulty is being experienced by meteorologists in getting data from the oceans and from coastal waters. Not only is the number of ships suitable as observing platforms decreasing as cargo vessels increase in size and speed but the reduction in crew size which accompanies the introduction of automation on ships may further reduce the number of observations made. The reduction in the number of ships carrying more than one radio operator has led to the situation where the meteorological observations made by deck officers are transmitted either not at all or too late for them to be of maximum value for forecasting purposes.

The decreasing dependence of aircraft on fixed ocean stations for navigational assistance and emergency services too has led to the disappearance of many of the fixed Ocean Weather Ships at a time when satellite technology is not able to provide data of sufficient accuracy or scope for operational purposes.

A possible way of providing some of the data required is to mount automatic weather-observing systems on buoys or suitable ships. It was with this possibility in mind that the Meteorological Office, in conjunction with the Royal Navy, began experiments in 1968 with a simple automatic weather station mounted on a 2·5-metre diameter toroidal buoy. After some initial experience with this equipment in two deep ocean air–sea interaction studies—the Atlantic Tradewind Experiment of 1969 and the Joint Air–Sea Interaction Experiment of 1970—experiments began in coastal waters and about 16 months' sea experience had been gained up to September 1974 with what is now known as OBOE 1 (Offshore Buoy Observing Equipment No. 1).

As a result of experience with OBOE 1 a requirement has been stated for a semi-permanent operational buoy to be placed in the mouth of the Thames. The development of a low-power-consumption data-acquisition system for this buoy, to be known as OBOE Thames, has been completed and the system has been tested ashore.

Because the 2·5-metre toroidal buoy is not thought to be suitable for use for long periods in deep water a system has also been designed which is based on a 3·3-metre semi-spar buoy provided by the Royal Navy. It is hoped that this system, OBOE 2, will begin trials during 1976.

Since 1971 a U.K. national data buoy programme has been established and the Meteorological Office has provided the meteorological sub-system for a large (7·6-metre diameter) data buoy—DB–1—which was intended to be moored off Lowestoft late in 1975. The DB–1 Project is sponsored by the Department of Industry, managed by the Institute of Oceanographic Sciences and supported by the Meteorological Office, MAFF (the Ministry of Agriculture, Fisheries and Food) and the Royal Navy. The same group is also co-operating in placing a small number of drifting buoys in the eastern Atlantic and the Norwegian Sea: the U.S. Satellite NIMBUS 6 is being used to locate the buoys and to relay their data.

Internationally, the European COST (Co-operation in Science and Technology) Project 43 is concerned with the establishment of five pilot networks of data buoys for oceanography and meteorology in waters of interest to the European nations and the Meteorological Office has been represented in COST 43 discussions. Proposals are now being prepared for an inter-governmental agreement which should lead to the establishment of these networks late in the present decade.

These activities are described in greater detail below.

Experience with OBOE 1

OBOE 1 is the buoy-mounted system used in the air–sea interaction experiments to which further sensors, and a VHF telemetry system (151 MHz), have been added. The sensors initially carried by OBOE 1 comprised electrical resistance thermometers for air- and sea-temperature measurements, an electrical transmitting aneroid barometer, a cup-contact anemometer suitably strengthened and waterproofed and a commercial humidity sensor. Recently a wind vane and digital compass were added.

OBOE 1 (*see* photograph opposite page 24) has been deployed for two periods of 3 months each in Aberporth Bay and for two periods in the Thames Estuary, one of 3 months near Southend Pier where control observations could be obtained, and one of 7 months in shallow water near the Knock John Tower. At the end of the latter period, the buoy capsized in Force 10 winds. However, when it was recovered six weeks later the data-acquisition system and transmitter were still serviceable though the sensors had been badly damaged.

During these periods the following data retrieval rates were obtained:

Period 1—98 per cent
Period 2—97 per cent
Period 3—99 per cent
Period 4—88 per cent.

The various control observations that have been made suggest that the following accuracies of measurement are being achieved:

Air temperature	±0·3°C
Sea temperature	±0·4°C
Wind speed	±4 knots
Atmospheric pressure	±0·3 mb
Relative humidity	±5 per cent.

Experience with wind direction measurements has been too limited to permit a conclusion at this stage.

OBOE THAMES

When moored in water of sufficient depth, and in the absence of strong currents, the 2·5-metre toroidal buoy has proved to be a suitable platform on which to expose sensors. The experience with OBOE 1 shows that sensors can be operated with fair reliability for periods of at least 3 months and probably 6 months. We have been encouraged, therefore, to attempt the routine collection of data in the Thames Estuary for use by London Weather Centre in forecasts for shipping.

A new data-acquisition system has been developed and is based on low-power electronics. The system can accommodate up to 64 channels of data, scanned at 10 channels per second. Only a small fraction of this capability is taken up in OBOE THAMES but the system is regarded as a prototype for OBOE 2, the 3·3-metre diameter buoy. The system is powered by air-depolarized primary cells, and experiments on OBOE 1 suggest that it should operate for at least 6 months without attention.

The sensors for OBOE THAMES are as for OBOE 1 with the addition of a point visibility meter and a peristaltic-pump rain-gauge. The former has a range of 50 metres to 5 kilometres and a probable accuracy of ±15 per cent. The peristaltic-pump rain-gauge records increments of 0·1 millimetre of rain and the water collected will be stored for later chemical analysis to estimate the amount of spray collected. It is unaffected by the motion of the buoy.

A feature of OBOE THAMES is that alternative reporting programmes can be commanded by means of a two-way radio link. It is envisaged that the buoy will normally transmit every 3 hours, but that more frequent reports will be called up when conditions warrant.

Both OBOE 1 and OBOE THAMES have recently been returned to the old position near the Knock John Tower and have again capsized in high winds. This is thought to be due to wrongly designed moorings.

OBOE 2

OBOE 2 is being designed to provide experience of operation in deeper water. It is intended that it will operate in coastal waters within VHF range for a proving period, after which it will be moved to deeper water on the continental shelf. A position has yet to be chosen, but the area near the southern approaches to the Celtic Sea is under consideration.

A model of OBOE 2 is shown in the photograph opposite this page. The meteorological sensors and data-acquisition system are as for OBOE THAMES but other sensors could also be accommodated. The size of the buoy enables sensors to be exposed at a height of 4 metres above the sea, thus reducing problems of exposure. The main application of OBOE 2 will be the evaluation of alternative sensors and power supplies, and the examination of the problems of providing servicing support at sea. Consideration has therefore been given to a method of removing the entire superstructure of the buoy by helicopter or ship after the operation of quick-release couplings. The cabling, sensors, electronics and radio equipment will be integral with the superstructure and it will be possible to attempt the complete replacement of the superstructure unit during servicing visits.

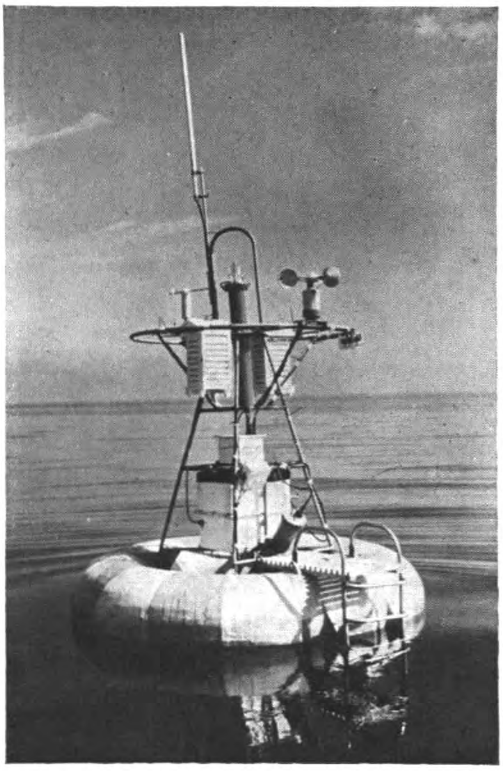
National Data Buoy, DB-1

The U.K. Data Buoy DB–1 was envisaged as a high-capability applications buoy for joint use by a variety of departments and institutes involved in oceanography and meteorology. The Department of Industry has been the lead agency for the project throughout but the work of project definition, initial design studies and the formulation of detailed specifications were given to a team in the Institute of Oceanographic Sciences (IOS). The Meteorological Office was represented on the Advisory Committee for the project and is responsible for the design and provision of the meteorological sub-system; the other departments involved are the Navy and MAFF. DB–1 is a 7·6-metre diameter discus buoy carrying a data-acquisition system which can accommodate 100 channels of data and is designed to operate for long periods without attention; it has a naval power supply system developed by the U.K. Atomic Energy Research Establishment. The buoy, which is shown in the photograph opposite page 25, has a telescopic mast on which the meteorological sensors are mounted at heights of 7·5 and 5·9 metres. Oceanographic sensors can be deployed and a three-point mooring system, designed with the advice of Trinity House engineers, will be used to prevent damage to them. The hull was designed to suit wave spectra encountered in the southern North Sea and, after proving trials near Lowestoft, will probably be moored about 25 n.mile to the east near the Smith's Knoll Bank. Fitting out is now well advanced (September 1975).

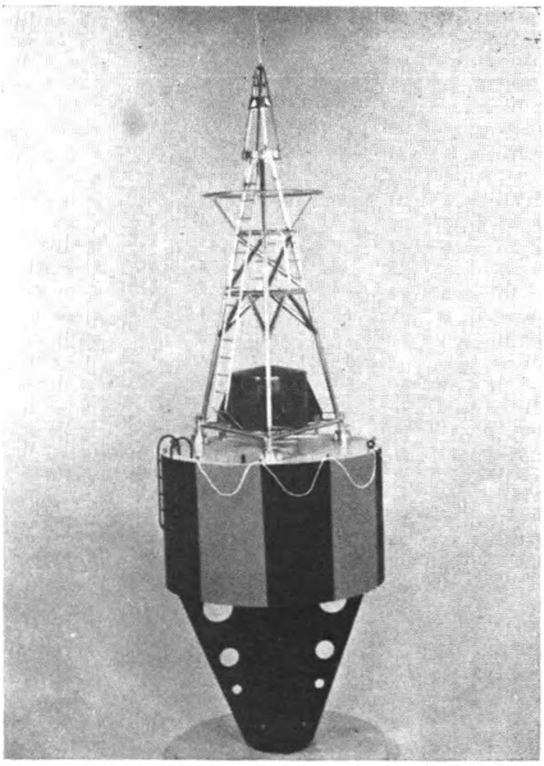
The shore station for DB–1 is in the MAFF Fisheries Laboratory at Lowestoft and data conversion, control and quality control is by mini-computer. Meteorological data will be passed in SYNOP code to the Meteorological Office at Honington. After evaluation, consideration will be given to the release of the data for general use. Absolute water-level data will be passed by the same route for use by the Storm Tide Warning Service at Bracknell.

DB–1 has been built by a consortium comprising Hawker Siddeley Dynamics Ltd, EMI and the shipbuilding firm of Green and Silley Weir Ltd. It is a much more sophisticated system, and thus more costly, than would be considered necessary for routine meteorological applications.

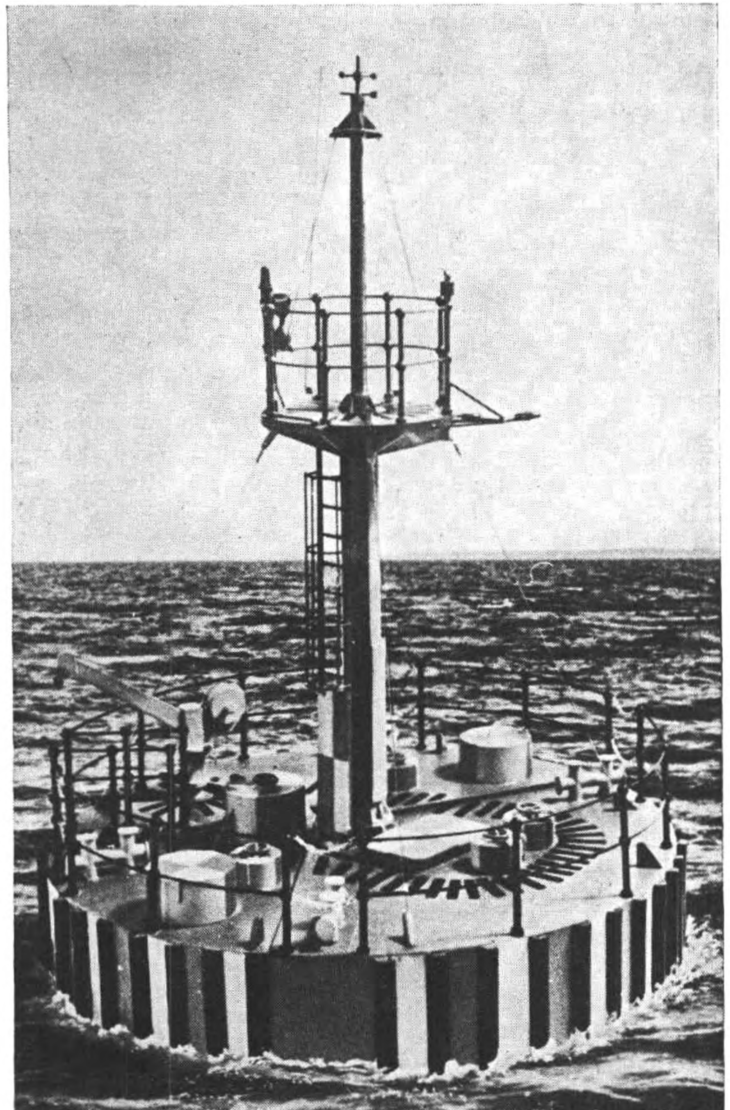
(*Opposite page 24*)



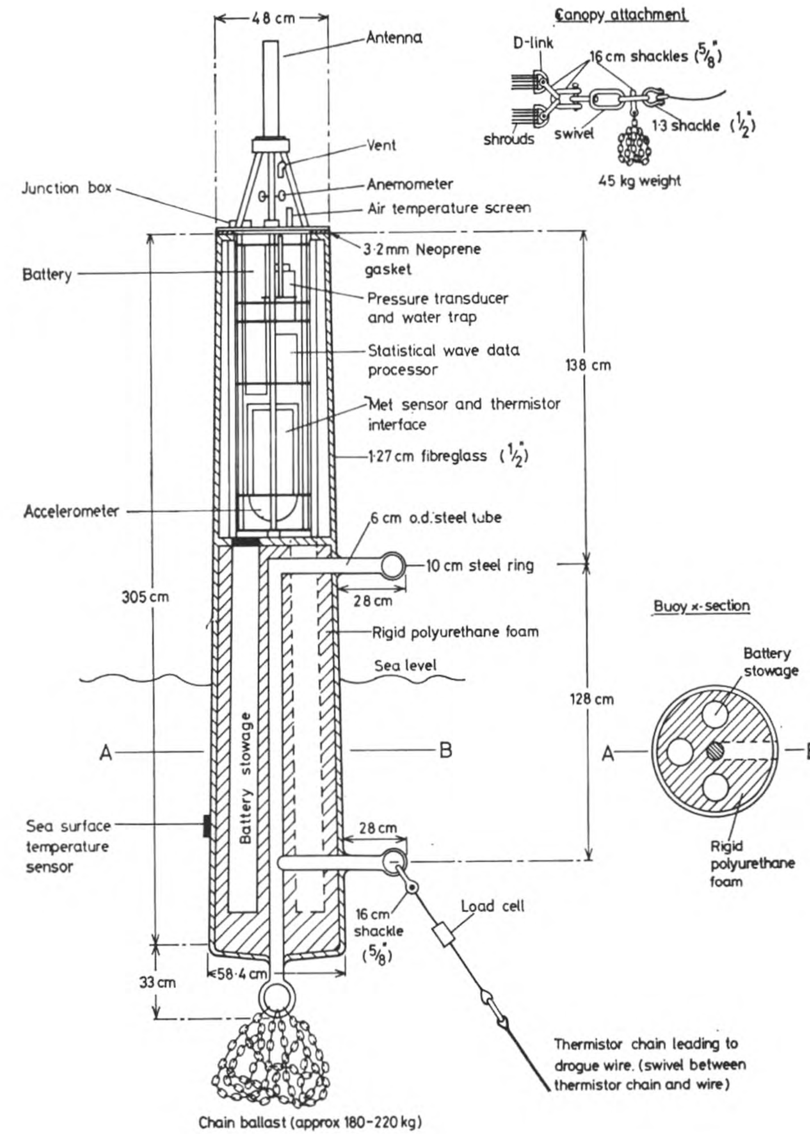
The 2·5-m buoy OBOE 1 moored in Cardigan Bay (*see* page 23).



Model of the 3·3-m semi-spar buoy OBOE 2, showing stainless steel superstructure and data-acquisition system pod (*see* page 24).



The U.K. data buoy DB-1, a 7·6-m diameter discus buoy (*see* page 24).

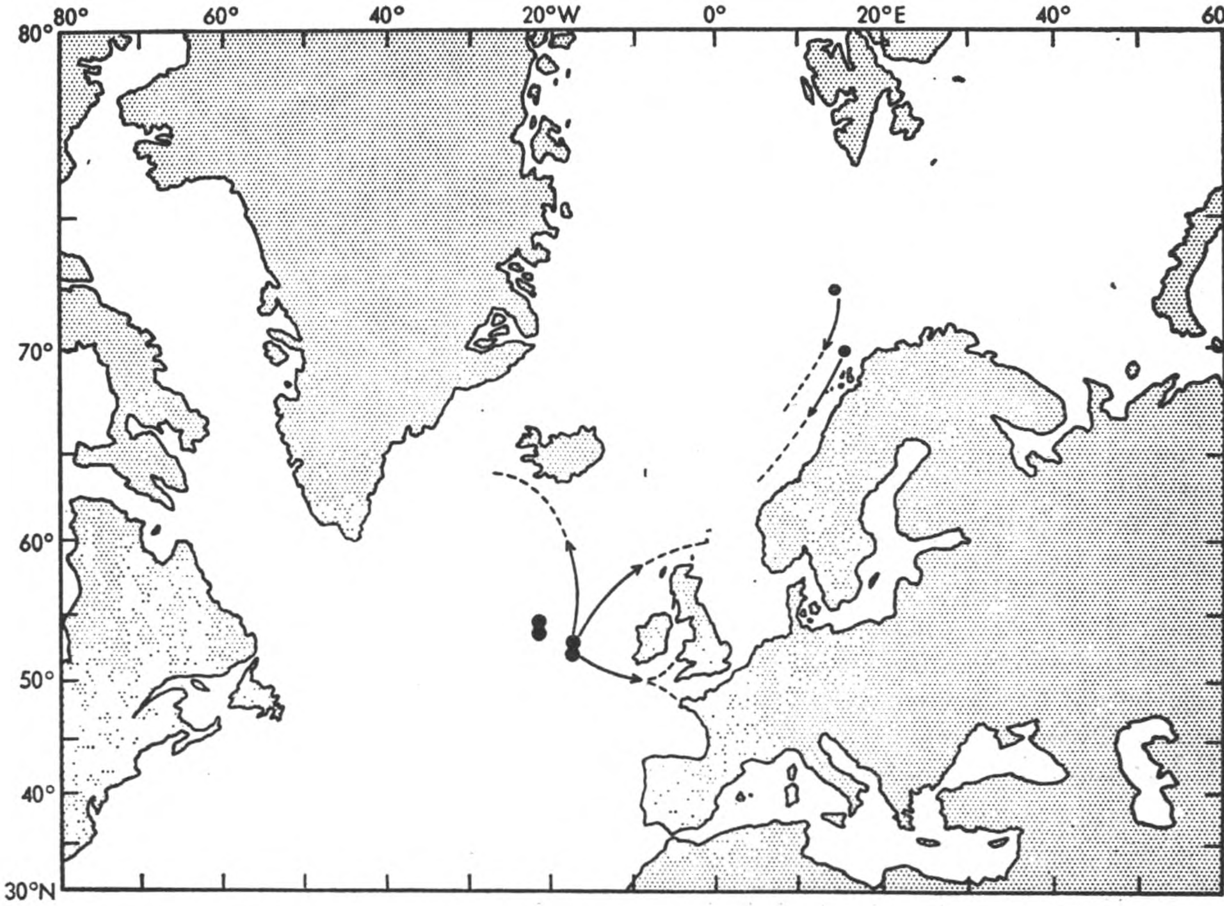


Spar buoy to be used in drifting buoy experiments (*see* page 25).

TWERLE drifting buoys

Another example of co-operative effort is the programme to place drifting buoys in the eastern Atlantic and Norwegian Sea. During 1972 the MAFF Fisheries Laboratory, which had previously acquired experience with the French EOLE satellite, decided to extend their work on ocean currents by using the U.S. NIMBUS 6 satellite to determine successive positions of a buoy and thus its drift. Informal contacts developed through the inter-departmental Standing Committee on Ocean Data Stations led to an arrangement in which several agencies agreed to share the cost of the buoys, the buoy transmit terminals and that of deployment and recovery. The buoys thus became available as platforms for other experiments, and a combined programme was proposed to NASA (National Aeronautics and Space Administration, U.S.A.) and accepted as part of the WMO TWERLE (Tropical Wind, Energy Conversion and Referrence Level Experiment) programme.

The Meteorological Office has designed and built a meteorological sub-system for the buoys to measure atmospheric pressure, air and sea temperatures and wind speed. The Navy will measure sub-surface sea temperatures to depths of about 250 metres, wave statistics will be acquired by IOS while the use of parachute drogues will enable the Fisheries Laboratory to derive ocean currents at various depths. The TWERLE buoy is shown in the photograph opposite this page and the proposed launching points in the chart below. At the time of writing four buoys have been launched.



Proposed launching points for drifting buoy experiments. Arrows show expected directions of drift.

International co-operation

The need for international co-operation has been recognized in the formation of the informal JONSIS (Joint North Sea Information Systems) Group, and the European COST (Co-operation in Science and Technology) Project 43, concerned with the establishment of data buoy networks. Proposals have been made for small pilot networks of 5 or 6 buoys each in the 5 areas North Sea/Baltic, Faeroes/Shetland, Biscay, Azores and Mediterranean. The pilot networks are to be established by 'action concertée' but a final phase has been suggested in which a standard 'European' buoy will emerge. A consultant has been engaged in harmonizing the individual national specifications to produce an acceptable 'European Specification' for this later phase.

DB–1 is regarded as the U.K. contribution to the North Sea/Baltic area. Although the U.K. has a clear interest in the Faeroes/Shetland area, the only available buoy, OBOE 2, is not considered to be suitable for the sea conditions obtaining there. The Meteorological Office is therefore exploring the possibility of another national co-operative action in which the Office might provide an OBOE 2 data-acquisition system and sensors for use on a platform, provided by some other group, in this area.

It should be remarked that there is a need to make progress with the safety and legal aspects of buoy operations. No progress has been made with the International Legal Convention on ODAS (Ocean Data Acquisition Systems) but proposals have now been made to incorporate sections dealing with some of these aspects into the inter-governmental agreement now being prepared on COST Project 43. The first point on which urgent progress must be made concerns the creation of a scheme for the recovery of environmental equipment lost at sea. Such a scheme must provide for the early recovery of data and the prevention of further damage to equipment by prompt maintenance in the country to which the equipment is initially brought by the finder. This European initiative could be invaluable in showing that at least some practical problems might be amenable to early solution.

Future operational possibilities

The developments discussed above are all concerned with buoy-mounted systems. There are many clear problems in using such equipment in deep water remote from land. The costs of moorings and regular maintenance visits—possibly using specially adapted ships—are relatively large and may be unacceptable for an operational service.

A more suitable approach may be to assemble an automatic weather-station package from the sensors and data-acquisition systems developed for offshore buoys. An equipment of this sort could be made completely self-contained and be adapted for easy installation in and removal from Voluntary Observing Ships. Problems of communication could be overcome by use of the satellite telemetry equipment now under test in the Drifting Buoy Experiment.

A detached study of a system of this sort is under way in the Meteorological Office and it is hoped that three prototypes will be under test by 1977.

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A Note on Tropical Storms in the Arabian Sea, October to December 1972

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Introduction

There are various definitions of 'tropical cyclones', 'tropical depressions' or 'tropical storms' and the terms themselves are subject to differing interpretations. However, setting aside these differences, it is well known that in an intense tropical storm the surface wind can exceed Beaufort force 12 (64 kn $\approx$ 33 m/s); the weather is often violently disturbed, usually with torrential rain and occasionally accompanied by thunder and lightning. The frequency with which these storms occur varies very considerably over the different oceanic areas in the tropics, reaching a maximum in the North Pacific Ocean and a minimum in the Arabian Sea. These storms often originate just north of the Intertropical Convergence Zone (ITCZ) when it is displaced by at least five degrees of latitude from the equator. It is generally accepted that the sea temperature in the area must be at least 26·5°C.

In the Arabian Sea there are two seasons for tropical storms; firstly when the ITCZ is moving southwards in October to December and, secondly, when the ITCZ is moving northwards in May and June. Pedgley (1969) showed that during the months October to December there were 30 storms over the whole Arabian Sea in the period from 1890 to 1950 (an average of one storm every two years). However, in the corresponding months of 1972 there were four storms which were all detected by means of satellite pictures from ESSA 8. Undoubtedly the use of the weather satellite will increase the frequency with which tropical storms are observed but the occurrence of four storms during October–December 1972 was probably not exceptional, since Pedgley suggests that during 1902 five storms were observed over the Arabian Sea area. He also refers to 10 storms in 25 years (1943–67) which approached or crossed the Arabian coast. In October–December 1972 two storms approached the Arabian coast and one of these (19–28 October) even entered the Gulf of Aden, where only three or four storms were experienced during the period 1879–1944 (London, Meteorological Office, 1962).

The storm of 19–28 October 1972

This tropical storm was first identified on 19 October and located at approximately 9°N, 62°E on the ESSA 8 satellite picture; this provided the only evidence for the existence of a tropical disturbance. Daily pictures from ESSA 8 continued to provide the only information (apart from a few aircraft reports) with the help of which to locate the storm and forecast its progress. The track which it followed is shown in Figure 1. The cloud associated with the storm on 20 October and its subsequent development can be seen in the photographs following this page.

The stage of development of the storm was estimated from the appearance and size of the cloud mass on the gridded satellite pictures. An estimate of the maximum surface winds associated with the storm was obtained from a nomogram produced by the Environmental Science Services Administration (ESSA) (1969) using stage of development and the diameter of the central cloud mass.

On 19 October the disturbance could only be classified as a dense cloud cluster. By the 21st the cloud mass was at least 6 degrees of latitude in diameter, with moderately concentric cloud bands. Much curved cirrus outflow was visible at the edge of the cloud mass, which was tending to become circular, but no 'eye' was discernible. A Stage X Category 2 storm had developed. Stage X storms are those

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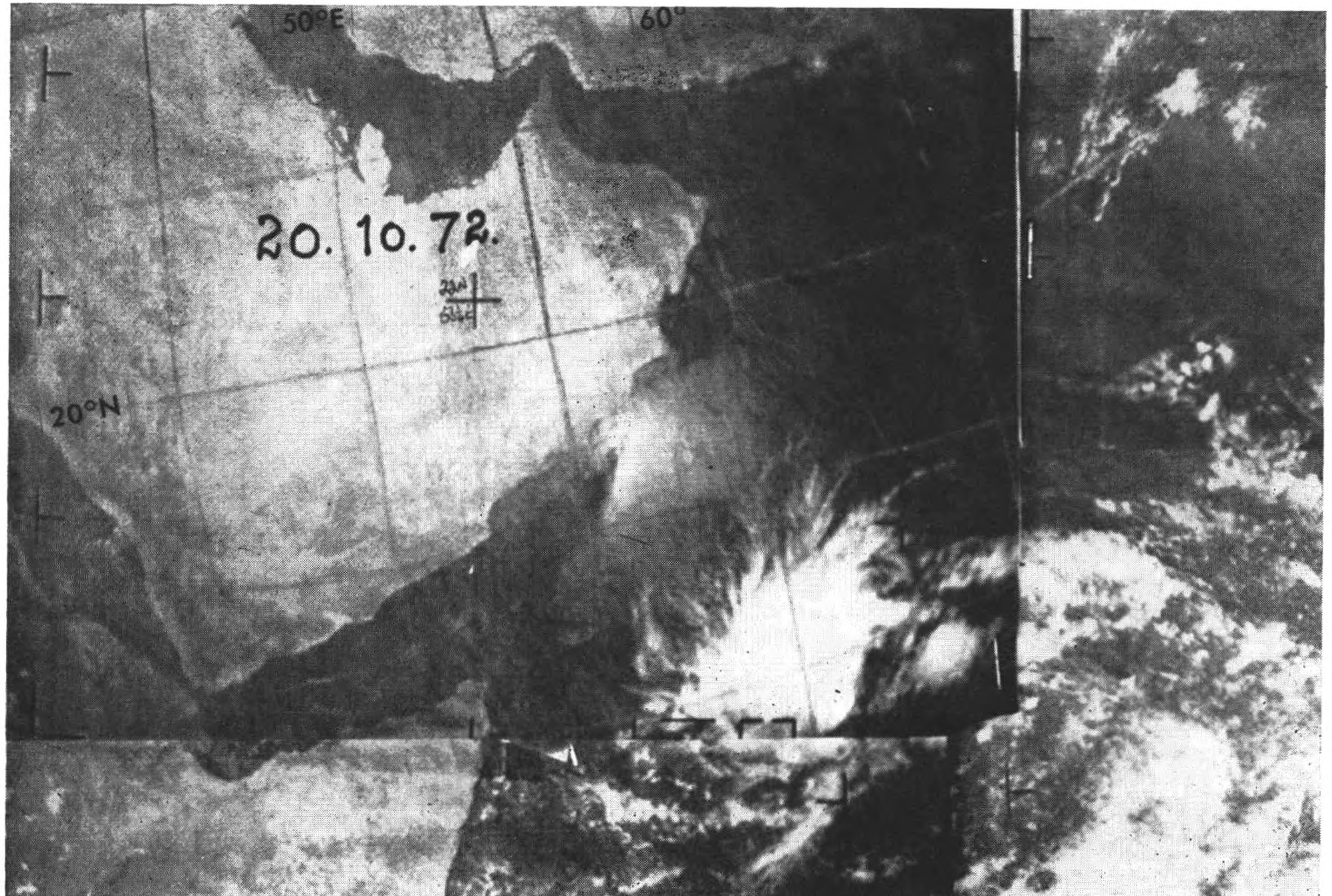
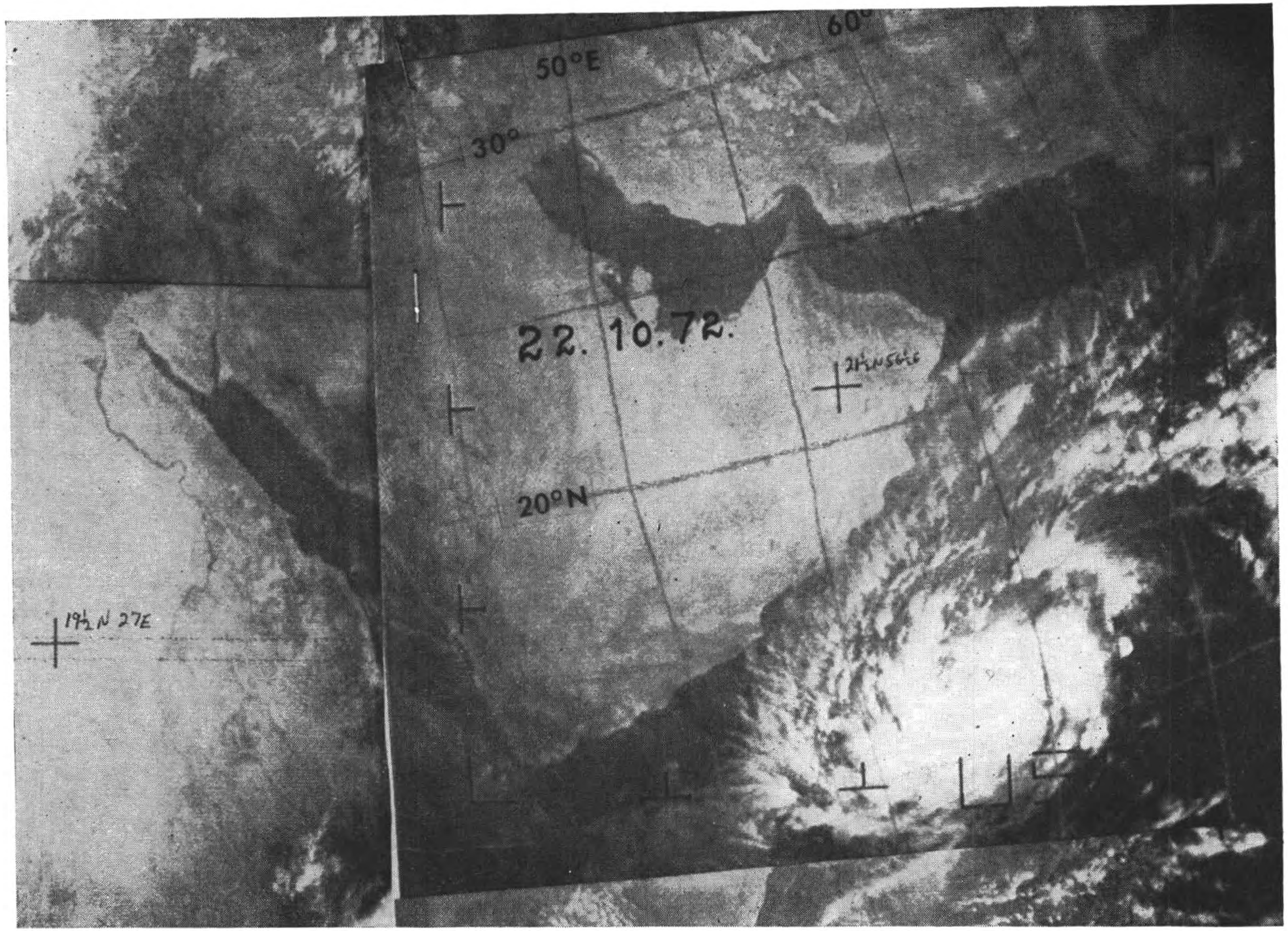
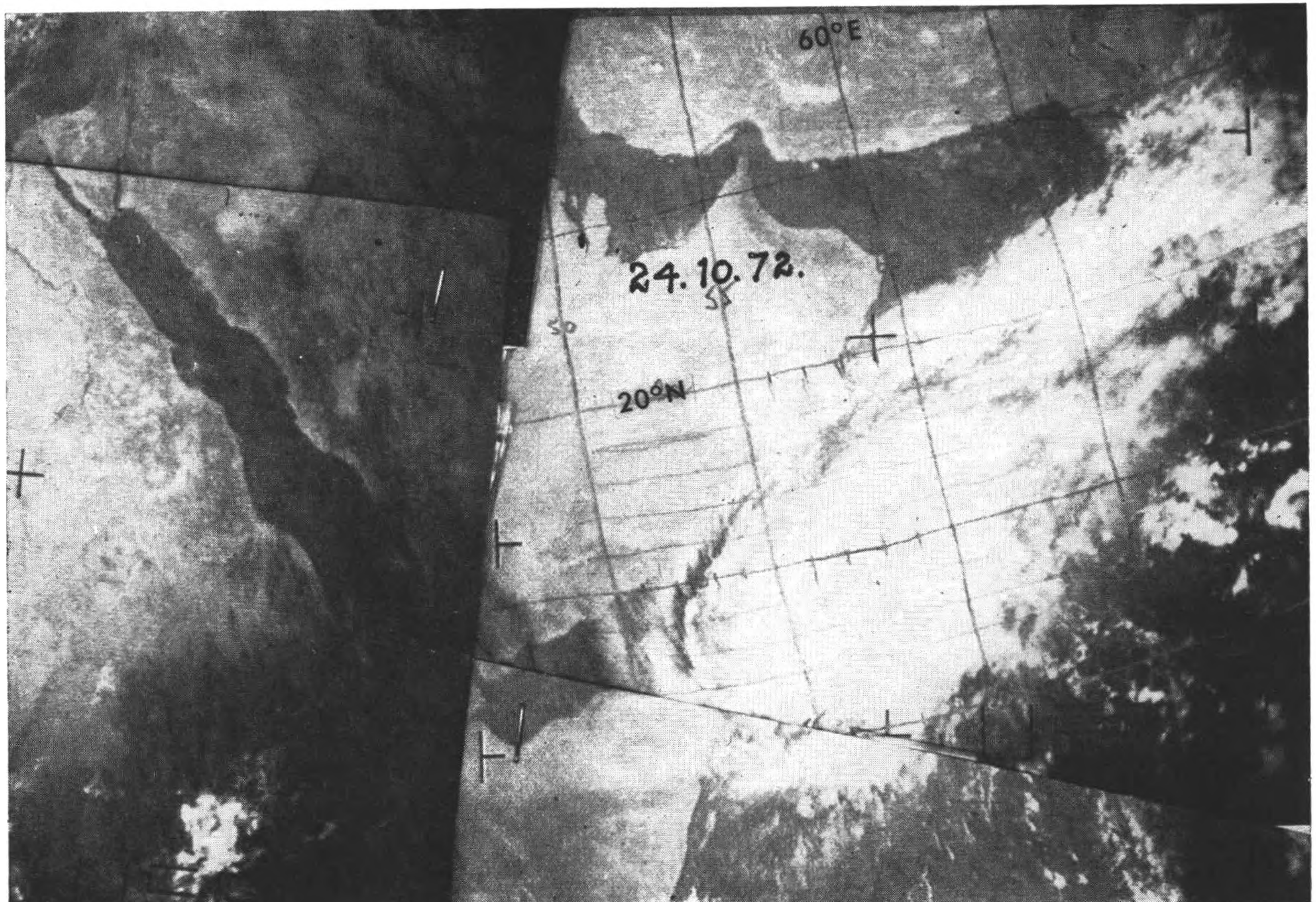
(*Opposite page* 28)



ESSA 8 satellite picture as received by automatic picture transmission at Masirah on 20 October 1972 (*see* page 28).

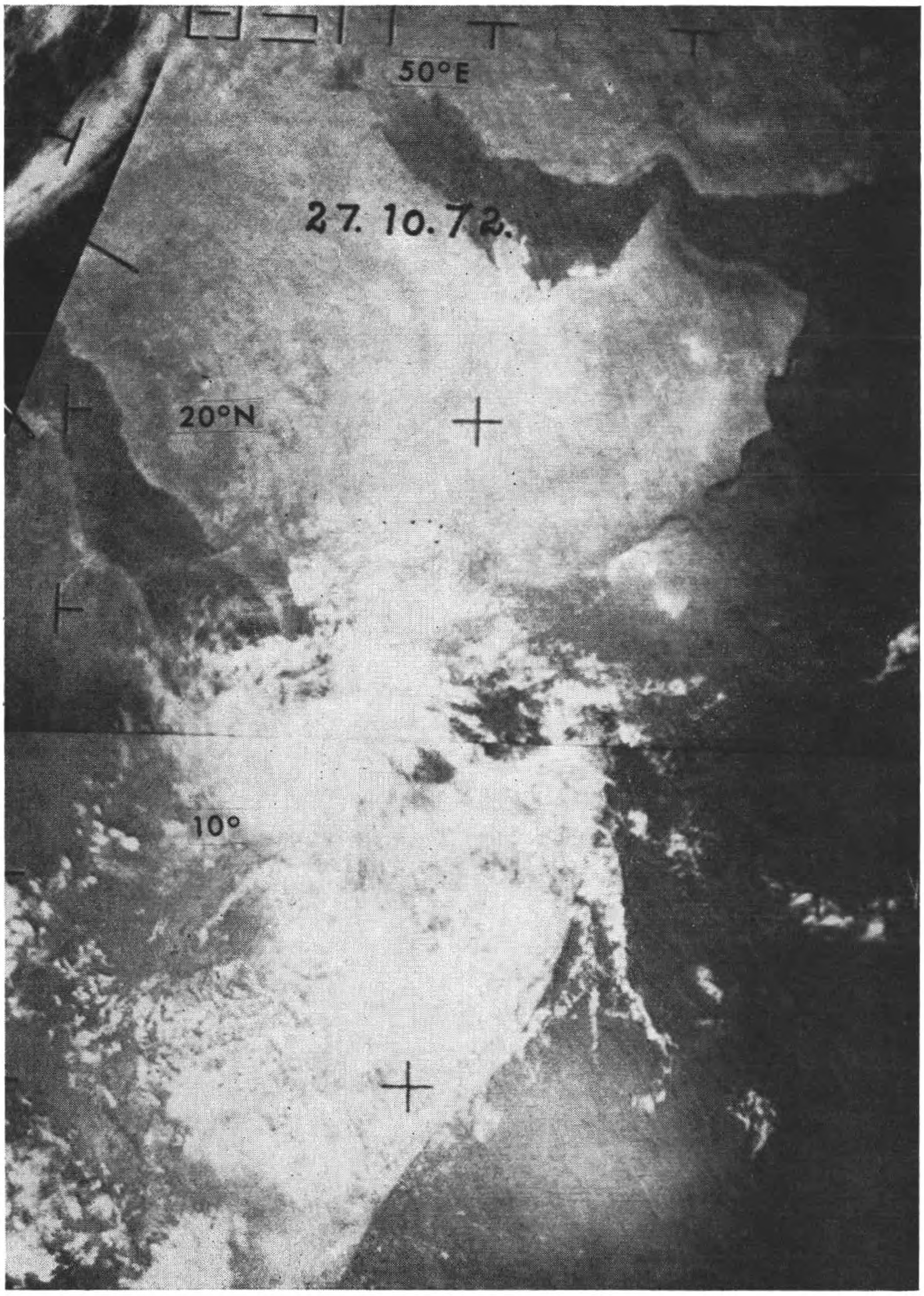


ESSA 8 satellite picture received at Masirah on 22 October 1972 (*see* page 28).



ESSA 8 satellite picture received at Masirah on 24 October 1972 (*see* page 28)

Opposite page 29)



ESSA 8 satellite picture received at Masirah on 27 October 1972 (*see* page 28).

with a centre within the cloud mass. The category (1–4) is determined from the degree of circularity of the curved and spiral bands. Only Stage X Category 3 and 4 storms have an 'eye'.

For the next two days (21–23 October) the storm continued to enlarge and a band of cloud 1600 kilometres long developed to the east. For about four days (19th–23rd) it moved broadly polewards at an average speed of 3½ knots. It was slow moving on the 23rd, possibly moving eastwards. On the 24th it changed direction and moved quickly westwards, passing south of Ras Asir on the 25th, and into the Gulf of Aden by the 26th. It passed inland near Djibouti on the 27th. The storm averaged about 11 knots during its westward movement. The satellite pictures show that decay was quite rapid from the 25th to the 26th, but that a very dense cloud cluster with a diameter of about 4 degrees of latitude still remained when the storm crossed the coast on the 27th. This cloud dissipated almost completely by 28 October.

The centre of the storm approached to within about 500 n.mile of Masirah on 24 October, and gave four rather cloudy days, with only a trace of rain on the 23rd—all the rain falling from unstable medium cloud in 20 minutes. At Salalah, where the centre was about 300 n.miles to the south on the 23rd, south-easterly winds reached 40 knots with gusts to 57 knots between 11 and 12 GMT, and visibility was reduced at times to 50 metres or less by rising sand. There was a further adjacent sandstorm on the 24th. Thunderstorms were reported in the vicinity of Salalah from 15 GMT on the 25th to 00 GMT on the 26th, when hail was reported. The rainfall recorded at Salalah was very close to the 1943–71 average for October of 8 millimetres. Farther west, at Aden, the storm gave 150 mm of rain, whereas the annual average rainfall there is only 40 mm. In Djibouti 230 mm of rain fell (average annual rainfall 130 mm) and there was considerable disruption and loss of life.

Upper-air observations in the vicinity of the storm were almost completely absent, the nearest radiosonde ascent being at Masirah, and the nearest pilot-balloon ascent being at Salalah. In addition, however, there were some wind measurements by aircraft on the eastern flank of the storm on 20, 21, 25 and 26 October. Using this admittedly meagre amount of information it is possible to suggest a likely sequence of events at the 300-mb and 200-mb levels. On 19 and 20 October the storm moved slowly north-west and west as it emerged from the upper equatorial easterly flow. From the 21st to the 23rd a slow movement to the north and north-west continued around the western edge of the subtropical high. However, from the 22nd onwards 300-mb and 200-mb heights were rising over Arabia ahead of a marked upper trough extending southwards over the Red Sea. By the 23rd a considerable ridge had built up over Arabia, and by the 24th an anticyclonic circulation had developed over south-west Arabia. The easterly flow on the southern side of the upper high cell steered the storm into the Gulf of Aden.

Other storms during October–December 1972

The tracks of the other three storms of the October–December 1972 season are shown in Figure 1. These also were obtained from the daily ESSA 8 pictures only. The movements are often erratic and complicated, whilst the development and decay are very difficult to predict. It must be remembered that surface and upper-air reports from ships or aircraft are often completely absent over the Arabian Sea.

Conclusion

In this paper only four storms have been considered and the sample is too small to form the basis of any reliable forecasting rules regarding their movement and development over the Arabian Sea. However, it is possible to say that, in the main, these storms conformed to the following conditions:

(a) Fast movement was usually associated with decay (two out of three storms).
(b) Slow movement usually indicated intensification (two out of three storms).

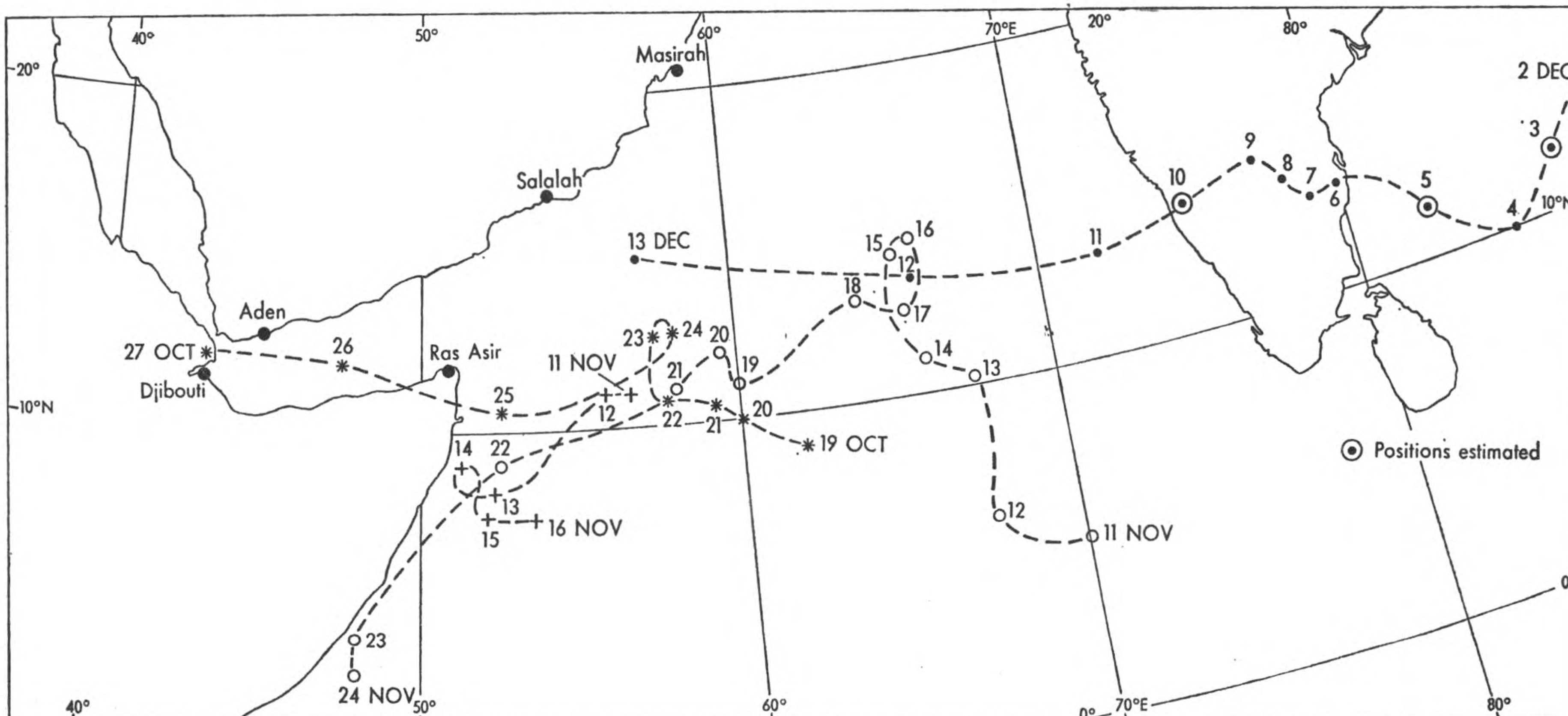


Figure 1. Tracks of four tropical storms over the Indian Ocean area—October–December 1972.

(c) Poleward movement indicated intensification (two out of three storms).
(d) Storms over land decayed.

The occurrence of these Arabian Sea storms during October–December 1972 highlighted the value of weather satellites for the early detection of tropical storms and for forecasting their subsequent movement and development in an area of very sparse meteorological data. Continued regular surveillance of the area by weather satellite is likely to show an increase in the average previously reported frequency of occurrence of tropical storms over this particular sea area, but of more practical importance is the fact that meteorologists are now in a position to improve on the advice and warnings hitherto given over the Arabian Sea air routes and the adjacent coastal regions.

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Note. This article is extracted from the *Meteorological Magazine*, **104**, 1975, pp. 227–230.

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Hong Kong's Royal Observatory*

(From the Director, Royal Observatory, Hong Kong)

As a focal point of world communications—with one of the busiest ports in the world and an airport that now handles a fifth of all domestic exports—Hong Kong's prosperity depends largely on the safe operation of ships and aircraft in all weather conditions. Furthermore, Hong Kong experiences a variety of weather unusual in the tropics. During the summer months, Hong Kong is affected by about five times as many tropical cyclones as the most exposed parts of Florida. It is hardly surprising, therefore, that the Royal Observatory plays an important role in the life of the community and the million tourists that visit Hong Kong each year.

History

The Hong Kong Observatory was founded in 1883 primarily to assist the navigation of shipping by providing magnetic measurements, meteorological data and an accurate time-service based on astronomical observations. Early astronomical observations were also used to determine the latitude and longitude of Hong Kong. Typhoon warnings in those days were issued by firing a cannon at the Tsim Sha Tsui Police Station in Kowloon. The value of these early services was soon recognized and in June 1912 His Majesty King George V granted the new title Royal Observatory.

Organization

The Royal Observatory is a department of the Hong Kong Government. It operates weather-forecasting, tropical-cyclone warning and various other services to meet the needs of shipping, aviation, and the general public. The work of the department is no longer confined to one place although the headquarters of the department is still housed in the original building. Other stations operated by the Royal Observatory are located at King's Park, Tate's Cairn, Kai Tak International Airport, Cape Collinson and Cheung Chau.

HONG KONG'S METEOROLOGICAL SERVICES

Meteorological observations

A wide variety of meteorological observations are made and recorded. Surface observations of pressure, wind, air temperature, humidity, weather, visibility, rainfall and cloud are made every half-hour at various locations. Regular upper-air soundings of wind, temperature, pressure and humidity are made at King's Park using balloon-borne instruments. Sunshine, solar radiation, evaporation, evapotranspiration, earth temperatures at various depths, sea waves and sea temperatures are also recorded.

Tropical cyclones

The tropical-cyclone-warning service still remains the most important single function of the Royal Observatory. As tropical cyclones approach Hong Kong, up-to-date information and forecasts are essential for the safety of aircraft, ships and small craft. Ships have to leave their berths alongside jetties and either put to sea or secure themselves at special typhoon buoys or anchorages. Smaller craft which include ferries, tugs, lighters, junks and sampans go to typhoon shelters where they are protected from the rough seas. In order to provide adequate warning, the Royal Observatory must collect information by radio from all available sources, including ships, islands, land stations and aircraft over a wide area. In 1972 the Observatory handled approximately 2·5 million digits of coded meteorological data every day.

* This article is reproduced from a leaflet published by the Hong Kong Government Information Services in May 1973, kindly obtained for us by the Director of the Royal Observatory.

Pictures transmitted by weather satellites about 1000 kilometres above the surface are also received. Tropical cyclones have a characteristic appearance and their position, size and sometimes their intensity can be determined from these pictures. When the centre of a tropical cyclone comes within about 240 nautical miles of Hong Kong it can be located by the Observatory's radar mounted on the top of Tate's Cairn (580 metres) and tracked continuously.

International meteorology

International co-operation in meteorology is essential. It is developed and refined at regular meetings and conferences and by correspondence through the specialized agencies of the United Nations. Other countries provide most of the information needed by the Royal Observatory and in return the department makes a variety of measurements and observations both on the surface and in the atmosphere over Hong Kong, passing on the results in special codes through an international communications network. The form of services which must be provided for shipping and aviation is laid down in great detail in published international standards and regulations.

Weather services for shipping

The Royal Observatory provides instruments and code-books for about 50 selected voluntary observing ships based in Hong Kong. Weather reports are collected from ships, including selected foreign-registered ships within Hong Kong's area. All reports are plotted and analysed as well as being passed on quickly to other countries. All seas and oceans are divided into forecast areas, with the Central Forecasting Office at the Royal Observatory headquarters preparing 24-hour weather forecasts for 16 areas twice daily. The department also supplies booklets to ships giving details of the weather services available in these and neighbouring areas. Other countries provide similar services so that, wherever a ship may be, its radio operator can always receive up-to-date weather forecasts, together with warnings of gales, typhoons, fog or any other hazard expected.

Weather services for the general public

The Central Forecasting Office issues local weather forecasts and other information to broadcasting and television stations and also answers enquiries from newspapers and the public. Warnings are issued whenever strong winds, thunderstorms, heavy rain, frost or an extreme seasonal fire hazard are expected in Hong Kong. Forecasts for nearby fishing-grounds are also broadcast in Cantonese for fishermen three times daily.

Liaison with the Armed Services

Since 1950 there has always been a Royal Navy officer attached to the Royal Observatory for liaison purposes. His prime function is to ensure the safety of Royal Navy ships in the China Seas and western Pacific, particularly when there are tropical cyclones in the area. In addition, the Naval liaison officer maintains contacts with all the armed services and arranges for any special requirements they may have. Routine operational meteorological advice is supplied to the British Armed Forces.

Research and Climatological Services

Records

The Climatological Section is responsible for the collection, checking, processing, storage and retrieval of all meteorological data in Hong Kong. All weather observations are entered on specially designed forms or punched cards from which climatological summaries and tabulations are prepared. Daily, monthly and annual summaries are published regularly for use in research and planning by overseas meteorological services and institutes, as well as by local engineering and construction firms. Special press releases are issued and radio and television interviews conducted whenever unusual or interesting weather phenomena are reported.

Analyses and publications

All the meteorological records of the Royal Observatory have been transferred to punched cards for processing by computer. Plans are being made to microfilm weather charts, autographic charts and observation logbooks so that extraction and retrieval of data can be facilitated.

Statistical analyses of meteorological data are carried out in connection with various investigations undertaken by the department. Many of these investigations are written up and either submitted to scientific journals or printed in Hong Kong as *Technical Notes* or *Memoirs*. All the Observatory's publications are exchanged with similar institutions in other countries, and research papers received in exchange form the basis for the department's library. Climatological information is also processed in connection with the design of various engineering projects such as tall buildings, reservoirs, tunnels, incinerators or desalination plants.

Each year, more than 5000 enquiries are received from various sources. Some of these can be answered immediately while a great many require detailed study. A small charge is made for the latter and for certified documents issued for legal purposes or in connection with insurance claims.

Hydrology

The Hydrometeorological Section maintains one of the densest rainfall observing networks in the world, consisting of more than 100 rainfall stations scattered over all parts of Hong Kong. The section maintains a close liaison with other government departments in developing water resources, and provides information required for the design of dams, reservoirs and drainage systems. Quantitative rainfall forecasts are prepared for the Waterworks Office of the Public Works Department and other users.

The section also prepares annual summaries and statistics on rainstorms and tropical cyclones which affect Hong Kong, and assists the World Meteorological Organization (WMO) and the Economic Commission for Asia and Far East (ECAFE) in planning preventive measures to mitigate damage due to floods and heavy rain.

GEOPHYSICAL SERVICES

Seismology

The Seismological Section of the Observatory operates 12 seismographs in a specially constructed cellar. These sensitive instruments can record vibrations of both long and short periods transmitted through the ground. On an average, tremors from about 800 earthquakes occurring all over the world are detected and analysed each year. Other tremors resulting from underground nuclear explosions, storm microseisms, local blasting or pile-driving are also registered by the seismographs.

The Observatory participates in the Tsunami Warning System for the Pacific area. Tsunamis are seismic sea waves and are caused by earthquakes. Whenever an intense earthquake is recorded with its epicentre anywhere in the Pacific Ocean or the South China Sea, a special message is sent to Honolulu and Tokyo where tsunami warnings can be issued.

Time service

The Hong Kong time standard is kept at the Observatory and is based on a crystal-controlled timing system, the accuracy of which is maintained by daily checks against radio signals received from other observatories. Time signals are broadcast by the department on a frequency of 95 MHz every 15 minutes and are relayed by the various broadcasting stations. They can also be picked up directly on any domestic FM receiver. These signals consist of six 'pips', the last 'pip' commencing on the hour and on the 15th, 30th and 45th minutes past each hour. At night, white lights are flashed from the Observatory's mast at the same time as the 'pips'.

Astronomy

A booklet of astronomical tables and star charts for Hong Kong is published by the Royal Observatory annually. This booklet lists the times of sunrise and sunset, duration of twilight, times of moonrise, moonset and different phases of the moon and other astronomical information. Also included for amateur astrologers are 12-star charts depicting the aspects of the night sky each month. Various astronomical queries are answered and an article on the appearance of the sky is prepared for the newspapers each month.

Radioactivity monitoring

The department is responsible for monitoring the radioactivity of the atmosphere, of rain-water and drinking water so that the effects of any fall-out from atomic tests can be assessed. Routine gamma-activity measurements are carried out in accordance with recommendations of the World Meteorological Organization for the purpose of estimating the presence of certain important nuclides in the atmosphere. Results are exchanged with the Atomic Energy Research Establishment at Harwell in the United Kingdom.

Geomagnetism

In co-operation with the Physics Department of Hong Kong University, the Royal Observatory operates a geomagnetic station near the top of Tate's Cairn. The station is equipped with standard magnetometers and provides a continuous photographic record of variations of the earth's magnetic field. Periodic absolute measurements are also taken for standardization purposes and to keep watch on long-term changes which are important for navigational and other purposes. Data are forwarded to the World Data Centre for Geomagnetism in Copenhagen and are available to interested scientists or institutions.

Upper-air soundings

King's Park Meteorological Station makes regular soundings of the upper atmosphere over Hong Kong as part of a world-wide network of observations organized by the World Meteorological Organization. These soundings consist of rawinsonde observations at 8 a.m. and 8 p.m. and radio-wind observations at 2 a.m. and 2 p.m. H.K. Standard Time every day. On the radio-wind ascents, the balloon-borne reflectors are tracked by wind-finding radar to estimate the winds at various heights up to about 30 kilometres. On the rawinsonde ascents the balloon also carries a radiosonde to determine the pressure, temperature and humidity at various levels in the atmosphere. The information obtained from these soundings is essential for the operation of aircraft and for forecasting the weather.

Radars

At Tate's Cairn a 100-mm meteorological radar is installed in a dome and the radar pictures are transmitted by microwave links to displays at the Central Forecasting Office in the Observatory headquarters and the Airport Meteorological Office, enabling forecasters at both places to locate rain areas. The radar is used for tracking tropical cyclones close to Hong Kong, for preparing thunderstorm and heavy rain warnings, for studies of anomalous propagation and other climatological purposes. In addition to the 100-mm radar, an older 30-mm radar is still maintained in operation at Tate's Cairn.

Satellites

The Royal Observatory was one of the first meteorological services to receive pictures directly from meteorological satellites. With these weather satellites orbiting the earth every two hours, three or four pictures from two to three successive orbits have been received daily since 1963. Radio signals are received at King's Park Meteorological Station and re-transmitted by land-lines to the Central Forecasting Office and the Airport Meteorological Office where they are converted into pictures. The satellite pictures are used in the analysis of the weather charts and for briefing airline pilots.

Instruments

The Meteorological Instruments Section installs, calibrates and maintains more than 100 meteorological instruments at various locations throughout Hong Kong. Various types of anemometers are installed at different places to obtain wind information. This information is of importance during the approach of tropical cyclones and is also required by other government departments in connection with various projects, such as the container terminal project at Kwai Chung and the new town development plan at Castle Peak. A sea-wave recorder has been installed off Waglan Island to study the effects of sea waves on the proposed dam to be constructed at Kwan Mun for the High Island Water Scheme.

The Instruments Section also maintains all the meteorological instruments at Hong Kong International Airport, where the safety of aircraft can depend on their reliability and accuracy. The section also maintains, calibrates and repairs all other meteorological instruments installed at the Observatory headquarters, King's Park, Tate's Cairn, Cheung Chau, Cape Collinson, Waglan Island and Green Island and those supplied on loan to about 50 selected voluntary observing ships based in Hong Kong. As the majority of these instruments, both electronic and non-electronic, are unique in Hong Kong, all repairs, calibration and maintenance are done by Observatory staff.

Other activities

The Royal Observatory is also involved in a wide range of other scientific problems including air pollution, disaster prevention, gravimetric surveys, metrication and metrology. Although it is now concerned with many and varied activities and receives a great deal of publicity, it is still one of the smallest departments within the Government of Hong Kong.

ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM JULY TO SEPTEMBER 1975

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

The periods used for the normals are as follows. Ice: Eurasian sector, all data up to 1956,[1] North American sector, 1952–56 (for north of 68°N)[1] and all data up to 1963 (for south of 68°N).[2] Surface pressure: 1951–66.[3] Air temperature: 1951–60.[4] Sea-surface temperature: area north of 68°N, 1854–1914 and 1920–50,[5] area south of 68°N, 1854–1958.[6]

JULY

The break-up of ice in Hudson Bay and Strait continued with the persistence of above-average temperatures, although pack-ice was slow to clear in Ungava Bay. Above-average temperatures also accelerated melt and disintegration in Foxe Basin reducing ice to near average but anomalous north-west winds reversed the normal break-up pattern giving excess in the south-east and deficits in the north-west. Above-average temperature and off-shore westerly winds resulted in continuing rapid disintegration in Davis Strait and Baffin Bay leaving only small areas of ice (much below average) along the coast of Baffin Island. Anti-cyclonic south-westerly winds quickly cleared remaining ice along the Labrador coast. The excess of ice to the south-west of Jan Mayen continued as prolonged south-westerly winds retarded outflow into Denmark Strait. The resulting congestion caused ice fields to expand towards the south-east and a tongue of close pack-ice became landfast with the coast of north-west Iceland. This is thought to be the heaviest ice reported in July along this coast since July 1929.

AUGUST

Much-above-average temperatures maintained the previous month's melt in Foxe Basin, Hudson Bay and Strait, Baffin Bay and Davis Strait. All these areas were virtually ice-free by the end of the month. Despite near-average temperatures the ice edge was slow to recede off east Greenland as anomalous southerly winds continued to cause congestion. By the end of the month large excesses were still reported west of Jan Mayen and in Denmark Strait. Air temperatures remained near or above average over the Barents Sea and coupled with the marked absence of northerly winds maintained the previous month's deficits of ice.

SEPTEMBER

Much-below-average air temperatures persisted to north-west of Baffin Bay. Refreezing was approximately ten days ahead of normal and anomalous north-west winds resulted in excess of ice drifting eastwards into Lancaster Sound. Davis Strait, Hudson Bay and Strait and Foxe Basin remained ice-free. Excess of ice was again reported off south-east Greenland where temperatures were well below normal in conjunction with anomalous winds from the north-west. Farther north, over the Greenland and Barents Sea the deficits of ice persisted.

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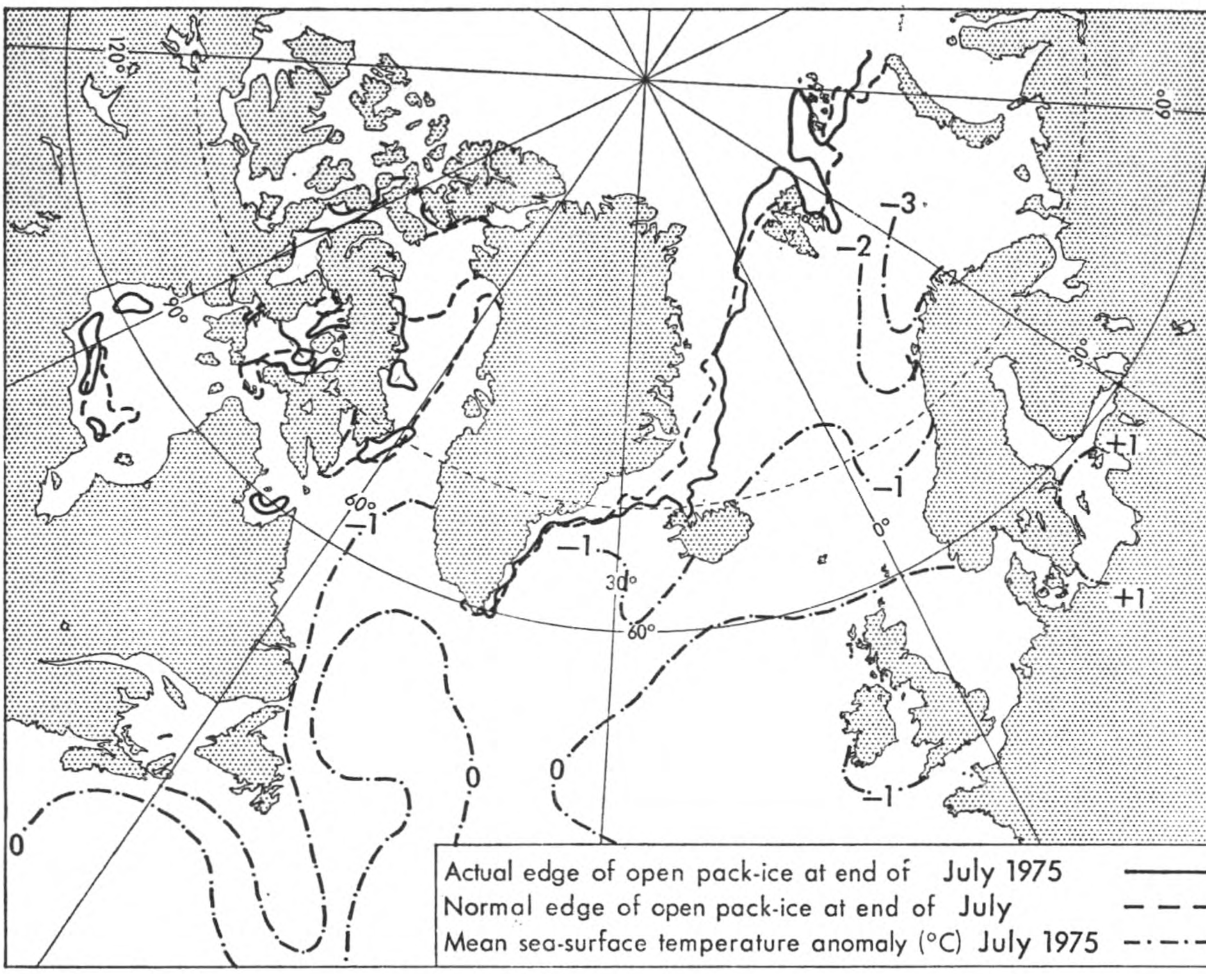
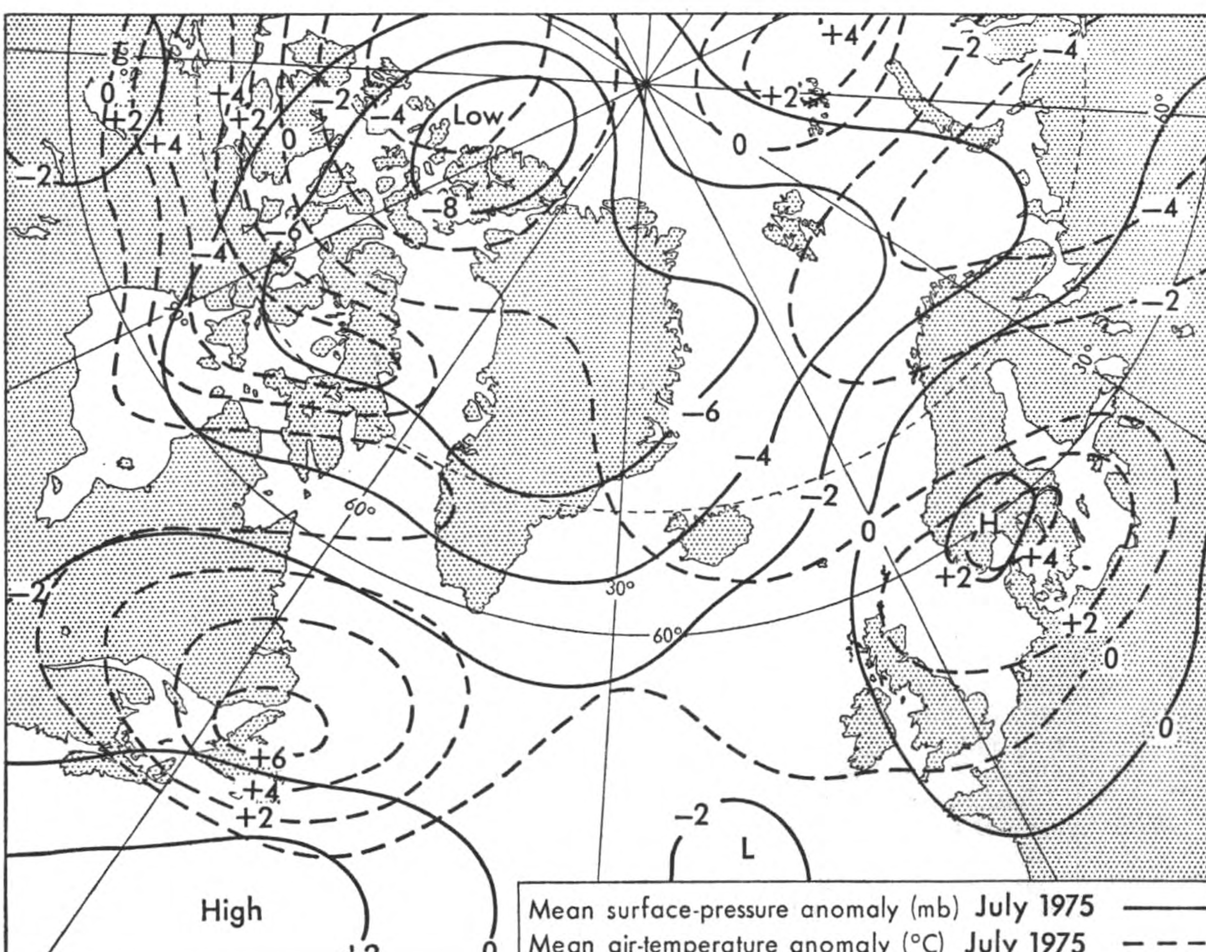
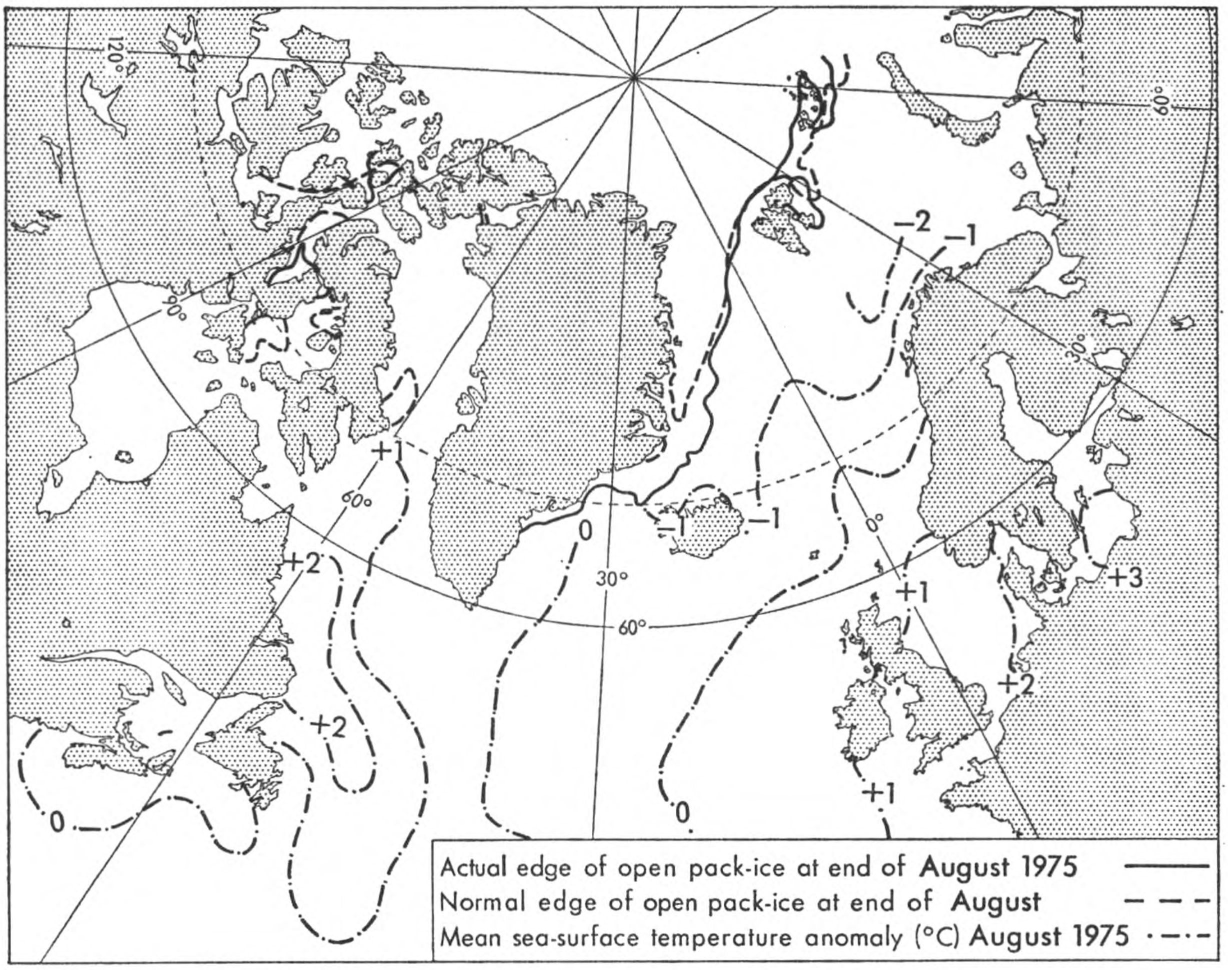
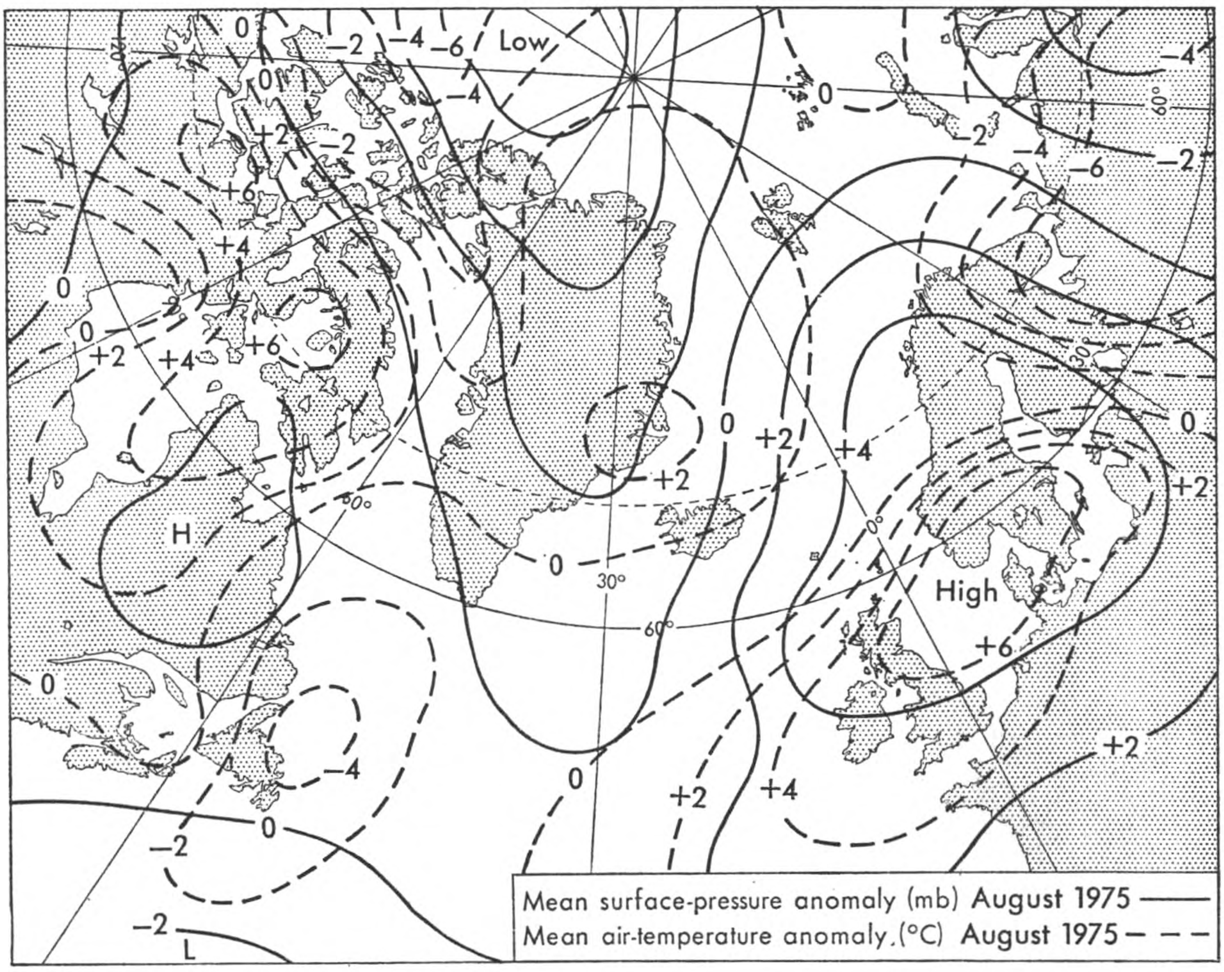


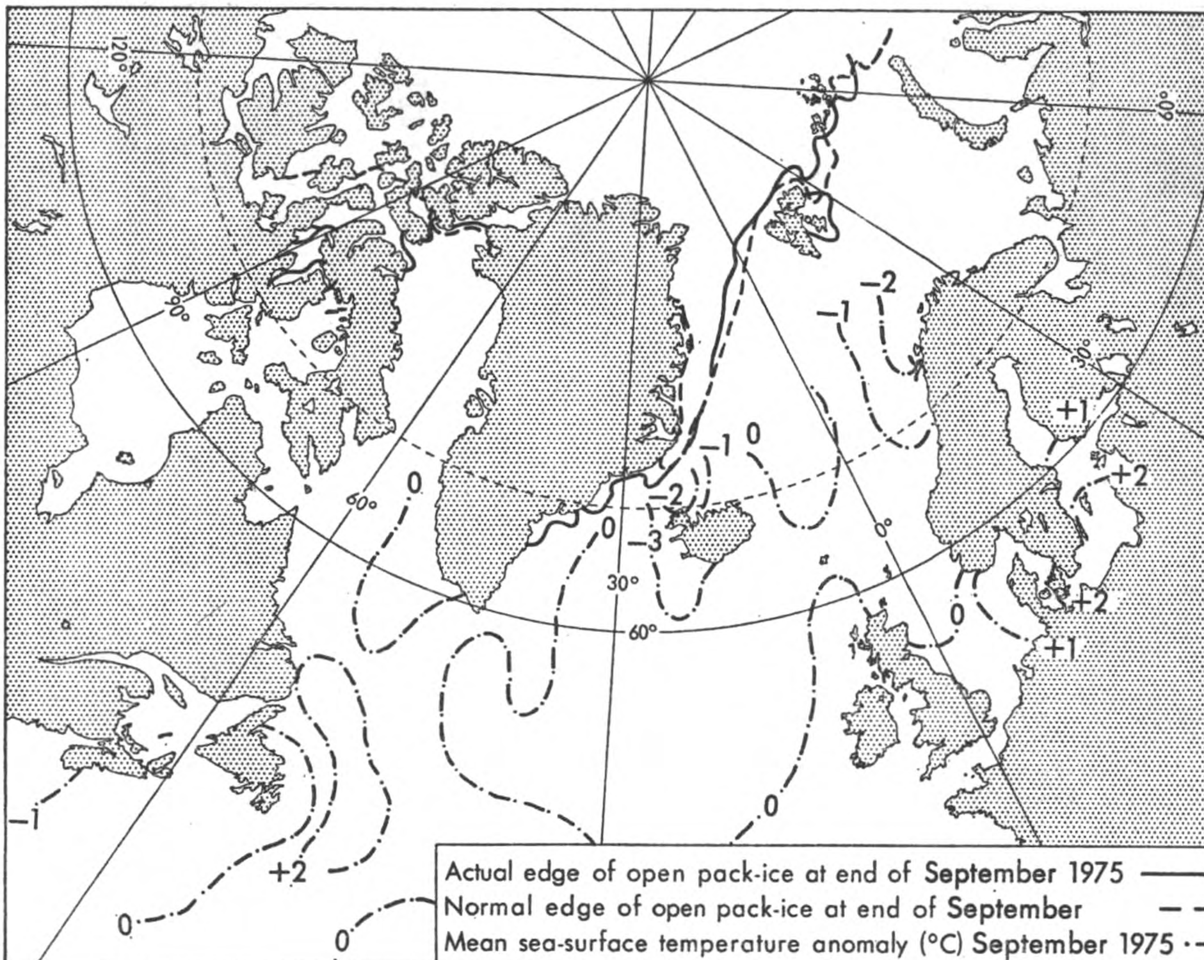
Actual edge of open pack-ice at end of July 1975
Normal edge of open pack-ice at end of July
Mean sea-surface temperature anomaly (°C) July 1975

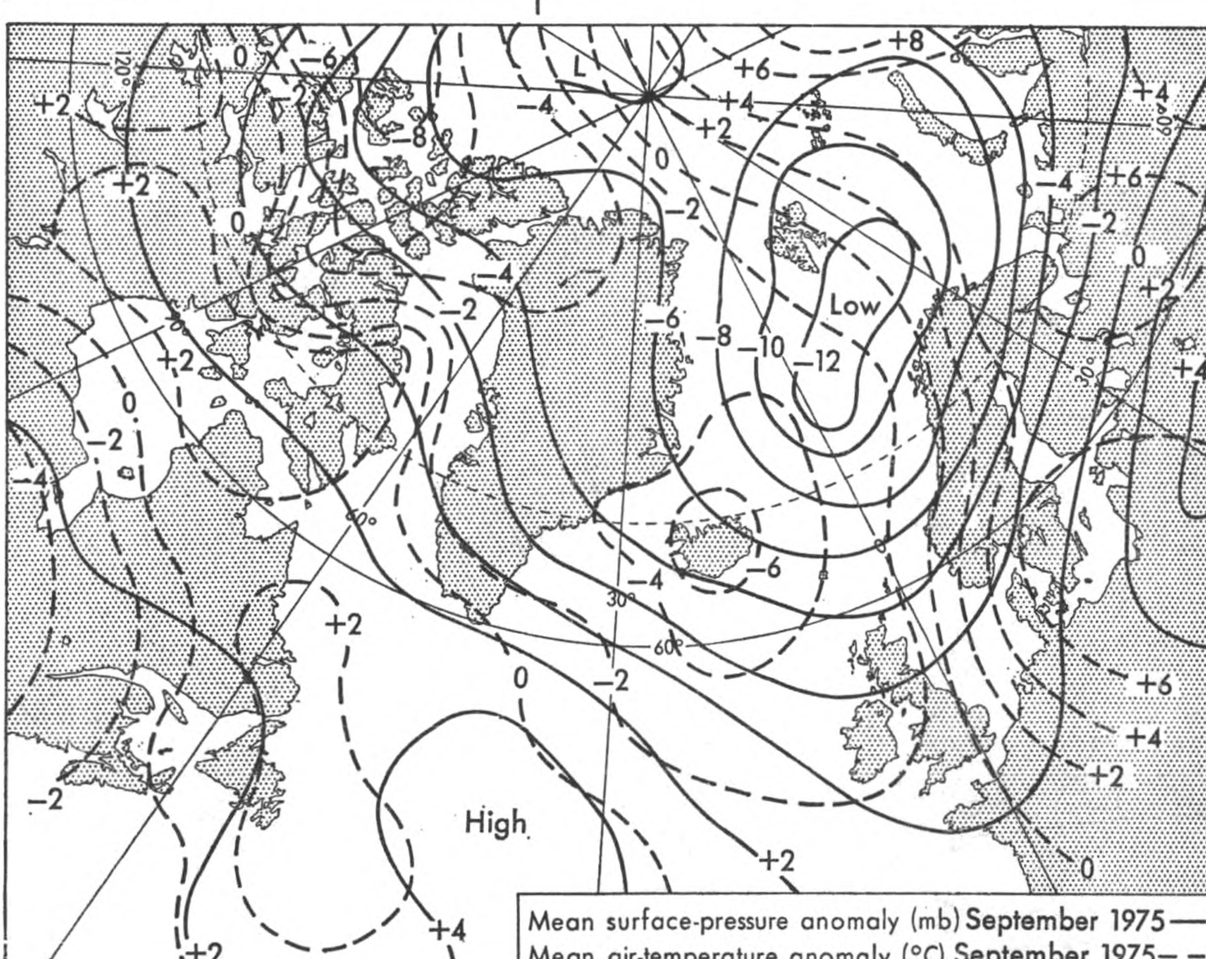


Low
High
H
L
Mean surface-pressure anomaly (mb) July 1975
Mean air-temperature anomaly (°C) July 1975


Actual edge of open pack-ice at end of August 1975
Normal edge of open pack-ice at end of August
Mean sea-surface temperature anomaly (°C) August 1975


Low
High
H
L
Mean surface-pressure anomaly (mb) August 1975
Mean air-temperature anomaly (°C) August 1975


Actual edge of open pack-ice at end of September 1975
Normal edge of open pack-ice at end of September
Mean sea-surface temperature anomaly (°C) September 1975


Low
High
Mean surface-pressure anomaly (mb) September 1975
Mean air-temperature anomaly (°C) September 1975

Book Reviews

The Dinghy-Owner's Handbook, by D. Jenkins. 195 mm × 125 mm, pp. 283, *illus*. Hollis and Carter, 9 Bow Street, London WC2E 7AL, 1975. Price: £3·50 (Hardback), £2·50 (Paperback).

The Dinghy-Owner's Handbook is written especially for the less-experienced dinghy sailor who is ready to launch out in his own boat.

Once into this book many readers will enjoy the all-round view of the dinghy-owner's world, in which every aspect of sailing, racing and maintaining a small boat is covered. Even opposing views on controversial subjects such as the value of racing experience are aired and fairly treated. The author's expertise as a professional illustrator is well used and the many illustrations throughout the book are a valuable addition.

Some chapters, such as the one on masts, spars and ancillary equipment will be too detailed for some novices but should provide 'room for growth'. In the chapter on wind, water and helmsmanship, however, the author runs into difficulties soon after the second page. In an effort to cover the complexities of meteorology, the statement 'Isobar pressures are taken at a height of 2000 feet which means that these pressure systems are at this height too', used when introducing the idea of a friction layer, puts him in very dangerous water. Even the usually helpful diagrams on the subject only serve to confuse matters. The chapter is rescued to some extent when it moves on to deal with apparent wind but does not fully recover until we learn how to 'cheat tidal flow and current' about midway through.

The chapter on racing a dinghy should give the novice a good basic concept of racing rules and techniques thanks to a useful set of illustrations and associated notes.

Another chapter which many will find particularly helpful is the one concerned with handling a boat ashore as it gives sound advice on transporting dinghies on both roof-rack and trailer and includes the legal requirements of the latter.

In general *The Dinghy-Owner's Handbook* will provide thought-provoking reading not so much from the depth of contents but from the author's style of introducing jargon without prior explanation, although some novices might enjoy guessing the meaning of the various technical terms before discovering them pages later. A note on the cover suggests that this book be used for ready reference ashore and afloat but the quality of the paper on which these words are printed indicate the fireside as a more suitable location in which to enjoy it.

J. J. A.

Wind Pilot, by Alan Watts. 250 mm × 190 mm, pp. 144, *illus*. Nautical Publishing Co. Ltd, Nautical House, Lymington, Hampshire, SO4 9BA, 1975. Price: £6·50. With Supplements as follows:

Supplement No. 1 Baltic and North Sea Coasts, Price: £5·00
Supplement No. 2 Atlantic Coasts of Europe, Price: £5·00
Supplement No. 3 Western Mediterranean Coasts, Price: £5·80
Supplement No. 4 Eastern Mediterranean Coasts, Price: £6·50

This work, in five volumes, is a reference for the yachtsman with regard to the detailed characteristics of wind that are of importance to him, e.g. in deciding the strategy for a race or planning a passage. The descriptive text is supported by much statistical data of winds along and near the coasts of Europe and the Mediterranean.

The first volume deals with wind systems in general. A summary is given of the broad patterns of wind associated with depressions and anticyclones, the frequency distribution of these large systems over Europe and the Mediterranean, and typical tracks. However, the greater part of this volume is devoted to more local wind systems, such as sea-breezes and land-breezes, and their characteristic variation during the course of a day, since these smaller systems are often the major concern of the yachtsman. Such local winds often evolve as a result of a difference in temperature between two adjacent areas and so the author finds it convenient to classify these as 'thermal winds'—though, as he is careful to explain, this does not correspond to the conventional meteorological use of the term. The departure from conventional usage seems reasonable in keeping the reader aware of the source of energy for such winds as sea- and land-breezes, lake winds, slope winds and thunder squalls; it seems unjustified, though, when applied to föhn or desert winds whose thermal properties are the result of rather than the cause of the wind. Very detailed accounts are given of the various 'thermal winds'—for instance different sea-breeze effects are described according to orientation and shape of the coastline, orography of the hinterland and distance off shore or inland. Numerous diagrams and photographs are given by way of illustration. There is an abundance of practical hints, such as how to anticipate wind changes from signs of sea or sky and how to use the general forecast from radio or television in assessing the way the wind will behave locally.

Each of the remaining four volumes (called supplements, though individually nearly as large as the first volume) deals with the detailed behaviour of winds along the coasts of a specific region:

1. Baltic and North Sea coasts,
2. Atlantic coasts of Europe,
3. Western Mediterranean coasts, and
4. Eastern Mediterranean coasts.

These volumes are to a standard format. For each area within a region there is an introductory article supplemented by wind statistics for the open sea; then local winds along each stretch of coast are described and illustrated whenever possible by wind statistics from coastal meteorological stations; finally notes are given on gales in the area. The latter part of each supplement contains maps of the areas covered, showing the positions of places named in the text and indicating, schematically, important local features of wind, for instance the main sea-breeze directions, other coastal winds, localities particularly subject to calms or wind eddies and areas of converging sea-breezes.

The fact that much statistical information is given in these supplements should not deter the yachtsman. The presentation is imaginative, pertinent to the practical aspects of yachting and is primarily in diagrammatic form. Wind frequencies are given by 'wind rosettes' which are simplified wind roses (and agreeably free from the finicky detail that often detracts from the visual impact of conventional wind roses). Thus from the 'rosettes' of a coastal station one can see at a glance whether winds off the sea are much more common about midday than about dawn (which would indicate a pronounced local sea-breeze effect), whether gales are frequent and the directions from which they blow, or whether winds vary much during the course of the sailing season (separate 'rosettes' are given for spring, summer and autumn, but not for winter since this is considered outside the sailing season).

The whole work is written in a racy style which is quite appropriate on the whole but occasionally leads to rather slipshod expression, hindering rather than helping understanding, and exceptionally giving misleading impressions. Thus on page 11 average wind speeds over the year for the coasts of Europe and the Mediterranean are erroneously taken as evidence that 'for the vast majority of the time the wind is manageable and less than Force 4'. This statement does not hold (at least with reference to less than Force 4), for some fairly extensive areas within the coverage of the *Wind Pilot*, e.g. for many western coasts of Britain.

Notwithstanding this criticism the *Wind Pilot* is recommended as a useful and detailed reference on local winds as they affect sailing, with much factual information concisely presented and many practical hints to enable the yachtsman to recognize and make use of local wind systems.

J. E. A.

Personalities

RETIREMENT.—CAPTAIN I. K. BOWERMAN retired at the end of 1974 after serving 42 years at sea.

Ivan Knight Bowerman commenced his career as cadet in British India Line's *Nardana* and was appointed to his first command in s.s. *Dunera*. He saw extensive troopship service in the *Dunera*, *Dilwara* and *Nevasa*, and from 1959 to 1961 he was responsible for British India's troopship operations from Southampton. For the last 4 years of his career Captain Bowerman commanded s.s. *Nevasa*.

Captain Bowerman sent us his first meteorological logbook in 1952 from s.s. *Dilwara* and since then we have received no less than 50 logbooks bearing his name, 27 of which were classed as Excellent. He received Excellent Awards in 1968, 1969, 1974 and 1975.

We take this opportunity to thank him for his splendid efforts on our behalf and wish him good health, happiness and a long comfortable retirement.

C. R. D.

RETIREMENT.—CAPTAIN A. B. C. BROWNE recently retired from sea-going service with B.P. Tanker Co. Ltd after completing 38 years with the Company. He commenced his career as an apprentice in October 1936, was promoted 3rd Officer in April 1940 and gained his first command in March 1956.

Captain Browne had a very quiet war period but in July 1970, whilst Master of the *British Aviator* and on passage Bombay to the Persian Gulf, a ship which was apparently on fire was sighted and course was immediately altered towards it. The ship turned out to be from the Maldive Islands and the *British Aviator* rescued four of the crew, another 23 being picked up by other vessels.

Captain Browne's record of voluntary observing goes back to 1953 when he sent us a meteorological logbook from the *British Consul*. Since then he has sent us a further 12 logbooks of which 4 were classed as Excellent. He received an Excellent Award in 1969.

We wish him health and happiness in his retirement.

C. R. D.

RETIREMENT.—CAPTAIN W. P. BUDGE, retired recently from sea-going employment with B.P. Tanker Co. Ltd for health reasons.

Following apprenticeship with Ellerman Wilson Line, Captain Budge joined B.P. Tankers in 1947 as 3rd Officer and was promoted Master in 1968.

Captain Budge's association with the Meteorological Office goes back to 1949 when as 3rd Officer of the *British Patience* he sent us his first logbook. Since then we have received a further 5 logbooks from him.

We wish him a speedy recovery in health, and happiness in his retirement.

C. R. D.

RETIREMENT.—CAPTAIN H. CHARNLEY retired at the end of July 1975 as Commodore of British and Commonwealth Shipping Co. Ltd.

Born in Barrow in Furness, Harold Charnley first went to sea in 1929 as apprentice with Stephen Sutton of Newcastle upon Tyne. For short periods during the war he served with Shaw Savill and Bibby Lines before joining Union Castle in 1942. In December 1940 his ship was torpedoed and sank but a British destroyer was quickly on the scene to pick up survivors. Captain Charnley's first command was m.v. *Margaret Bowater* in 1965 and he was appointed Commodore of British and Commonwealth Line in April 1973.

We received our first logbook from Captain Charnley in 1946 whilst he was serving in the *Cape Town Castle*; since then we have received a further 22 logbooks of which 1 was classed as Excellent.

We wish him good health and happiness in his retirement in South Africa.

C. R. D.

RETIREMENT.—CAPTAIN G. E. MAYNE retired from Denholm Ship Management on 12 July 1975. Captain Mayne first went to sea in 1928 as a seaman. He obtained his 2nd Mate's Certificate in 1933 and his Master's in 1938. Captain Mayne served in Socony Vacuum Company from 1934 to 1946. In 1946 he joined Anglo American where he served until 1956. He then sailed with Caltex and Clyde Tankers until 1960.

Captain Mayne joined Denholm Ship Management in March 1960 as Chief Officer and was promoted to Master after one month's service. He then served mostly in tankers until the end of 1971. Captain Mayne stood by the building and brought into service the g.t.v. *Asiafreighter* and remained in command of the g.t.v. vessels until his retirement in 1975.

Captain Mayne sent us his first meteorological logbook from the *Asialiner* in January 1973 and since then we have received a further 9 logbooks of which 2 have been classed Excellent.

We wish him health and happiness in his retirement.

C. R. D.

Notice to Marine Observers

DISCHARGE BOOK NUMBERS

Some of you will know that in the Marine Division of the Meteorological Office we keep a card index of all voluntary observers at sea. A card is started for an officer as soon as the first meteorological logbook bearing his name is received, and thereafter an entry is made on the card in respect of each subsequent logbook and the character awarded to it.

The purpose of these cards is mainly for the compilation of a table of records in order to assess long-service barograph awards. These are normally awarded to officers who have observed over a period of 15 years or more. The cards are also used, however, when writing up retirement notices and obituaries etc.

With the rapid turnover of ships' officers at the present time, a high percentage leave the sea in their mid twenties; also, a number of officers have two or more cards to their names owing to mis-spelling of surnames, or forename initials given in error, or with only one initial entered in a book when it should have been three. Recently six cards were unearthed bearing the same name and initial, covering a period of about 25 years, the ships all being of different companies. We are still, at the time of writing, endeavouring to discover whether all or some of these cards refer to the same officer.

From the above it can be seen that we have a large number of 'dead' cards in our files, and in order to resolve this complex situation it has been decided to computerize the whole carding system. This in itself is insufficient to obviate the duplication and triplication etc. of information; to reach a position where we have only one card for each observing officer programmed into the computer we need something more concrete than mis-spelt names and inexact initials.

Only one means of identification appears infallible—your discharge book number. If all officers will please enter their discharge book numbers on the back page of the logbook this will go a long way towards clarifying our carding system.

We would most earnestly request that all masters and officers fill in the back page of the logbook and sign in the appropriate column.

In many cases we have ships with three or four masters and principal observing officers entered on the back page, without the dates of joining and leaving the ship. If such a book earns an Excellent Award, to which of the four principal observing officers do we present it? In such a case the longest-serving master or officer receive the award; it is comparatively easy to decide which master served through the longest period of the book as his name appears at the top of each page; with the principal observing officer it is an entirely different matter; unless all principal observing officers' dates of joining and leaving are entered on the back page it is impossible to discover which officer served the longest.

In the next reprint of the logbook a column has been added after each observation for the observer's initials. We do sincerely hope that you will make use of this column in order that we may more speedily determine the recipient of the award.

But please, first and foremost, enter your discharge book numbers; it is to your ultimate advantage that we ask for this information as well as saving a considerable amount of correspondence between this office and yourselves. For instance, approximately 80 letters each year are written to masters and officers in an endeavour to sort out various cards; I might add that we are extremely pleased to receive replies from about 75 per cent of these enquiries, enabling us to amend the relevant records accordingly.

Finally, may we thank you all most sincerely for your continuing interest and assistance in our work.

J. D. B.

Fleet Lists

Corrections to the list published in the July 1975 number of *The Marine Observer*.

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

GREAT BRITAIN (Information dated 1.10.75)

The following coasting vessel ('Marid' ship) has been recruited:

Name of Vessel	Master	Owner/Manager
Esso Milford Haven	W. Connolly	Esso Petroleum Co. Ltd

The following vessels have been deleted:
Duke of Argyll, Duke of Lancaster, Framptondyke, Pointer, William J. Everard.

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

Skipper	Radio Operator	Trawler Owner/Manager
C. Andrews	J. D. Winder	Hellyer Bros. Ltd
J. Berry	J. Black	Hudson Bros. Trawlers Ltd
P. E. Craven ..	C. Sheen	Boston Deep Sea Fisheries Ltd
P. Garner	G. A. Ellis	Boyd Line Ltd
W. Harris	H. C. Pougher	Northern Trawlers Ltd
R. Johnson	J. A. Brooks	J. Marr & Son Ltd
—. Nelson	G. Riley	J. Marr & Son Ltd
C. H. Pitts	A. Spence	Boyd Line Ltd
H. Smith	G. A. Ellis	Boyd Line Ltd

GREAT BRITAIN (*contd.*)

The following ships have been recruited as Selected Ships:

Name of Vessel	Date of Recruitment	Master	Observing Officers	Senior Radio Officer	Owner/Manager
Agamemnon	30.4.75	P. J. Hamilton	S. Hidayat, H. W. Simmonds, J. A. Davies	M. S. McLaren	Ocean Transport & Trading Ltd
Anchises	5.9.75	S. B. Gilliat	A. P. McCall, V. Rigo, H. Lawton	T. Smith	Ocean Transport & Trading Ltd
Andalucia Star	4.7.75	P. W. W. Hunt	T. P. Green, J. Gray, R. H. Foden	C. M. Jackson	Blue Star Line Ltd
Arrino	11.4.75	P. D. Guerrier	A. P. Lowe, J. Beck, J. McNamara	P. Barratt	Trinder Anderson & Co. Ltd
Cairnsmore	18.4.75	C. A. Morrison	A. Jeffrey, C. A. Lines, R. Winn	M. Lambert	Matheson & Co. Ltd
City of Hull	21.4.75	N. Perry	T. Pennell, W. McRitcher		Ellerman Lines Ltd
Cornish Wasa	18.7.75	R. A. Reay	J. R. Scott, J. Bashford, R. T. Sneeden	G. H. Williams	Whitco Marine Services Ltd
Gela	14.7.75	J. Porteous	M. Gaffney, T. Tait	E. Bromham	Sir Wm. Reardon Smith & Sons Ltd
Grafton	22.5.75	W. Council	R. Kenchington, P. Swift, M. McGowan	D. L. Wrex	P. & O. S.N. Co.
Maihar	12.8.75	W. H. C. Hicks	T. Judge, P. Pettitt, A. McCutcheon	C. Clarke	Cunard Lines Ltd
Post Chaser	8.5.75	J. C. Bott		J. Bradley	Panocean Shipping & Terminals Ltd
Strathairlie	9.4.75	R. G. Dando	R. M. Dutta, D. J. Pratt, M. H. Graves	D. J. Taylor	P. & O. S.N. Co.
Vimeira	13.5.75	A. S. Young	D. McClaren, A. Jones	A. N. Davies	Harrisons (Clyde) Ltd
Wiltshire	12.5.75	M. J. Horn	P. G. Williams, D. Wilson, J. Corcoran, M. J. Winter	B. Foley	Bibby Line Ltd
Zaida	4.9.75	P. M. Pitcairn			P. & O. S.N. Co.
Zira	26.8.75	F. S. Angus			P. & O. S.N. Co.

The following ships have been recruited as Supplementary Ships:

Baltic Jet	10.6.75	P. Hyde	D. Whitehead, S. Williams, J. Priestly		United Baltic Co. Ltd.
Goth	24.9.75	J. N. Kerr	R. Spall	R. Spall	British United Trawlers Ltd
Ross Canaveral	18.9.75	N. Redfern	A. Fulcher	A. Fulcher	British United Trawlers Ltd

The following Selected and Supplementary Ships have been deleted:
Amarna, Annuity, Australind, Beechwood, Brandon Priory, British Kestrel, British Kiwi, British Mallard, British Robin, Canopic, City of Leeds, City of Oxford, Craigallian, Durango, Esso Hampshire, Esso Lancashire, Esso Pembrokeshire, Geesthaven, Hadra, Hanetia, Hartland Point, Horomya, Hyala, Jomi, Lindisfarne, Longstone, Maretta, Ocean Monarch, Oronsay, Otaki, Roland, St. Margaret, Serenia, Serenity, Silvershore, Tasmania Star, Trewidden, Volvatella, Zaphon.

BRITISH COMMONWEALTH

AUSTRALIA (Information dated 30.9.75)

The following ships have been recruited as Selected Ships:
Andros (Australia-West Pacific Line)
Asian Reward (Asia Australia Express)
Australian Emblem (Australian National Line)
Australian Explorer (Australian National Line)
Baron Wemyss (Scottish Ship Management Ltd)
Cape Hawke (Scottish Ship Management Ltd)
Cape Grafton (Scottish Ship Management Ltd)
Clydebank (Bank Line Ltd)
Darwin Trader (Australian National Line)
Melbourne Trader (Australian National Line)
Myarra (Union Bulkships Pty. Ltd)
Regional Endeavour (Drillships Ltd)
Seaway Queen (Union Bulkships Pty. Ltd)
Sydney Trader (Australian National Line)
Yarra River (Australian National Line)

The following ships have been deleted:
Abel Tasman, Bass Trader, Carpentaria, Cenpac Rounder, Guavacore, Harry Messel, Papuan Chief, Rosie D, Thorsorient, Wongala.

CANADA (Information dated 15.9.75)

The following ships have been recruited as Selected Ships:
Cardiff City (Sir Wm. Reardon Smith & Sons Ltd)
Devon City (Sir Wm. Reardon Smith & Sons Ltd)
Havdrill (B.P. Exploration Can. Ltd)
Incan St. Laurent (Pacific Maritime Agencies)
Island Princess (P. & O. Lines Inc.)
Louis S. St. Laurent (Government of Canada)
Northern Seal (Government of Canada)
Pacific Princess (P. & O. Lines Inc.)
Parizeau (Government of Canada)
Star Boxford (Star Shipping Co. Ltd)

The following ship has altered its name:
Frobisher now becomes *Frobisher Transport*

The following ships have been deleted:
Imperial Bedford, Kakawi, Nahidik, Port Dauphine

Canada now has 79 ocean-going Auxiliary Ships and 68 Auxiliary Ships operating on the Great Lakes.

NEW ZEALAND (Information dated 1.9.75)

The following ships have been upgraded to Selected Ships:
Milburn Carrier (N.Z. Cement Holdings Ltd)
Titoki (Anchor-Dorman Ltd)
Totara (Anchor-Dorman Ltd)

The following ships have been recruited as Selected Ships:
Glomar Tasman (Bocal Pty. Ltd)
Penrod 74 (Hunt International Petroleum Co.)

The following ship has been recruited as a Supplementary Ship:
Strathloyal (P. & O. (N.Z.) Ltd)

The following ships have been deleted:
Fijian Swift, Hamilton, Holmburn, Kaituna, Karepi, Katea, Kawerau, Koraki, Koranui, Parera, Pukeko, Storm, Tongaroa, Waikare, Wanaka, Wenchow, Zira, Teesta.

New Zealand now has 10 Auxiliary Ships currently reporting.

HONG KONG (Information dated 10.10.75)

The following ships have been recruited:
Eastern Oak (Oak Steamship Co. Ltd)
Halldis (Thoresen & Co. Ltd)

The following ships have changed names:
Asian Exporter is now *Poyang*
Aska is now *Strathcarrol*

The following ships have been deleted:
Hallborg, Halldor, Hyria.

We apologize for the following errors which occurred in the July 1975 issue: *Orient Mariner* should read *Oriental Mariner* and her Owner/Manager should be Island Navigation Corp. Ltd.

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