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THE MARINE OBSERVER

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

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October, November, December

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 UK will supply bottles, preservative and instructions on request.

SEVERE STORM

Irish Sea and Western Approaches

m.v. *Columbia Star*. Captain T. D. Brewster. Liverpool to Panama. Observers, the Master and Officers of the watch.

23–24 December 1977. The following is a sequence of weather observed during the passage through the Irish Sea outward bound to a position approximately 100 n. mile west of Land's End.

GMT

23rd 0200: Wind s'w, force 4–5, barometer reading 1002·3 mb. Moderate sea and swell. During the next six hours the barometric pressure remained steady and the wind decreased slightly in strength.

0800: Wind SE, force 2. Overcast with drizzle.

1000: Wind SSE, force 5. Barometric pressure falling slowly.

1140: Due to the increasing swell the vessel reduced speed to 105 revolutions.

1200: Wind SSE, force 7. Barometric pressure 1000·0 mb. Sea rough, heavy swell. Overcast with drizzle.

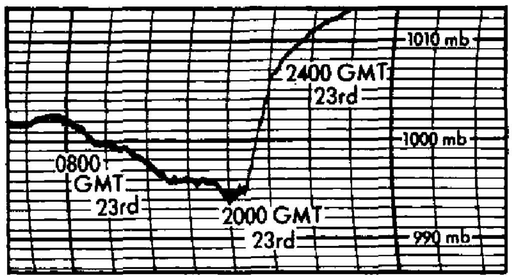
1430: Wind s'ly, force 8. Due to the increased swell the vessel reduced to half ahead.

1630: Wind s'w, force 9. Barometric pressure 996·5 mb. Sea rough, short heavy swell. Overcast with light rain. Vessel reduced to slow ahead.

1800: Wind SSW, force 10. Vessel hove-to on reduced revolutions to maintain steerage way only.

2000: Wind SSW, force 10. Barometric pressure 994·0 mb. Sea and swell increased, height of swell estimated to be 9 metres. Vessel shipping water overall. Cloud breaking up, cumulus cloud present.

2200: Wind sw'w, force 11–12. Barometric pressure 999·9 mb. Between

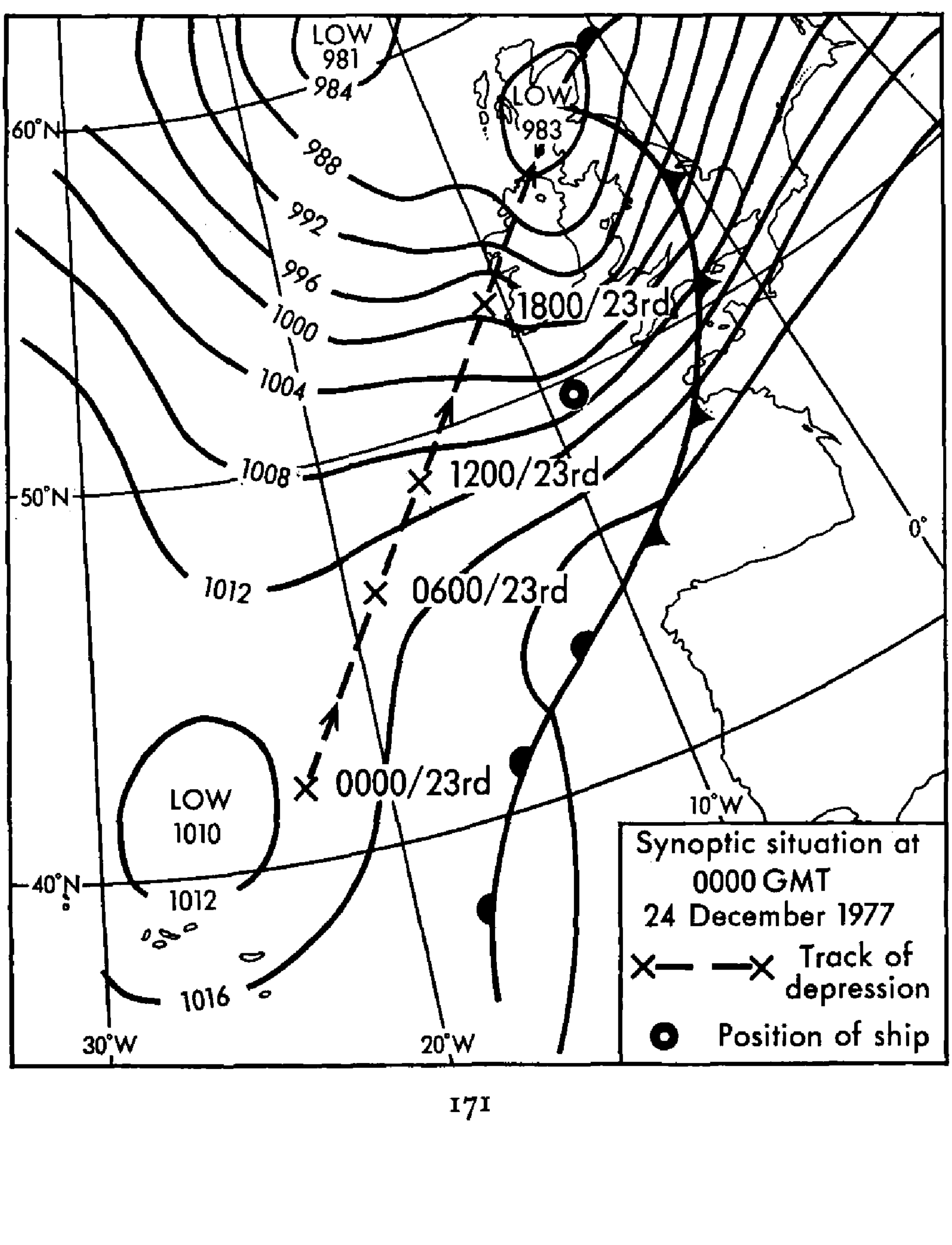


2000 and 2200 the pressure started to rise rapidly, see barograph trace.

2300: Wind w's, force 11. Barometric pressure 1005·2 mb. Very rough sea, swell estimated to be 12–13 metres, visibility reduced by flying spray. Five oktas of stratus cloud present. Vessel altered course to keep head to wind and swell.

2330: Wind beginning to moderate. Cloud type stratocumulus and thin altostratus.

24th 0000: Wind w'ly, force 9. Sea and swell moderating, swell estimated to be 10 metres. Cloud type predominantly altostratus. During the morning the barometric pressure continued to rise although now less rapidly.



0400: Wind SW, force 6.
0800: Wind W'S, force 5–6.
1200: Wind SW'W, force 5–6.
1600: Wind SW, force 4.

By 0900 the sea and swell had moderated sufficiently to enable the vessel to increase speed and resume passage.

Position of ship at 0000 on the 24th: 49° 54'N, 9° 12'W.

Note. The chart illustrates the synoptic situation which gave rise to the sequence of observations recorded by the Officers of the *Columbia Star.*

At 0000 GMT on the 23rd a depression to the west of Scotland was moving slowly NE and filling, there was also a recently developed secondary well to the SW of the British Isles. This low moved quite quickly NE, deepening as it moved, crossing over the west of Ireland to be centred over Scotland by 0000 GMT on the 24th.

A marked trough developed in the air mass to the rear of the cold front so that there was little change in the wind speed or direction until some three to four hours after the passage of the cold front.

LOCAL DEPRESSION

South Indian Ocean

m.v. *Safocean Weltevreden.* Captain A. M. Smaldon. Fremantle to Port Louis (Mauritius). Observers, the Master, Mr S. Hyland, Chief Officer, Mr H. M. Voss, 2nd Officer and Mr N. Richardson, 3rd Officer.

8 December 1977. At 2100 GMT when the vessel was some 700 n. mile due west of Fremantle, the barometric pressure began to fall and over the next 16 hours had fallen 12·5 mb. During this same period the wind backed slowly round from NE to NNW and increased from force 2 to 6.

From 1300 on the 9th the wind remained steady at NNW, force 3–4 whilst the barometric pressure remained between 1004 and 1005·5 mb.

However, about seven hours later the barometric pressure began to fall and the wind backed and increased until at 0100 on the 10th it had become SW, force 8 and a heavy sea was running forcing the vessel to reduce speed. The SW, force 8 wind continued until about 1000 after which time the barometric pressure became steady and the rain squalls and generally overcast sky which had prevailed, cleared, and fine weather conditions were experienced.

Position of ship at 0500 on the 9th: 31° 25'S, 97° 52'E.
Position of ship at 0500 on the 10th: 30° 06'S, 90° 46'E.

Note. The *Safocean Weltevreden* is a South African Selected Ship.

CLOUD FORMATION

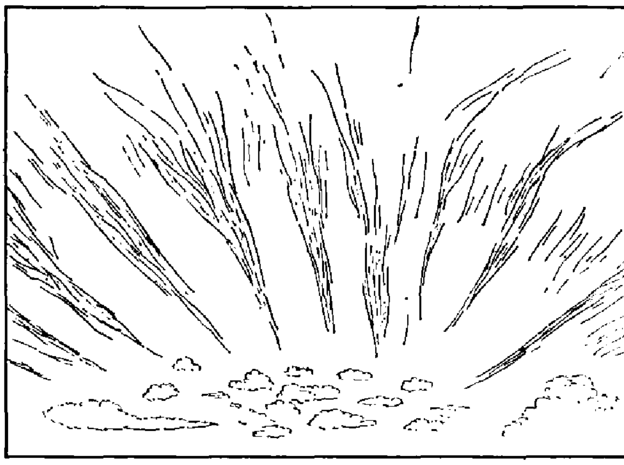
North Atlantic Ocean

m.v. *Cardiff City.* Captain D. L. Bell. Gibraltar to Bahama Islands. Observers, the ship's company.

2 December 1977. At 1200 GMT the sky was completely covered with a stratus-type cloud, lines in the cloud seemed to radiate from one specific point, see sketch. Underneath the cloud were fibrous filaments of cloud similar in appearance to that of cirrus with hooks; these also radiated from the same point.

Just above the horizon small cumulus clouds were present and between 320° and 050° a line of large cumulus cloud was observed.

Position of ship: 30° 30'N, 37° 48'W.



Note 1. The *Cardiff City* is a Canadian Selected Ship.

Note 2. The 'stratus-type' cloud was probably a layer of cirrostratus cloud which is defined as being a thin whitish veil which is sometimes so diffuse as merely to give a milky appearance to the blue sky. At other times it may show a fibrous structure, in greater or lesser degree, with disordered filaments, but is never thick enough to blur the outlines of the sun or moon. It gives rise to halo phenomena. Cirrostratus, alone or mixed with cirrus, is often arranged in parallel bands which appear to converge to the horizon by perspective effect.

CURRENT RIP

Eastern North Atlantic

m.v. *Lackenby*. Captain E. Dunn. Saldanha Bay (S. Africa) to Port Talbot. Observers, the Master and Mr C. R. Bamford, Chief Officer.

11 November 1977. At 1820 GMT the vessel entered an area of strong currents—lines of breaking water lay in a 170° to 350° direction diagonally across the path of the vessel approximately ¼ to ½ n. mile apart. Whilst passing through the lines of broken water the vessel was deflected some 15° from its course of 322°T. The sea temperature remained constant at 29°C, the wind was calm, dry bulb 30 and wet bulb 25·7.

Position of ship: 9° 41′N, 16° 52′W.

Note. This area, off West Africa, appears to be particularly favourable for current rips. The *Marine Observers' Log* has, over the last 30 years or so, contained some 10 other reports of current rips near this location and it is interesting that rather similar features have been observed, e.g. separate bands of broken water, in one instance, separated by as much as one n. mile.

The disturbances are likely to occur when the east-going Equatorial Counter-Current and the west-going North Equatorial Current flow in close proximity.

RADAR INTERFERENCE

Western North Atlantic

m.v. *Edenfield*. Captain J. A. Conlon. Sarroch (Sardinia) to New Orleans. Observer, Mr D. Sim, 3rd Officer.

2 December 1977. Between 2100 and 2300 GMT a line, approximately three degrees wide, was observed on the radar screen; the line extended from the vessel to the edge of the screen on all range scales and its position was constant. There were also, at intervals, thinner and weaker lines which varied with every sweep.

At the time when the interference was first observed, a target was also noted at a distance of 20 n. mile; after an hour, however, it was too far distant to be picked up. The only other occasions on which this type of interference was observed were when the Radio Officer was transmitting, but the interference during these times was similar only to the thinner and weaker lines. However, the Radio Officer was not transmitting during this observation period.

Position of ship: 33° 16′N, 62° 30′W.

Note. Mr Shaw at the Meteorological Office Radar Research Laboratory, comments:

'This would appear to be a normal interference problem from another high-power radar in the same waveband accentuated by anomalous propagation since atmospherics were also enhanced at the same time.

'The constancy of direction is consistent with the interference source being at long range, probably somewhere on the coast in the region of Cape Hatteras or Norfolk (VA).

'The 3°width corresponds to heavy interference in the aerial main beam. The thinner and weaker lines varying from sweep to sweep could be lower-level signals in the aerial side lobes or similar side lobe signals from reflections of the main beam in masts or wires on the vessel.

'Interference of this type is quite likely from military and civil airport radars since radiated power levels are from 100 to 10 000 times greater than the average ship's radar.'

MARINE LIFE

Eastern North Atlantic

m.v. *Lutetian.* Captain R. T. Mudd. Tripoli (Libya) to Newcastle. Observers, the Master, Mr S. Woodward, 2nd Officer and Mrs Woodward.

17 November 1977. At 1030 GMT, approximately 35 n. mile off the west coast of Spain, a large number of whales (about 80–100) were sighted. They were all of the same kind—about 3–5 metres in length, and each had a dark grey to black back and pale grey sides. During the time they were observed neither tails nor undersides were seen and no whale was seen to blow.

They seemed quite unconcerned by the presence of the vessel and many were observed to pass within about eight metres of the vessel's side. However, they all disappeared upon the approach of another vessel which was subsequently identified as a whaler—it was easily recognized as such by the cat-walk down from the bridge to the forecastle head and by the villainous-looking harpoon gun in the bows. We hoped the whales escaped and wondered if hunting such small whales was a commercial proposition.

Position of ship: 42° 20′N, 9° 30′W.

Gulf of Guinea

m.v. *Adastrus.* Captain R. Dinnie. At anchor off Tema (Ghana). Observer, the Master.

2 December 1977. Two whales were observed within five cables of the vessel sporting themselves in a rather unusual manner.

The larger of the two (both had black top-sides and white under-sides) appeared to be hanging head down in the water with about 2½ metres of its tail projecting vertically above the surface; the span of the tail was estimated to be 4 metres.

The smaller whale was swimming around the larger whale in very close proximity to it and for much of the time just breaking the surface of the water.

After some 10–15 minutes the larger whale surfaced and the two swam slowly to the surface keeping close company. The dorsal fin was short and stubby and in the case of the larger whale the distance between vent and dorsal was about 6 metres.

After a further 10 minutes, the larger whale resumed its head-down position with tail projecting and remaining fairly rigid. The whole performance was repeated for another 10 minutes after which both surfaced and swam off.

Position of ship: 5° 41′N, 0° 0′E.

Note. Dr F. Evans of the Dove Marine Laboratory of the University of Newcastle upon Tyne, comments:

'The Master was witnessing the pre-copulatory activity of a pair of humpbacks. The swimming activities of humpback whales have earned them a reputation as comic acrobats. Had the Master seen two tails in the air this would have indicated a consummation. As a footnote the gestation period is 11 months and the progeny a 1-ton baby 4½ metres long.'

Eastern North Pacific

m.v. *Albright Pioneer*. Captain J. H. Kitching. Balboa to Honolulu. Observer, Mr D. J. Thomas, Chief Officer.

17 December 1977. At 1800 GMT a dead flying-fish was found lying on the deck, nothing unusual for this part of the Pacific Ocean, however, attached at right-angles to the body beneath the fish's left lateral fin was a crustacean-like parasite.

The fish was 18½ cm long, 2½ cm in depth and had a wing-span of about 18 cm.

The parasite was 3 cm long and 1 cm wide at its widest point. The upper-side was slate-grey and the under-side silver-grey in colour. It had 8 hook-like legs, the front 4 appeared to be gripping onto the fish, the back 4 lay along the under-side. The parasite was similar in appearance to a wood-louse.

Position of ship: 17° 36′N, 119° 18′W.

Note. Dr F. Evans comments:

'This is a good description of an isopod parasite *Glossobius* which infests the mouths, gills and sometimes the surrounding skin of flying-fish. The animals are related to wood-lice but have piercing mouth parts and will readily bite the hand of the collector.'

Persian Gulf

m.v. *Al Ahmadiah*. Captain J. R. Hobkirk. Suez to Kuwait. Observer, Mr J. Stewart, 2nd Officer.

21 October 1977. At 1045 GMT and during the half-hour that followed about 24 sea snakes were observed around the vessel. They were seen singly, not in groups, and all seemed to be of the same type.

They varied in size from about 25 cm to a particularly large one estimated to be 1½ m long, the average size being 70–80 cm. They were yellowy-buff in colour with narrow dark-brown stripes across the body at intervals of about 3 cm.

A small shark, about 80 cm long, was also observed during this period.

Position of ship: 27° 00′N, 52° 04′E.

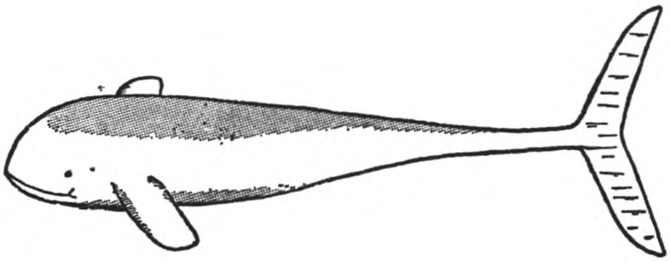
Note. Dr F. Evans comments:

'There are more than 50 species of sea snake and many are colour-ringed, it is not possible, therefore, to give an exact identification. All are poisonous. They swim well and feed mostly on fish; on the other hand larger fish and sharks feed on them, which may account for the shark in this report. Sea snakes are entirely Indo-Pacific being absent from the Atlantic'

Mediterranean Sea

m.v. *Ethel Everard*. Captain A. J. A. Richards. Malta to Tripoli (Libya). Observer, Mr P. G. Powell, Chief Officer.

8 October 1977. At 0600 GMT three fish approximately 60 centimetres long, see sketch, were observed swimming around the bows. Although they were moving



only slowly, their movements were so effortless that they gave the impression of being very fast swimmers.

They were mainly dark grey in colour but each had a yellowish tail fin.

Position of ship: 32° 49′N, 13° 07′E.

Note. Dr F. Evans comments:

'These probably were yellow-tails, *Seriola dumerili*, with a yellow tail fin and narrow tail stalk—a fish much sought after by anglers, but the flesh is only moderate eating.'

BIRDS

Western North Atlantic

m.v. *Garmula.* Captain J. O. Spence. Gibraltar to Houston. Observer, Mr N. Stevens, 3rd Officer.

9 November 1977. During the morning watch a small sparrow-sized bird, see sketch, was observed flying in a 'dipping motion' around the vessel. It seemed to be interested in any activity about the vessel and was constantly flitting to and fro where people were working.

During the early afternoon when the 3rd Officer was working on the boat deck, the bird appeared and began to peck at some small brass washers lying on the deck. At close quarters it appeared to be more finch-like than sparrow-like, there also seemed to be a perky and somewhat mischievous air about it.

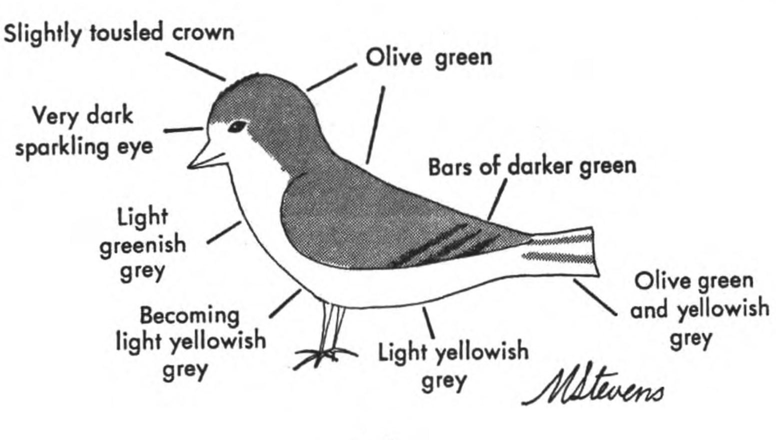
When crumbs were offered to the bird it seemed more interested in the 3rd Officer's wedding ring and after a few unsuccessful attempts to remove it, the bird hopped onto his shoulder and began to peck at his ear.

The 3rd Officer concludes by asking if this behaviour was typical of the species.

Position of ship at 1200 GMT: 27° 36′N, 72° 18′W.

Note. Captain G. S. Tuck, Chairman of the Royal Naval Birdwatching Society, comments:

'This is the orange-crowned warbler, *Vermivora celata.* The bird breeds in Canada and migrates south to winter in the Gulf States; at this time of the year it would be well on its



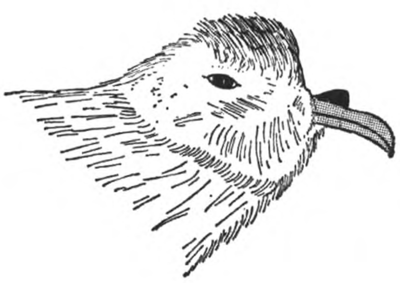
way south. It is usually found in brushy woodland cover. It is about 12 cm in length. The orange crown is seldom noticeable.

'I can well imagine this little warbler flitting from place to place with little fear of people after a long sea migration.'

North Atlantic Ocean

m.v. *City of Newcastle.* Captain E. Finch. Cape Town to Montreal. Observers, Mr S. R. Poole, Chief Officer and Mr M. Das.

13 November 1977. At 2130 GMT the bird, the head of which is shown in the sketch, was found on deck near the galley. It was carefully examined for injuries and later released.



It was black all over except for a white part on the tip of the tail. Three toes were webbed and the fourth toe and heel were very small. In spite of the dangerous-looking beak, the bird made no attempt to peck when handled.

The dimensions were as follows: overall length 200 mm, beak length 15 mm, wing-span 450 mm, body width 60 mm, foot length 24 mm, fourth toe 2 mm and claw tips to 'knee' 50 mm.

Position of ship: 33° 30'N, 46° 10'W.

Note. Captain Tuck comments:

'This is the Leach's Storm Petrel *Oceanodroma leucorhoa.*

'A most useful description. The accurate measurements are right in line with the averages of this species which may be found in this area right across the North Atlantic.'

Tasman Sea

s.s. *Moreton Bay.* Captain M. R. Ryan. Auckland to Brisbane. Observers, the Master, Mr D. R. Lewis and ship's company.

2 October 1977. At 0000 GMT the look-out heard some fluttering at the after part of the port bridge wing and upon inspection a small dunlin-like bird was found.

The bird was obviously unharmed judging by its unrestricted movements, but was having problems combating the wind and so remained in the shelter of a coiled hose. When the bird began to 'peck' at the salt water it was thought it might be thirsty but when fresh water was brought, this was ignored.

The bird stood about 18 cm high. There was a distinct yellow edging to a few feathers on the back and a number of heavy dark patches on the breast.

As the vessel approached the reef around Lord Howe Island the bird took off but was buffeted by the wind and carried out to sea.

Position of ship: 32° 18'S, 161° 00'E.

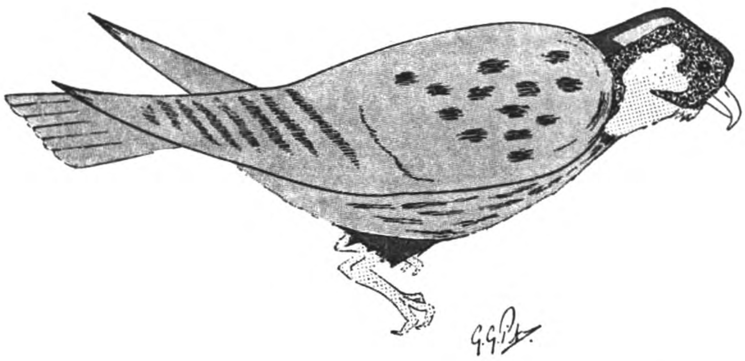
Note. Captain Tuck comments:

'This is clearly a Wader but there are so many very similar wader species which come from the Northern Hemisphere as migrants in winter plumage, or others which breed in Australia and New Zealand, that it is not possible to make a positive identification.'

Arabian Sea

s.s. *Esso Scotia*. Captain W. D. B. Boler. Southampton to Ra's Tannūrah. Observers, the Master, Mr G. Pritchard, 2nd Officer and members of the ship's company.

20 November 1978. At 0600 GMT it was observed that a considerable number of birds had joined the vessel overnight. Two birds which drew particular interest are as illustrated in the sketch; we were, however, unable to identify the species. They were predators and were seen to attack other birds and to eat those they caught. By the morning of the 22nd all the birds had left us.



At the time of the observation a severe tropical depression was centred about 600 n. mile to the east and the wind had been west to north-west, it was thought, therefore, that the birds had come from Socotra.

Position of ship: 15° 12'N, 56° 48'E.

Note. Captain Tuck comments:

'This very good sketch is probably of the African Hobby, *falco cuvieri*, which comes from Ethiopia. It is much darker than the European Hobby.'

Southern Indian Ocean

s.s. *Act* 2. Captain L. J. Brown. Liverpool to Melbourne. Observers, the Master and ship's company.

3 December 1977. A bird was observed and thought to be a Wandering Albatross. It had a wing-span of about three metres, the bill was pink and the eyes appeared as black dots in the head. The wings were black on the top-side and white on the under-side except for a very distinctive black tip to each wing. Patches of white on the wings suggested that this was an immature bird.

The albatross remained with the vessel for most of the voyage across the Indian Ocean and at times took to 'buzzing' the bridge as the majority of these birds tend to do.

Position of ship: 35° 50'S, 22° 10'E.

Note. Captain Tuck confirms that the bird was a Wandering Albatross, ***Diomedea exulaus*** with immature plumage.

North Sea

m.v. *Singularity*. Captain A. Duncan. London to Archangel. Observer, Mr N. B. H. Skinner, 2nd Officer.

8 October 1977. At 1240 GMT the observer was surprised to find an owl flying from the north towards the vessel. The bird circled the vessel for a while then disappeared southwards.

A short while later it reappeared and landed on No. 2 hatch and the following observations were made: it stood about 60 cm high and when fully extended the wing-span was estimated to be 120 cm, the head was round and the ears could not be seen, the lower parts were a light tan and the upper parts were slightly darker, both upper and lower parts were mottled with dark flecks.

Position of ship: 55° 12′N, 02° 49′E.

Note. Captain Tuck comments:

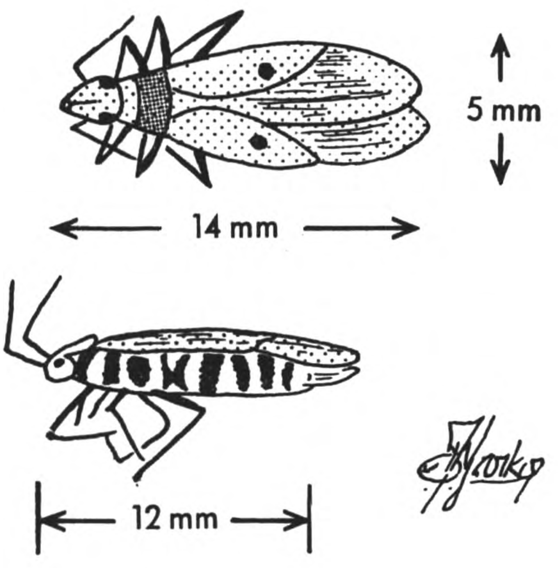
'This is the tawny owl *strix aluco*, the most common medium-sized brown owl with a dark-brown face. It inhabits the area of the southern tip of Norway.'

INSECTS

Eastern North Atlantic

m.v. *Good Hope Castle*. Captain W. J. Howson. Zeebrugge to Ascension Island. Observer, Mr J. T. F. Broughton, 2nd Officer.

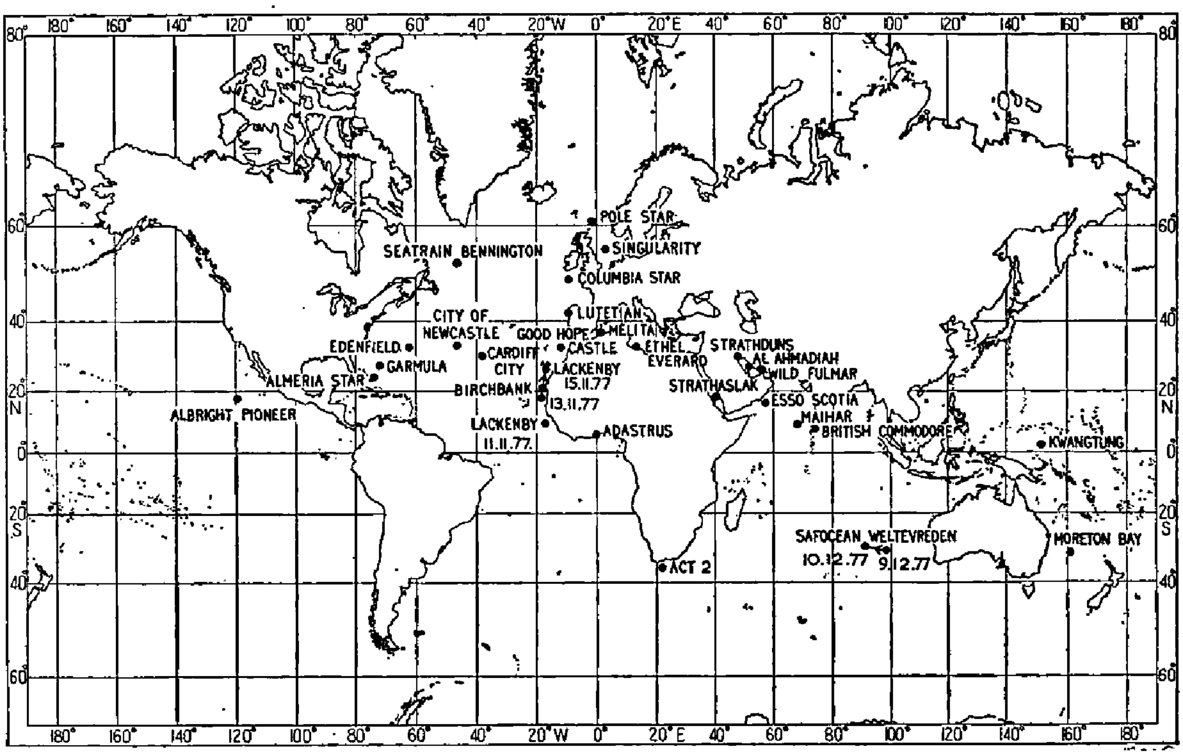
8 October 1977. The insect shown in the sketch was found dead on the carpet of the 2nd Officer's cabin. It had a light-brown 'armoured' top with black transparent wings and a striking red and white underbody.



Position of ship: 33° 22′N, 12° 16′W.

Note. Mr W. R. Dolling of the Department of Entomology, British Museum (Natural History), comments:

'This is one of the cotton-stainer bugs, *Dysdercus superstitiosus*, Fabricius. It is a common insect in West Africa which suggests it boarded the ship some time before it was discovered.'



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

Eastern North Atlantic

m.v. *Lackenby*. Captain E. Dunn. Saldanha Bay (S. Africa) to Port Talbot. Observers, the Master and ship's company.

13 November 1977. At 1200 GMT a number of locusts were sighted when the vessel was about 100 n. mile from the nearest land.

The locusts were yellowish-brown in colour with lighter colourings on the first and second pairs of appendages, whilst the third pair of appendages were a purplish-orange with double orange barbs and black tips. The eyes were large and brown with light stripes. On the hood over the thorax were several small white specks and one larger brown spot on the right-hand side.

Whilst the locusts were kept in captivity they fed heartily on lettuce and celery.

About a dozen locusts were sighted from time to time between the 13th and the 15th. One locust was sent to the Centre for Overseas Pest Research.

The surface wind during the period of the observation was NE'ly, force 2–5.

Position of ship at 1200 GMT on the 13th: 17° 26'N, 18° 02'W.
Position of ship at 1200 GMT on the 15th: 26° 36'N, 16° 36'W.

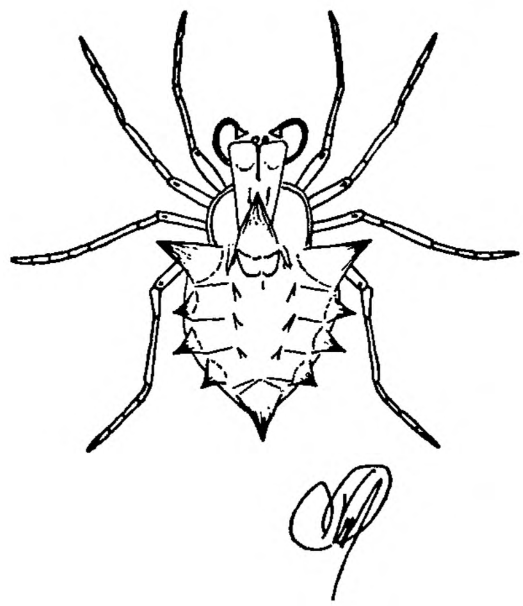
Note. Mr Jeremy Roffey at the Centre for Overseas Pest Research, comments:

'The specimen has been identified as a species of tree locust whose scientific name is *Anacridium melanorhodon*, Walker. The species is widely distributed between 10°N and 20°N and also extends into south-west Arabia. The position at which the specimens were captured, therefore, fits in well with its known distribution.'

Eastern South Pacific

R.R.S. *Bransfield*. Captain S. J. Lawrence. Panama to Valparaiso. Observers, the Master and ship's company.

23 November 1977. At 1800 GMT when the precision depth recorder was being examined, it was noticed that a small spider, see sketch, had appeared from a roll of recording paper inside the machine.



On examination by a biologist it was found to be a female '3rd Instar Florida crab spider'. It was a light coffee-brown colour.

The 3rd Officer decided to keep it as a pet, unfortunately, however, it died some three weeks later of the cold during our approach to the Antarctic Peninsula.

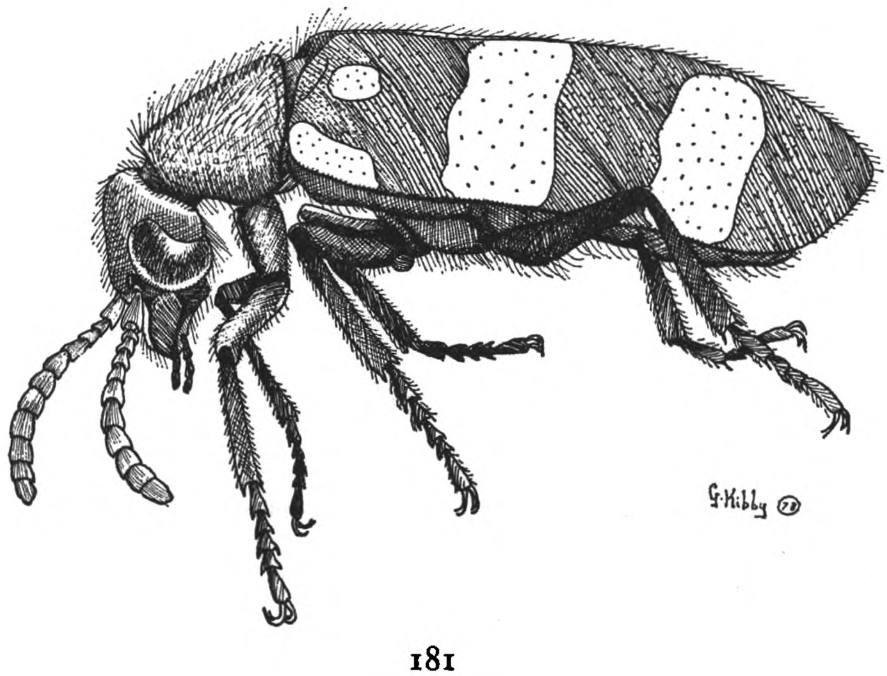
Position of ship: 22° 24′S, 80° 00′W.

Persian Gulf

m.v. *Strathduns*. Captain D. J. Harrison. Suez to Salalah (Oman). Observer, the Master.

23 December 1977. An insect, see sketch, caught whilst the vessel was berthed in the port of Basrah was despatched by the Port Meteorological Officer, Tyne to the Department of Entomology of the British Museum and the following interesting report was prepared by Mr M. J. D. Brendell:

The specimen has been identified as belonging to the genus *Mylabris*, family



Meloidae, 'oil' and 'blister beetles', the example most closely resembles the species *zonata* Klug, which has an Arabian distribution.

The dried bodies, and especially the elytra (wing-cases) of most *Mylabris* are a source of cantharidin which has been used in the past for making blister plasters. It is still used as an aphrodisiac, as with its close relative *Lytta vesicatoria*, the famous 'Spanish fly'. Live adults can leave irritating blisters on the skin if handled.

The female beetle deposits her eggs in hard dry soil. The larvae, when they hatch, will search, for many days if necessary, for locust or grasshopper egg masses on which they feed. The larvae take on many specialized forms moulting about six times before pupation and final emergence as an adult insect.

There are a great number of species of *Mylabris*, most of them are African or Oriental.

The specimen has been retained for the national collection at the British Museum.

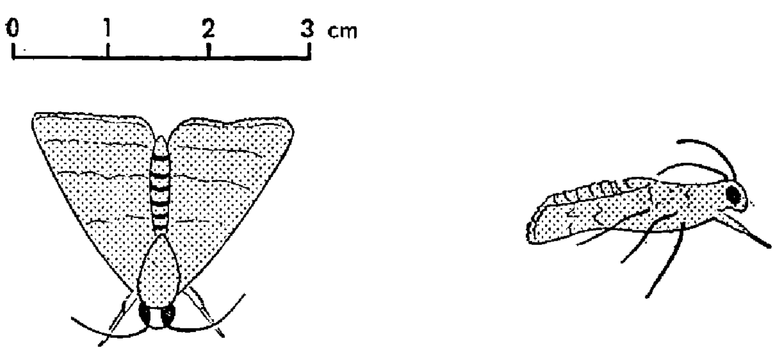
Position of ship: 30° 31'N, 47° 50'E.

Note. The sketch of the beetle was very kindly drawn for *The Marine Observer* by Mr Geoffrey Kibby of the British Museum.

Red Sea

m.v. *Strathaslak.* Captain I. M. Adie. Suez to Abu Dhabi. Observer, Mr M. A. Cook, 3rd Officer.

14 November 1977. At 1800 GMT a small moth, see sketch, was found in the radio room. It measured 2 cm in length and had a wing-span of about 3 cm. The upper-wing surface in ordinary light had a dark-orange mottled pattern with an antique-gold background; in direct light the gold background became more prominent.



Dark-brown wavy lines were clearly marked running across the wings. The abdomen showing between the wings was antique-gold in colour with dark-brown ribs. Behind the head was an area of light-brown hair and the underpart of the body was covered with a creamy-white fur. The most outstanding features were, however, the eyes, they were dark brown in ordinary light but in direct light they became a bright orange.

Position of ship: 17° 55'N, 40° 18'E.

BIOLUMINESCENCE

Eastern North Atlantic

m.v. *Birchbank.* Captain D. Young. Barcelona to Cape Town. Observer, Mr L. Pink, 3rd Officer.

8 November 1977. At 2200 GMT bands of bioluminescence, light green in colour, were observed in the bow wave and in the wake along the vessel's side. Bright spots,

visible for up to two seconds, were also observed where the bow wave started to break and tumble. There was a slight green glow in the disturbed water from the bow wave. There was also a green luminous band, similar to the shade of green of the vessel's starboard side light, along the side of the vessel at water level and extending outwards to a distance of about 60 cm from the vessel's side. The band did not seem to be disturbed or broken up by the movement of the vessel or the wake. The bioluminescence was observed for about two hours.

Position of ship: 20° 01'N, 17° 49'W.

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

'The bright green colour and the general glow suggests that luminous copepods (small planktonic crustaceans) were responsible. They are certainly abundant in this region at certain times of the year and their light is noticeably greener than that of many other animals.'

Western North Atlantic

m.v. *Almeria Star*. Captain J. Calabrase. Yokohama to Valparaiso. Observers, Mr S. K. Hardcastle, 3rd Officer and Mr R. Hutton.

8 December 1977. At 0100 GMT large areas of bioluminescence were observed in the bow wave. Between 0100 and 0130 what appeared to be a shoal of fish was observed on the surface of the sea. The shoal took the form of an elongated letter S estimated to be 4 metres wide and 16 metres long. When close to the vessel the shoal appeared to break up and move ahead of the bow wave. The fish were estimated to be 30 cm long. Once the main shoal had broken up about 10 smaller shoals were in view at any one time, some could be seen to tail off beneath the surface in a whirlpool-like shape.

Position of ship: 24° 43'N, 74° 47'W.

Note 1. In a similar report on the following day the observers add that on occasions the fish could be seen tracing lines across the surface of the water and at times fish leaping and even 'flying' were observed.

Note 2. Dr Herring comments:

'Shoals of fish were almost certainly responsible, possibly flying fish as suggested by the observer, though lanternfish and tuna also leap out of the water when chasing (or being chased) during feeding.'

North Pacific Ocean

m.v. *Kwangtung*. Captain R. Kennett. Apia (W. Samoa) to Hong Kong. Observer, Mr P. Midgley, 3rd Officer.

On three consecutive nights the vessel encountered bioluminescence and the following are extracts from the logbook:

28 December 1977, at 1000 GMT. The vessel encountered an area of bioluminescence which consisted in the main of a dense mass of dimly glowing globular shapes, green in colour, activated by the vessel's bow wave. The shapes were about 30 cm in diameter and irregularly spaced, often in groups of three or four, some of which collided in areas of greater turbulence to give a brighter flash, while other shapes were observed singly and as much as 3 metres apart. The movement of the shapes in the turbulence was like that of a jelly-fish. Occasionally spot flashes—pin-pricks of light in the bow wave and in the wake of its turbulence—were observed, but by 1030 the light from the moon dimmed most of the display.

At 1050 the vessel entered an area of slightly different bioluminescence. The globular shapes were about 15 cm in diameter and more evenly distributed at distances of about 1½ to 2 metres. This display was visible only on the side of the vessel shaded from the light of the moon.

29 December 1977, at 1030. The display was similar to the previous night but brighter, due probably to the darkness as cloud cover obscured the moon. The

globular shapes flashed brightly on being disturbed and maintained their brilliance for a full second or so before fading, the shapes were, however, not so numerous as on the previous night.

Bright spot flashes, green in colour, were observed in the vessel's bow wave and in the sea waves, occasional spots produced multiple flashes. The display dimmed as the cloud moved away and the area became illuminated by the light from the moon.

30 December 1977, at 1100. Faint green speckling was observed in the bow wave and its turbulence. Pin-pricks of light also appeared for a fraction of a second. Bright green spot flashes were also observed as on the previous night about two metres apart. There were also occasional sub-surface blooms, mainly in the bow wave. The blooms were green in colour and about 50 cm apart.

Position of ship at 1000 on the 28th: 0° 27′N, 157° 12′E.
Position of ship at 1030 on the 29th: 2° 31′N, 151° 56′E.
Position of ship at 1100 on the 30th: 4° 50′N, 146° 46′E.

Note. m.v. *Kwangtung* is a Hong Kong Selected Ship.

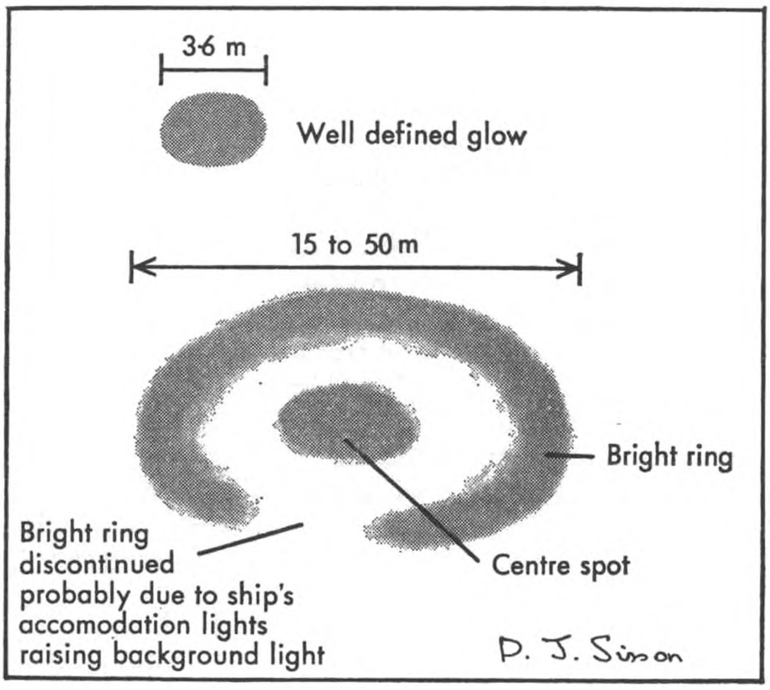
North Indian Ocean

m.v. *British Commodore.* Captain W. Callaghan. Kwinana (Australia) to Kharg Island. Observer, Mr D. J. Sisson, 3rd Officer.

9 December 1977. At 1650 GMT an area of bioluminescence was observed for a period of about 10 minutes.

The phenomenon appeared as well-defined patches, circular in shape, which rose to the surface and spread out to form widening, very bright rings with a less-bright centre spot, see sketch. Each ring appeared to be duller at the outside edges, this was, however, due probably to the vessel's accommodation lights increasing the background lighting.

About 15 of these patches were observed to have a diameter of 45–50 metres. A further similar number of smaller patches about 30 metres in diameter and between 40 and 60 patches about 15 metres in diameter were also observed. The larger



patches were observed for about 25 seconds and the smaller patches for between 5 and 15 seconds. The whole appearance was likened to rising vertical streams of water, narrow in width, reaching the surface and spreading out to form a bright ring or dying out at varying depths below the surface.

The bioluminescence was observed mainly on the starboard side of the vessel (to the north-east) at a distance of about 200 metres.

Weather conditions at the time were: sea calm, wind NE'ly, force 2, sea temp. 28°C.

Position of ship: 7° 34'N, 74° 42'E.

Note. Dr Herring comments:

'This is a fascinating account of what is sometimes described as "erupting" luminescence. Its cause is not certain but may perhaps be related to underwater seismic disturbance. The observer is to be congratulated on the clear and detailed description which adds greatly to its value. It is particularly surprising that no bow wave or wake luminescence was visible at the same time.'

Arabian Sea

m.v. *Maihar*. Captain S. Baxter. Colombo to Suez. Observers, Mr R. L. Grenville, 3rd Officer and Mr P. N. Senanayake.

9 October 1977. At 1800 GMT an area of bioluminescence was observed. When a light from a torch was directed onto the phenomenon it was observed to take the form of rapid globe-shape flashes which ceased when the light was extinguished. The flashes were about 6–10 cm in diameter and were observed for a period of eight minutes.

A little less than an hour later the phenomenon was again observed but this time more intense. The bioluminescence was activated by the lights from the accommodation decks and was observed all around the vessel wherever light was reflected on the water. Even the faint light from Jupiter reflecting on the sea surface was seen to activate the bioluminescence. On this occasion the phenomenon was observed for about 1½ hours.

The air temperature was 27·8°C and the sea temperature 28·4.

Position of ship: 9° 00'N, 68° 00'E.

Note. Dr Herring comments:

'An interesting report of light-stimulated bioluminescence. While many luminous animals can be stimulated by light, e.g. fishes, crustaceans and Pyrosomas, it is not possible to identify the source of these observations.'

Persian Gulf

m.v. *Wild Fulmar*. Captain H. C. Hynard. Abadan to Bandar Abbas. Observers, the Master and ship's company.

9 November 1977. At 2100 GMT the phenomenon known as a phosphorescent wheel was observed and the following description was recorded:

The wheel first appeared approximately two points on the port bow rotating in an anti-clockwise direction. The wheel moved parallel to the course of the vessel in the opposite direction, increased in intensity when abeam and changed to a clockwise direction when on the port quarter.

The bands of light appeared grey in colour, they seemed to move towards the side of the vessel then disappear. The time interval between successive bands was 2–3 seconds.

At all times the wheel appeared to be above the surface of the water and seemed to rise to eye-level when abeam.

Weather conditions were as follows: dry bulb 28·0°C, wet bulb 24·5, barometric pressure 1014 mb, wind ENE, force 3.

Position of ship: 26° 31'N, 55° 53'E.

Note. Dr Herring comments:
'An interesting phosphorescent wheel report. The illusion of the light being above the water surface is frequently reported and the change of direction of rotation is another common feature of this puzzling phenomenon.'

AURORA

Eastern North Atlantic

m.v. *Pole Star*. Captain N. Morrison. Burra Firth (Shetland Islands) to Stromness. Observers, the Master and Mr A. D. Welsh, 2nd Officer.

6 October 1977. At 2100 GMT a moderate glow, pale greyish-green in colour, with pulsating rays was observed above the northern horizon; it was apparently the upper part of a rayed arc, the lower part of which was below the horizon.

The rays slowly faded and disappeared after about 10 minutes; the glow was, however, observed for a further 20 minutes. Eight minutes later the pulsating rayed arc was observed again over an arc of the horizon between 310 and 020°T with a maximum altitude of 10–15°, the arc was observed for about 40 minutes after which the display was obscured by cloud.

Position of ship: 60° 24'N, 01° 54'W.

Note. See page 204 for Aurora Notes for 1977.

UFO

North Atlantic Ocean

m.v. *Seatrain Bennington*. Captain N. W. Cockshoot. Montreal to Southampton. Observers, Mr J Hall, 3rd Officer and Cadet R. T. Upton.

5 December 1977. At 0045 GMT, whilst on watch on a clear dark evening the look-out observed an 'amberish'-coloured light to the south-east at an altitude of about 30° moving westwards across the sky; when viewed through binoculars it appeared to be a red flashing light with several white lights in close proximity.

It moved swiftly across the lower part of Orion and then, when bearing approximately 200°T, it appeared to halt and then move off directly away from the vessel. It was, however, lost as it became obscured by cloud.

It had moved through about 70° of azimuth in 10–15 seconds, this, it was considered, was too fast for a satellite or jet aircraft. It appeared to be flying at a height well over 30 000 ft and its magnitude was 1·8, comparable to the star Alnilam in the constellation of Orion.

The dry bulb temperature was 2·5°C and 4 oktas of cloud were present during the period of the observation.

Position of ship: 53° 10'N, 46° 00'W.

RESCUE AT SEA

Mediterranean Sea

m.v. *Melita*. Captain I. McAllister. Ashdod (Israel) to Antwerp. Observers, the Master and ship's company.

19 November 1977. At 1240 GMT the 2nd Officer sighted a yacht to starboard in apparent distress. The Master was called to the bridge and the distress was confirmed when it was observed that the yacht was flying the signal CV4IA6—'Can you assist, I have received damage to engine-room?'

The vessel was manoeuvred so as to create a lee for the yacht and by 1330 the first three of the seven crew members, by using one of the yacht's life-rafts, were brought on board.

Preparations were made to pick up the remaining four crew members and to take the yacht in tow and at 1448 a rocket line was fired across to the yacht. By 1500 the yacht was being taken in tow by using a wire rope from the stern of the vessel and secured to the yacht's mainmast. The four remaining crew members were then brought aboard the vessel by using the second life-raft. Towing commenced at 1544 but at 1606 a sudden tension in the wire rope ripped the mast out and the tow was lost.

At 1630 the *Melita* resumed passage on a course of 264°T and messages were broadcast to the effect that all persons had been recovered, that the yacht was adrift and sinking and that no further assistance was required.

Weather conditions at the time were: overcast with continuous rain, rough seas and heavy easterly swell causing the vessel to roll and yaw heavily as she manoeuvred around the yacht.

On the following day the seven crew members were landed at Gibraltar and the vessel resumed passage for Antwerp.

Position of ship at 1200 on the 19th: 37° 00'N, 01° 48'E.

910.4(99:42)

The British Antarctic Survey

(from material kindly supplied by the Director, British Antarctic Survey)

The British Antarctic Survey, a component body of the Natural Environment Research Council, is responsible for British scientific activities in British Antarctic Territory and the Falkland Islands Dependencies; these territories comprise a total land area of about 700 000 square miles.

Most of the early expeditions to the region carried out important scientific work as well as geographical exploration and much that they accomplished is still of value today.

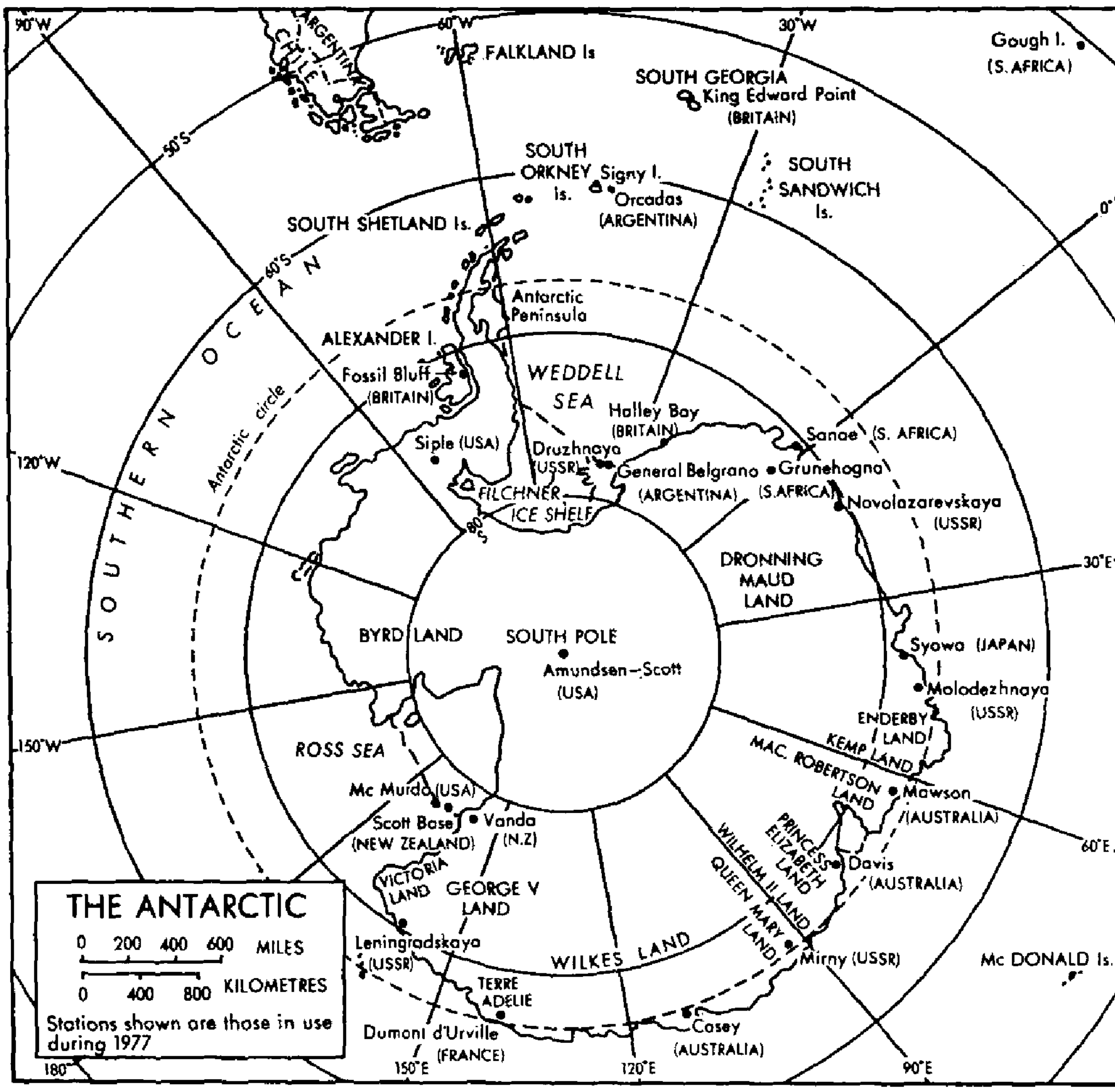
British scientific programs in the Antarctic have been almost continuous since 1925 having been interrupted for only four years during World War II. They were initiated by a Committee set up by the Colonial Office in 1917 to advise on Antarctic research; from this developed the Discovery Committee whose Discovery Investigations (now part of the Institute of Oceanographic Sciences, also a component body of the Natural Environment Research Council) carried out extensive oceanographical and biological research in the Antarctic, including the Antarctic Peninsula region from 1925 to 1939 and in 1950–51. This was mainly in connection with the whaling industry and, since 1949, the Institute has acted as scientific adviser to the International Whaling Commission.

Another important forerunner of the British Antarctic Survey was the British Graham Land Expedition, 1934–37, which worked on the west coast of the Antarctic Peninsula. Notable among its achievements was the confirmation that Graham Land is part of the Antarctic Peninsula, not an island as previously reported, and the discovery of George VI Sound which was explored as far south as latitude 72°s.

The British Antarctic Survey owes much to these predecessors, not least because some of their members helped to launch it in 1943 when it began as a war-time naval operation 'Tabarin', and it was they who immediately saw its scientific potential. Two bases were established at the beginning of 1944 and 16 more in the ensuing years, five of them being occupied at present by a total wintering party of 80 men. At the end of the war control was transferred to the Colonial Office and the name changed to Falkland Islands Dependencies Survey, but links with the Royal Navy were retained, fruitful co-operation still being continued with the present ice-patrol ship HMS *Endurance.*

Scientific programs were initiated at the beginning of Operation 'Tabarin' but for some years high priority had to be given to geographical exploration and mapping, and it was not until 1950 that a small office (the Falkland Islands Dependencies Scientific Bureau) was set up in London—under the directorship of Dr (now Sir) Vivian Fuchs—to organize these and publish the results. The programs expanded rapidly in the next few years, largely as a result of the impetus given to Antarctic research by the International Geophysical Year (IGY), 1957–58, and close liaison was established with a number of British organizations interested in Antarctic science, notably the Scott Polar Research Institute, the Royal Society, the Meteorological Office, the Radio and Space Research Station (since renamed the Appleton Laboratory) and the Medical Research Council. At the same time, international co-operation was developed through the Royal Society and the Foreign Office. Part of the British contribution to the IGY was the Trans-Antarctic Expedition, 1955–58, which was organized and led by Dr Fuchs. The expedition succeeded in making the first overland crossing of the Continent and carried out important scientific observations both at its base and *en route.*

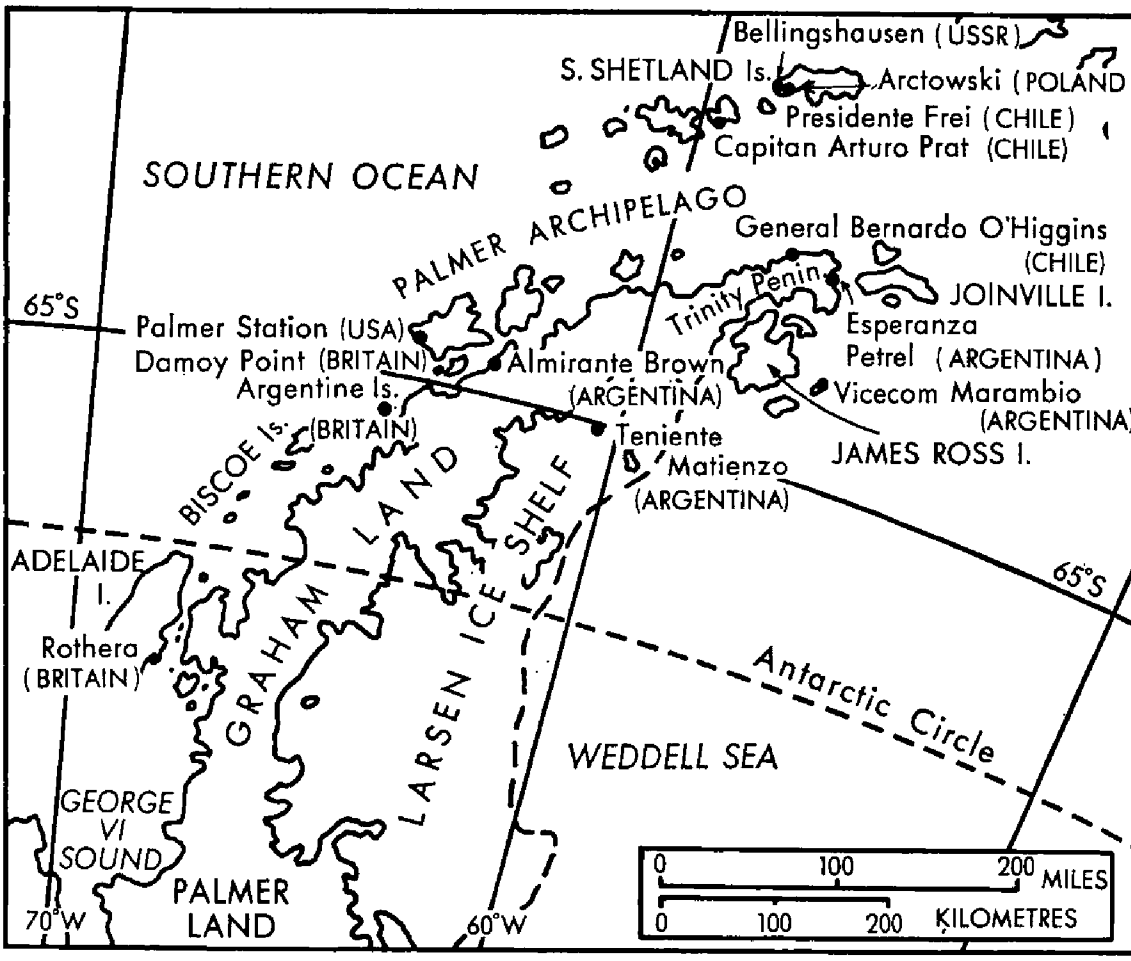
By 1956 the increasing volume and complexity of the scientific work made it imperative to expand the scientific administration, but funds were limited and the



Map of Antarctica showing the locations of stations in use in 1977

only means of achieving this was to negotiate the setting up of units in appropriate university departments and research institutes. The first of these was established in 1956 by the Acting Director, Sir Raymond Priestley, at the University of Birmingham of which he had been Vice-Chancellor for 14 years, and others were subsequently set up in London, Edinburgh, Birmingham, Cambridge, Slough and Huntingdon. Special projects have also been undertaken elsewhere. Although this was an important development and it was possible to enter into quinquennial agreements with the universities, the Survey's future was still uncertain.

The situation was changed, however, in 1959 when Britain became a signatory to the Antarctic Treaty. This Treaty was originally concluded between the 12 nations which had co-operated in the Antarctic so successfully during the IGY and its aim was to ensure that the Continent would be used for peaceful purposes only and that scientific investigation and co-operation could continue unhampered by politics, claims to territorial sovereignty being left in abeyance. As the Treaty was limited to the region south of latitude 60°s, the Antarctic part of the Falkland Islands Dependencies was re-designated British Antarctic Territory in 1962 and the name of the Survey changed to British Antarctic Survey. The advent of the Treaty increased the importance of the work being continued, especially as it had become apparent that the Survey occupied a key area in many world-wide fields of study and was also engaged in a number of projects of far-reaching significance. By that



Map of the Antarctic Peninsula showing the locations of stations in use in 1977

time, the program covered all major areas of environmental research, and it was a logical development that the British Antarctic Survey was granted more-permanent status and incorporated into the Natural Environment Research Council in 1967.

All the scientific sections flourished but their wide dispersal had its disadvantages. The continued development of the Survey's science depended on the simultaneous development of the headquarters' activities—of personnel selection and logistics (the provision of everything required by the Antarctic bases from matches to sophisticated scientific equipment and the maintenance of ships and aircraft), the co-ordination of field programs and the provision of central services. Moreover, as the work progressed, there was increasing overlap between the various disciplines. To ensure maximum efficiency all these required maximum consultation and co-operation which could be achieved only by centralization, so it was hoped that all sections might eventually be housed together in one place in permanent accommodation.

This hope was finally realized when the new headquarters building was officially opened by HRH The Duke of Edinburgh on 7 May 1976. It had been specially designed and built for the Survey and is fully equipped with laboratories, workshops, a small library and a computer. It constitutes the greatest landmark in the Survey's history to date.

The Survey maintains five permanent bases for field work in the Antarctic and these are manned throughout the year. There are also several minor bases used for summer operations and transit to the field. A number of field huts and refuges are available at strategic sites.

The base on South Georgia is situated at King Edward Point (lat. 54° 16′s, long. 36° 30′w); this was established as a main research station in 1969 following the collapse of the whaling industry. Nineteen men recently wintered at the station and the complement increases to 50 in the summer. Their work is multidisciplinary; biological, ionospheric and meteorological studies predominate, while geological, geomorphological and glaciological field work is carried out by field parties supported by ships around the island. There are three small summer bases at Bird Island, Elsehul and Schlieper Bay, and these have complements of three or four men engaged in studying the abundant fur seals, albatrosses and other birds. A small work boat is used for marine biology. This and other small craft also provide local transport.

The base at Signy Island (lat. 60° 43'S, long. 45° 36'W), one of the South Orkney Islands, was established in 1947, but the present main building of prefabricated glass-fibre laminate was erected in 1964. Signy Island is biologically one of the richest places in the maritime Antarctic and the purpose of the base is to make intensive studies of the marine, terrestrial and fresh-water ecosystems. This base has a diving facility and much of the research into the marine and fresh-water environments is done by SCUBA diving, which involves working beneath the ice in winter. A launch is used for work at sea. Recently 12 men wintered at the base, but as elsewhere there is a large influx of Survey field workers in the summer.

At the Argentine Islands (lat. 65° 15'S, long. 64° 16'W) is the oldest operational British base in the Antarctic Peninsula. It was established in 1947 and is now known as Faraday base. It is situated on one of the islands forming a small archipelago five km off the Graham Coast. This is a geophysical observatory and was this year manned by a wintering party of 10.

Rothera base at Rothera Point (lat. 67° 34'S, long. 68° 07'W), Adelaide Island, occupies a rocky promontory on the south-eastern coast of the island. This has replaced Adelaide base 65 km to the south-west and is now the main base for summer air operations in the central and southern parts of the Antarctic Peninsula and on Alexander Island. The aircraft use a snow runway five km from the base. The winter complement is 11 men but about 40 men operate from the base in the summer when parties are flown into the field to work on glaciology, geology and geophysics. Further south, a summer base at Fossil Bluff, Alexander Island (lat. 71° 20'S, long. 68° 17'W) is used by summer field parties working in that area.

Another small base at Damoy Point, Wiencke Island (lat. 64° 49'S, long. 63° 30'W) serves as an air facility and is a transit base for personnel transferring from the ships to aircraft to be flown south before the summer break-up of the sea ice allows access by ship to Adelaide Island. The personnel are air-lifted from Damoy Point south to Rothera.

The most southerly base is situated at Halley Bay (lat. 75° 31'S, long. 26° 50'W) on the floating Brunt Ice Shelf on the eastern coast of the Weddell Sea. Because the base buildings are permanently buried and slowly crushed by accumulating snow, it has been rebuilt several times. The latest huts, constructed in 1973, were erected inside steel tubes to avoid damage by the pressure from snow and ice. Access to the base is through shafts to the surface. This is also a geophysical observatory and was, this year, manned by a wintering party of 17.

Ships and aircraft

The Survey operates two ice-strengthened ocean-going vessels for logistic support and research. R.R.S. *John Biscoe*, launched in 1956 is of 1584 tons gross, has an overall length of 67 metres and is fitted with diesel-electric propulsion developing 1450 shaft horse-power. She is due to undergo a major refit in 1978–79. The larger and more-modern R.R.S. *Bransfield* of 4816 tons gross 100 metres overall length, was launched in 1970. Like *John Biscoe*, she is a diesel-electric vessel, developing 5200 shaft horse-power. *Bransfield* is amongst the finest of the research vessels in the Southern Hemisphere. Both vessels are classed at Lloyd's '100 A1* ice-strengthened'.

Two ski-wheeled de Havilland Twin-Otter aircraft are operational in the Antarctic between November and March. They are used primarily for radio echo-sounding of ice depths, aeromagnetic surveys, topographical survey control and the movement and supply of field parties. They also have a search-and-rescue function should this become necessary.

Organization

The British Antarctic Survey comprises an Administration Division which is responsible for co-ordination, logistics, staffing and finance and three scientific divisions. Each scientific division is sub-divided into about seven sections including a leader, four or five contract scientists and two or three scientific assistants. The contract scientists are usually recent graduates, recruited for a period of about five years. In the case of the Atmospheric and Life Sciences, an initial training period in the United Kingdom is followed by 2½ years in the Antarctic and a further period up to two years in the United Kingdom completing the research for publication. For the earth scientists, summer field work in the Antarctic alternates with laboratory work in the United Kingdom and preparation for the next season.

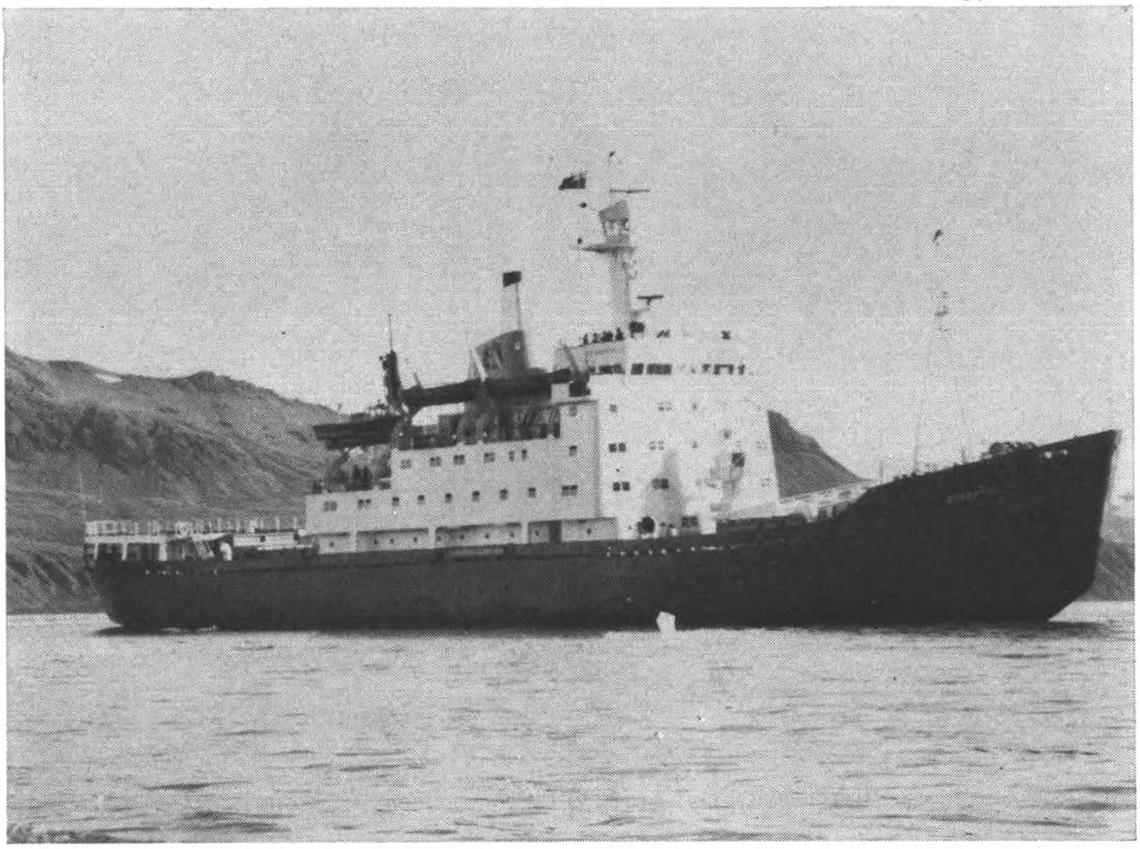
Administration

The Administration Division of the Survey has a wider and more-responsible task than that of most scientific organizations. In addition to the day-to-day administration associated with running a medium-sized research organization in the United Kingdom, there are the formidable logistic problems allied to controlling two ships, two aircraft and five permanent Antarctic bases.

The staff of the British Antarctic Survey is about 360, more than half of these are short-term contract workers, thus necessitating regular recruiting. As living and working conditions are arduous and physical stress may be extreme, personnel selection is far more careful and rigorous than for posts in more-conventional locations. In 1977, the Establishments Section dealt with over 2000 enquiries, held 200 interviews and recruited 70 staff, including scientists, cooks, mountaineers, builders, wireless operators, mechanics, medical officers, ships' officers and general assistants.

The Logistics Section organizes the provision of all material supplies such as buildings, aircraft spares, vehicles and spares, fuels, food, sledges, tents, scientific equipment, radio equipment, clothing, chandlery, etc. When necessary, technical advice and assistance are obtained from outside organizations. In addition it deals with the ships' refits and provisioning. The Survey's operations are on a large scale, for example, during the first seven months of the 1976–77 financial year, 2083 contracts were placed with 619 suppliers and these were subsequently followed through to packing and loading. Arrangements were made for the ships to be refitted in Southampton and the aircraft to be overhauled in Toronto. The ships sailed with approximately 14 500 separate pieces of cargo (*Bransfield* 11 800, *John Biscoe* 2700) of 70 kg average weight. These included 1500 crates processed by the packing stores, 7500 crates delivered direct to the ships, 3100 drums of fuel and lubricants, 1300 sacks of coal, 14 vehicles, 150 tonnes of concrete mix and one complete base building complex to house 35 men and weighing 120 tonnes. This new base, built at Rothera Point, was designed by a Survey projects team. *Bransfield* sailed with 770 tonnes of cargo and *John Biscoe* with 240 tonnes. For much of this cargo specifications had to be discussed with suppliers, buildings designed, boats and vehicles modified, tenders sought and bills of lading, customs and VAT documents, etc. prepared. In Southampton these cargoes are loaded by dock workers with all modern facilities but in the Antarctic they have to be unloaded by the Survey's staff from ships lying offshore or alongside an ice shelf, using flubbers, scows

(*Opposite page* 192)

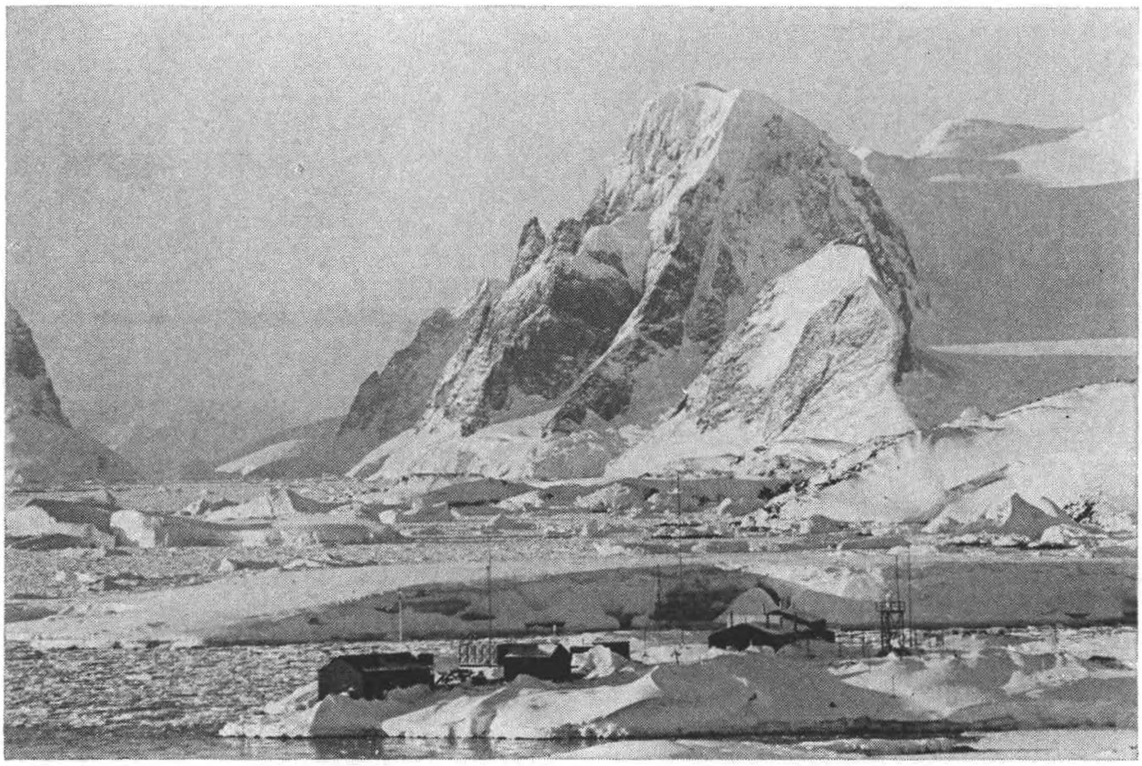


RRS *Bransfield* in Cumberland East Bay, South Georgia

RRS *John Biscoe* beset off the coast of the Antarctic Peninsula

(*see* page 188)

(*Opposite page* 193)



The Observatory at the Argentine Islands off the west coast of the Antarctic Peninsula

A field party on Alexander Island being supplied by Twin-Otter aircraft

(*see* page 188)

or cargo sledges. In difficult ice conditions, they have to be transported long distances by vehicles plying between the ship and base. At Halley, the most remote base, this distance has sometimes been as much as 64 kilometres.

The Survey's two aircraft are overhauled each year at the de Havilland factory in Toronto. This involves a long ferry flight each way, including a 1300-km crossing of Drake Passage. Excluding the ferry flight, each aircraft averages about 300 hours of flying each season.

Co-ordination and communication are vital tasks of the administration. The Antarctic base commanders and ships' masters are in regular contact with the Survey's headquarters in Cambridge by radio teleprinter via the Cable and Wireless station in the Falkland Islands. Over 200 000 teleprinter groups are transmitted each month. Action arising from these messages may involve not only one of the scientific divisions but also commercial suppliers, other research organizations, the Ministry of Defence, the Foreign and Commonwealth Office or overseas institutions, such as the Division of Polar Programs in Washington.

Atmospheric Sciences

The Atmospheric Sciences Division is primarily interested in the properties of the atmosphere from the ground to its outer limits and in relations between changes in it and solar activity. A very wide range of techniques is used in these studies, involving observation of surface and upper-air meteorology, ozone, solar radiation, magnetic pulsations, diurnal change of the magnetic field, the ionosphere and magnetosphere. Thus the work of the Division is more interdisciplinary than is usual in scientific work and the results from the different experiments can be combined to solve problems which would otherwise be intractable.

The Survey's Atmospheric Sciences Stations are strategically placed in a zone which forms a natural laboratory for the study of atmospheric phenomena; it is, in fact, unique. This occurs for two main reasons:

1. Antarctica forms a great dome centred near the south geographical pole which is almost entirely surrounded by water, providing a remarkably simple situation for studying the growth and decay of weather systems and their interaction with the higher atmosphere.
2. The magnetic field of the earth corresponds to that of a triangular-shaped magnet offset from the centre of the earth so that the south magnetic pole is much further from the geographical south pole than the magnetic pole in the north. This has a major effect on the behaviour of the high atmosphere, the ionosphere and the magnetosphere, on the electric currents which flow in it and may have significant effects on the interaction between the atmosphere and the sun.

In addition the isolation of Antarctica from local sources of pollution gives special advantages for studies of the global transport of pollutants. The cold conditions, giving low water content in the atmosphere and lack of dust, provide exceptionally favourable conditions for the measurements of the total ozone in the atmosphere and the incident radiation.

A rapidly growing field of study is concerned with establishing whether weather and climate are altered by changes in the radiation from the sun during the solar cycle and, if so, the mechanism involved. Such interactions are likely to be due either to changes in its particle streams (the solar wind) or electro-magnetic radiation, or both. The geometry of the magnetic field provides critical tests of theories of such phenomena in Antarctica.

Systematic radiation measurements since the International Geophysical Year, 1957–58, have provided data on the energy input due to solar radiation. One of the projects is the investigation of whether these changes show any links with general climatic variations. The data clearly show the influence of major volcanic eruptions which have varying effects on the available radiation when the surface has a high albedo (ice or snow) or low albedo (land or sea).

Most research in the Atmospheric Sciences is based on obtaining accurate measurements of atmospheric phenomena, taking advantage of the special conditions in the region and waiting for nature to make the critical experiment. Occasionally, special experiments are added to the basic observations in order to test particular points. Thus the work is largely of a routine nature, preliminary sorting and analysis of the data being made at the Antarctic station. However, it is necessary for every man sent south to be a specialist in one field and to lend a hand in several other fields. This gives an exceptionally wide range of interest. In addition, of course, all members of an Antarctic station have to take part in the maintenance of the station and the work necessary to keep everyone fed, warm and entertained.

Earth Sciences

The work of this Division covers a wide range of research in geology, geophysics and glaciology. In selecting Earth Sciences research problems, it is important to assess whether or not it is more rewarding or more cost effective to attempt to solve a particular problem in the Antarctic rather than in a more-accessible part of the world. Although scientific research was only one of the motives which led the Survey to commence work in the Antarctic Peninsula, this region has since been found to occupy a uniquely favourable position for certain studies of general and indeed global significance. Investigations this far have provided an explanatory framework of base-line data on which future programs and developments may be based.

A large proportion of the land area of Antarctica is buried beneath an ice sheet which is in some places more than four km thick and is surrounded by an ocean which is in some places more than 4000 m in depth. All aspects of Antarctic research are dominated more by the ice environment than by any other factor. The vast Antarctic ice sheet, through its heat exchange with the ocean, influences conditions over the entire earth. Antarctica provides the only contemporary example of an ice sheet in an extreme glacial period and it is the principal factor controlling sea level round the coasts of Britain. By studying its form, flow and stability, it is possible to understand the causes and affects of former glaciations on other continents. The Antarctic ice sheet provides a unique area of deposition and preservation of atmospheric precipitation from the past. Dating techniques are used to establish variations in space and time, not only of the precipitation itself but also of the terrestrial and extra-terrestrial impurities within the ice, and these can be determined in an environment that is almost free from local contamination.

The Survey's glaciological programs have made important contributions to contemporary understanding of the physical properties of ice. By concentrating on the study of ice shelves, which are particularly well represented in British Antarctic Territory, fundamental advances have been made at relatively low cost compared with work on the inland ice sheet. Elsewhere, remote-sensing techniques are used to study the ice thickness, sub-surface glacier dynamics, bedrock morphology and the physical characteristics of the ice-rock interface. Radio echo-sounding, using a pulsed radar at a frequency to which ice is transparent, is the method employed by the Survey. In 1963 the British Antarctic Survey were the first to achieve the continuous recording of glacier thickness from a moving vehicle and in 1966 also the first to operate an airborne system in the Antarctic. The Survey's aircraft have since flown ice-sounding profiles over tracks totalling around 80 000 km. Results have included published maps giving the first information on ice thickness in the Antarctic Peninsula region and extensive data on sub-glacial morphology that is of wide interest to all the Earth Sciences. The Survey were the first in the world successfully to adapt an echo-sounder for making a detailed ice-depth survey of a single valley glacier and first to measure the velocity at which a glacier more than 1000 m thick slides over its bed. Many geographical discoveries have also been made while radio echo-sounding and it is now possible to define the position of the coastline where it is covered by ice. In some areas, the coastline depicted on published maps was found to be as much as 100 km away from its true position.

Life Sciences

Systematically organized biological research is the youngest of the three scientific disciplines pursued by the Survey. Although valuable research on seals and penguins was done in the early days of the Survey, it was not until 1961, when the biological program started at Signy Island, that a systematic approach to investigating the Antarctic ecosystem was begun.

The Antarctic is a region of severe climatic conditions and great isolation. The Southern Ocean is characterized by a species-rich, highly productive ecosystem which contrasts sharply with the species-poor, relatively barren terrestrial and fresh-water ecosystems of the islands and continental land mass. Antarctic organisms have had to adapt themselves in order to survive in an environment approaching the limits of life. The Survey is studying these ecosystems to discover what organisms are present and which of these may be judged successful.

The Antarctic marine ecosystem offers the widest and potentially most profitable field for research. Early work and commercial harvest have revealed the degree of productivity of the seas and the need for intensive research is undisputed. The Survey's efforts have in the past been concentrated on near-shore waters and the land-breeding birds and seals that are accessible from the shore.

However, the Survey has now commenced open-ocean research. The seas in the Survey's area of operation are very rich in krill, a small shrimp-like crustacean. This is the key organism in the food-web that forms the basis of the ecology of the Southern Ocean. Increasing pressure on traditional fisheries, dwindling stocks and extension of exclusive fishing zones have combined to force nations with a distant-water fishing capability to look to this area. A program of research into the biology of krill and its principal predators is therefore being undertaken as a matter of some urgency in order to provide a sound scientific basis for management policies in an attempt to ensure against over-exploitation.

The Survey's medical officers usually undertake medical or physiological research programs. Conditions at the Antarctic stations provide unique opportunities for studying 'captive groups' in an extreme environment. Naturally many of the research topics are related to the particular conditions of work in the Antarctic. Thus, studies of physiological adaptation to cold and the use of protective clothing have been made. An interesting extension relating to the growing interest in environmental medicine in the North Sea oil industry, where many divers are employed, is the heat relation to wet-suit SCUBA divers in the Antarctic. In addition small isolated groups have provided an ideal opportunity for research on the transmission of the common-cold virus.

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Development of Work on Ocean Currents

By J. E. Atkins

Meteorological Office

Summary

A brief history of the work in the Meteorological Office on ocean currents is given, the present work is described and future developments discussed. The potentialities for future work are closely related to improvements in the observations made possible by modern navigational aids and to the greatly enhanced observational archives that will be formed as a result of international exchange of data.

Work in the past

For more than a century ocean currents have been systematically observed from co-operating ships. Much work has been carried out over the years in studying and analyzing these observations so that guidance could be given to the mariner as to the currents he might expect to encounter in any sea area. In the Meteorological Office this work was particularly extensive between about 1925 and 1960 and was described in many articles in *The Marine Observer* (for instance by Barlow, 1933 and 1939). The work resulted in the publication of atlases summarizing currents—'Quarterly Surface Current Charts of the Atlantic Ocean' (Meteorological Office, 1945) is an example. In fact the series of atlases prepared during this period dealt with most of the sea areas of the world. A large staff was required foi the considerable labour of extracting data from logbooks, making computations of frequencies, vector-means and predominant currents, analyzing the results and summarizing these in diagrammatic forms that would make them more readily appreciable. During the same period atlases of ocean currents were also being prepared in several other countries, e.g. the USA, the Netherlands and Germany.

In addition to the work on atlases the Meteorological Office has supplied over many years the information on currents incorporated in the *Admiralty Pilots* published by the Hydrographer of the Navy. The articles, diagrams and local notes for each volume are completely revised for each new edition—normally at intervals of about ten years.*

Work on the analysis of ocean-current observations was greatly curtailed in the 1960s after the atlases had been prepared. Efforts of the much-reduced staff were then concentrated on transcribing the numerous manuscript records to punched cards and eventually magnetic tape so that the data could be readily processed by computer; also much work was done in formulating quality controls that could be applied by computer. More recently, when the magnetic-tape archives had been compiled and erroneous records corrected or eliminated, computer programs were written to facilitate the more commonly required types of analysis, e.g. calculation of vector-mean currents and of frequencies within an area for drawing current roses.

Present work

At present work on ocean currents is somewhat restricted owing to the demands of more immediate tasks in particular that of advising clients on the climatological

* Additionally, the Hydrographer has been supplied with information on currents for the preparation of Admiralty Routeing Charts and for Notes on navigational charts.

aspects significant for the design and operation of off-shore installations; however, work on articles for *Admiralty Pilots* continues. As each volume comes up for revision a thorough study is made of the observed currents in the appropriate sea area so that the new article will incorporate the latest knowledge. Analysis of the observations made from ships on passage forms the major part of this work and is greatly facilitated by the computer programs now available. Also, full account is taken of the results of oceanographic expeditions and surveys and of reports of various oceanographic phenomena such as current rips or changes in the colour and appearance of the sea—reports which have often appeared in the pages of *The Marine Observer's Log*. These additional data can be most valuable in helping define local detail and discontinuities in currents.

At the present then, guidance to the mariner on the most up-to-date information about ocean currents is being given in a rather piecemeal manner by the periodic revisions of *Admiralty Pilots* instead of by the preparation or revision of atlases. Some of the atlases are now out of print and many may be out of date to some degree; it is consequently important that the revisions of *Pilots* should be as comprehensive as possible. This is facilitated by the data processing that can now be readily performed by computer and by the increasing number of observations received. For example, frequency distributions and the diagrammatic equivalent—current roses—are now feasible for some small sea areas and on a monthly basis whereas, when the atlases were prepared, it was generally feasible to make such analyses only for comparatively large areas, e.g. five degrees of latitude by five of longitude, and then only on a seasonal (three-monthly) basis. The following examples, compiled during recent revisions of *Pilots*, show how roses for smaller areas and briefer periods of the year can be used to define significant geographical or seasonal changes in currents.

Examples of current roses

The maps of Figure 1 show schematically the currents over part of the Indian Ocean during October and November. In the area east of Sri Lanka the currents mostly set south-east during October to join the general eastward flowing Equatorial Counter Current. During November, however, there is a considerable difference in the pattern of currents—east of Sri Lanka currents set south-west to join the rather limited but nevertheless significant flow to the west. This flow in fact develops into the Indian (NE) Monsoon Current which becomes a major feature of the following months. The maps show average flow whereas on a particular occasion during a given month it may differ to a greater or lesser degree from average. Useful indication of this variability is given by the current roses for area A. Thus, during November there is a much greater risk in the area of being set towards the coast of Sri Lanka (and, moreover, by strong currents) than during October.

The strong west-wards flow of the Indian (NE) Monsoon Current that develops south of India after November is accompanied by a displacement towards the Southern Hemisphere of the eastward-flowing Equatorial Counter Current. Sanderson (1973) has described the seasonal alternations in currents in the Equatorial Indian Ocean and has drawn attention to the importance for safe navigation of a correct assessment of the areas and seasons for the régimes of strong flow to east or west. It will be seen from Figure 2 that although the two régimes in February are separated by an area of weak and variable currents east of about 70°E, they lie in close juxtaposition further to the west. Here the sharp distinction of characteristics is shown by the current roses for the areas marked B and C.

A third example showing the sharpness of local detail that can be revealed by current roses for suitably chosen areas is given in Figure 3 and concerns the Gulf Stream—or the Florida Current as it is sometimes called—in the area just north of the Florida Strait. East of Florida the flow is concentrated in a narrow and strong

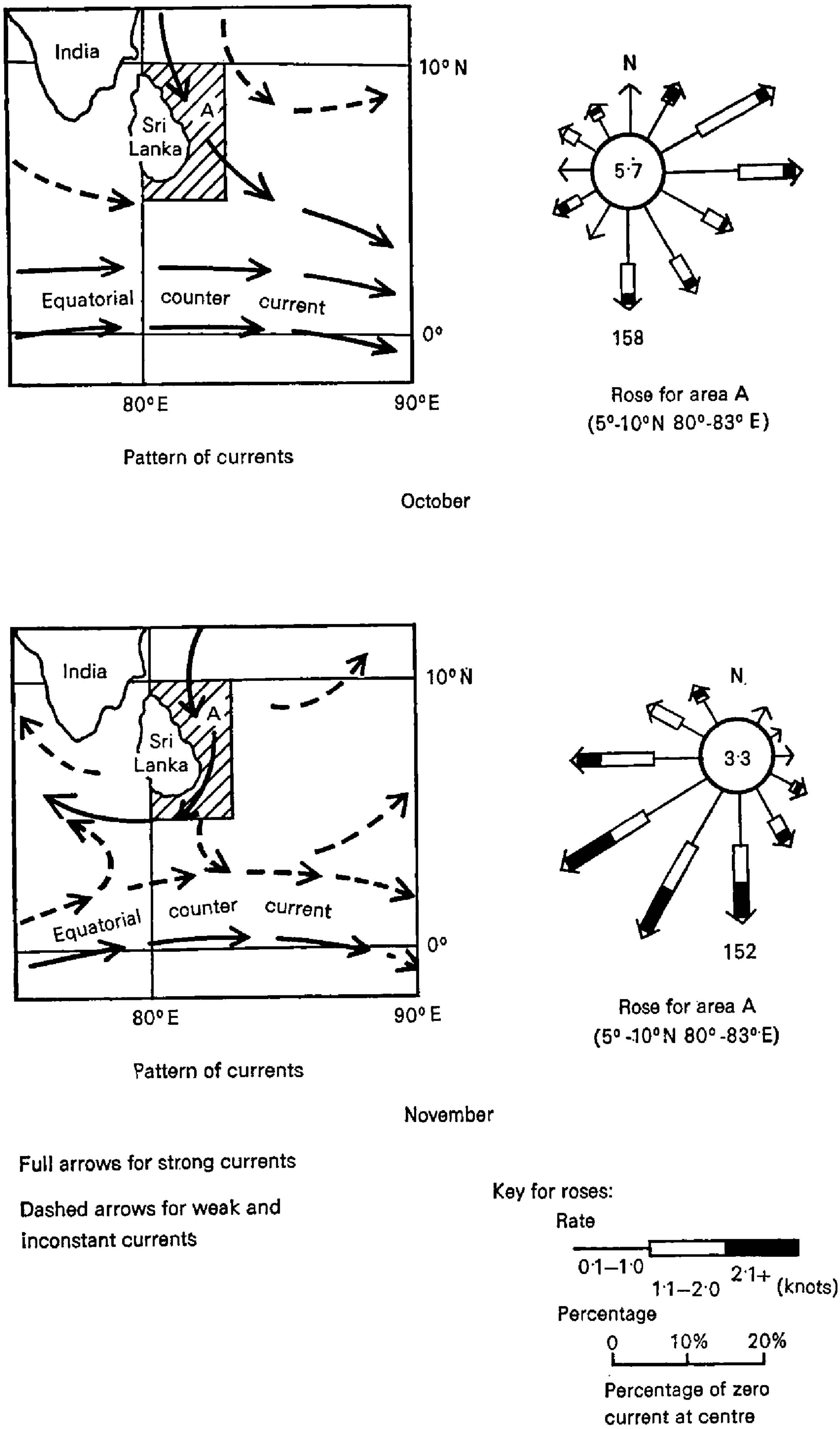
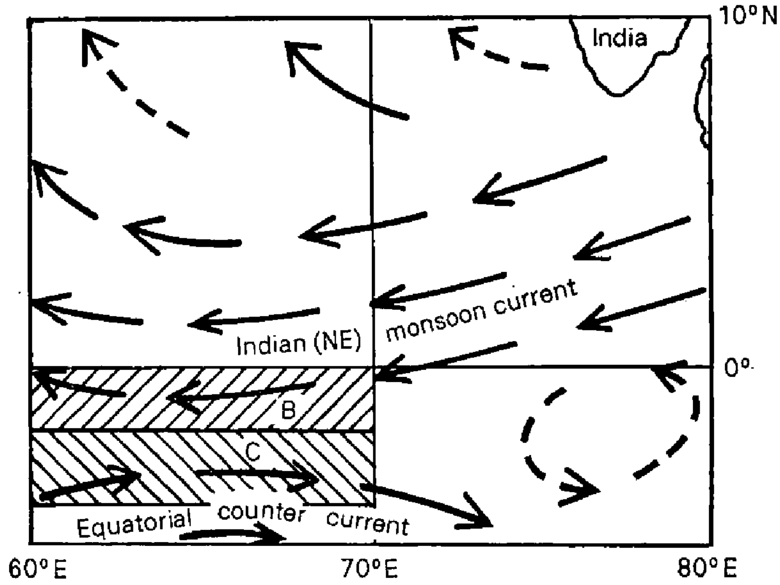
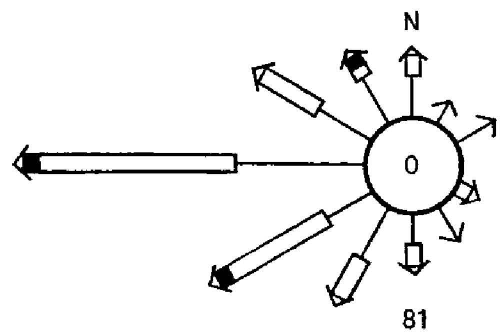


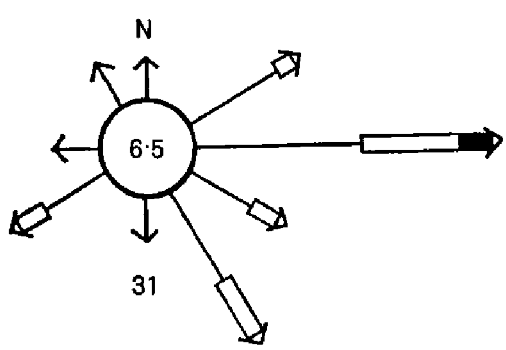
Figure 1. Pattern of currents and current roses in the vicinity of Sri Lanka—October and November



Pattern of currents



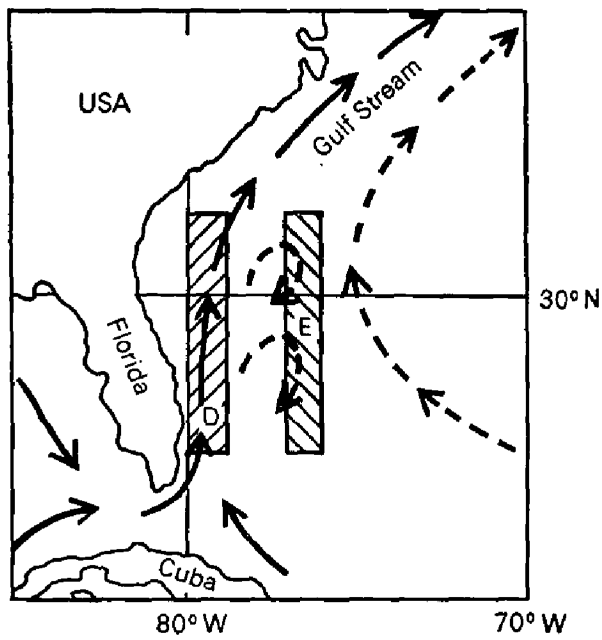
Rose for area B
(0°-2°S 60°-70°E)



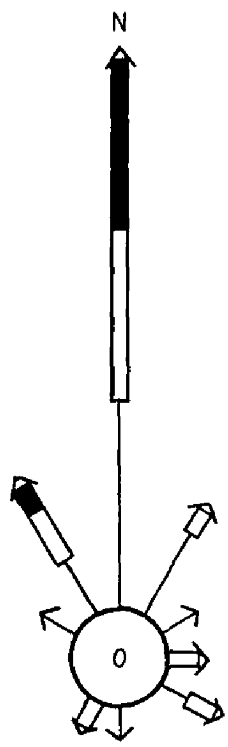
Rose for area C
(2°-4°S 60°-70°E)

(For explanation see figure 1)

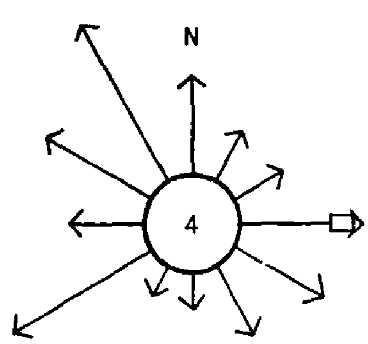
Figure 2. Pattern of currents and current roses south-west of India—February



Pattern of currents



Rose for area D
(28°-31°N 79°-80°W)



Rose for area E
(28°-31° N 77°-78° W)

(For explanation see figure 1)

Figure 3. Pattern of currents and current roses east of Florida—the year

stream of high constancy. The sharpness of the eastern boundary can be appreciated by comparing the current roses for the areas marked D and E—areas separated by only one degree of longitude.

The need for observations of currents over comparatively short distances

It is perhaps surprising that variations of such sharpness can be shown since each of the observations analyzed is not of the current at a point but over the distance between two fixes.* Possibly in the observations used for Figures 1–3 the majority of ships were steaming more or less with or against the current rather than across it but this would be fortuitous and elsewhere equally pronounced local differences must be blurred or obscured in analysis because of the nature of the observations. It is clear that much is to be gained by having current observations made over fairly short intervals of time and distance so long as this is compatible with accuracy of results.

That in past observations distances run must often have been considerable can be demonstrated by the percentage breakdown of time intervals in the data held by the Meteorological Office:

Interval in Hours	Years of Data 1920–29	1930–39	1940–49
Less than 6	2	4	4
6–11·9	13	22	10
12–17·9	12	22	10
18–23·9	12	11	16
24–25	61	41	60
	1950–59	1960–69	1970 and later
Less than 6	3	7	7
6–11·9	15	27	26
12–17·9	16	25	22
18–23·9	14	14	13
24–25	52	27	32

The frequency and accuracy with which the ship's position can be fixed by means of modern navigational aids gives great opportunity for making current observations more frequently and over comparatively short distances. Certainly there are dangers of registering results that are inaccurate or unrepresentative if the time interval is too short; these will be discussed later. In general, however, a greater proportion of observations over fairly short intervals (say about six hours) would be welcome.

On a few recent occasions enthusiastic observers have sent in observations made between fixes at intervals of an hour or less, the fixes being obtained by means of satellite navigation. We have been grateful to have had such results for study but the impression left is that these intervals have been too short since consecutive currents have differed drastically and erratically—any slight error in one of the fixes has a magnified effect on the current calculated over such a short time. Another disadvantage in calculating a current over a very short period of time is that in some areas the movement of water would often be that of a tidal stream rather than that of a true current. In general, observations should not be made where the main flow of water is likely to be tidal though the contamination of the observation is largely eliminated if the interval is about 12 hours or 24 hours.

Precise guidance cannot be given as to the optimum period or distance over which a current should be measured, much must depend on the circumstances at the time

* To simplify analysis the current observation is attributed to the mid-position between the two fixes but this should not obscure the fact that the observation represents a mean value over a distance.

and the mariner himself is often the best judge of these. As a tentative guideline it is suggested that observations at about six-hourly intervals would be especially useful. Under ideal conditions with highly accurate fixes, e.g. obtained by satellite navigation systems accurate to 0·1 n. mile, at an interval of only three hours the observation could be valuable but a shorter interval would probably be inadequate.

The need for more observations of currents

Though the observations have been collected over a long period of years the total number available (about half a million in the Meteorological Office) is not large for analysis over the extent of the ocean areas, particularly in view of the fact that substantial seasonal or even month-to-month changes in the pattern of currents occur in some areas. Moreover, the available observations tend to be concentrated along the major shipping routes so that off these routes the frequency of observation is particularly low. On individual occasions in the same area and during the same season currents can vary a great deal—as the current roses show—and consequently many observations are required to establish firmly the characteristics of a current, even merely the average flow. Depicting the average or typical flow must be the first aim of analysis but given more-numerous observations there is much scope for study of the variations from average, variations that may last a few days, months or even a year or more. For example, the pattern of sea-surface temperatures, as revealed by meteorological satellites, shows that the Gulf Stream is subject to large meanders about its average course. The development of these features may be traced over weeks or months. Knowledge of the latest detailed position of the Gulf Stream can be used to advantage by the mariner. Another example of an important variation from the normal, this time on a longer time scale, occurs off the coast of Peru when the normal Peru Current with its associated upwelling and abundance of marine life is displaced by the El Niño (Holy Child) Current. During a year with such an intrusion the fishing of anchovies is drastically affected.

Clearly there is a continuing need for observations of ocean currents—the more that become available the more useful will be the deductions that can be made. More-frequent observations from ships on passage will help a great deal but also the organization is needed to ensure that all observations become available for analysis. Individual nations collect the observations made by their ships and in the past there has been some exchange of data between nations, but only to a limited extent. Now, however, under a scheme of the World Meteorological Organization (WMO) the member nations will pool their observations; the Meteorological Office of the United Kingdom has been designated to collect these and form them into a common archive. The existence of the resulting large body of data will greatly facilitate work on ocean currents.

Conclusions

There is at present an opportunity for increased and more-accurate observations of currents to build up archives that will be far more extensive than those of the past. The interest, judgement and enthusiasm of observers will be an important factor in developing this work. The increased knowledge of ocean currents can be of considerable benefit to the mariner and to marine science.

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PRESENTATION OF BAROGRAPH

On 23 May Captain E. T. Rowland, Peninsula and Oriental Steam Navigation Company, visited the Meteorological Office Headquarters to receive the fourth and last 1977 Long-Service award of an inscribed Barograph from Dr B. J. Mason, Director-General of the Meteorological Office. An announcement of this Award appeared in the January edition of this publication.

On presenting the Award Dr Mason showed some of the most recent satellite photographs received but explained the continuing need for meteorological observations from ocean areas made by ships' officers and expressed his sincere thanks to Captain Rowland for his very valuable contributions over the years.

We were pleased that Captain E. R. Hayton, who had recently taken up a new shore appointment with P. & O., could accompany Captain Rowland. After the presentation both took luncheon with the Marine Superintendent of the Meteorological Office and other marine staff. During the afternoon they had a conducted tour of the Telecommunications Centre, Computer Laboratory and Central Forecasting Office.

A photograph taken at the presentation is reproduced opposite page 209.

G. A. W.

INDIAN EXCELLENT AWARDS

(From the Deputy Director-General of Observatories (Forecasting), India)

During the year 1976–77 there has been active and continuous co-operation between the India Meteorological Department and the ships of the Indian Voluntary Observing Fleet (IVOF) in the collection of meteorological information from the high seas and this is much appreciated; we look forward to even more co-operation in the future. It is becoming increasingly realized that the ocean and the atmosphere should be observed and studied together because they continually affect each other in a number of important ways. A large amount of valuable meteorological and oceanographical data have been collected during the Monsoon Experiment (MONEX) of May/July 1977 by the participating Russian and Indian naval ships for detailed study and better understanding of the Indian Monsoon. More than 100 ships of the IVOF have also contributed towards this endeavour by supplying meteorological logbooks containing data of great importance to the Experiment.

During the year 12 new ships were added to the strength of the IVOF and 4 ships were decommissioned. At the end of the year there were 281 ships on the Fleet List which included 45 Selected, 204 Supplementary and 32 Auxiliary ships. These ships rendered commendable service by recording and reporting valuable meteorological observations during their voyages. The meteorological logbooks received from these ships during the year contained 14 082 observations.

It is essential that observations made by ships are transmitted as expeditously as possible to the nearest coastal radio stations to facilitate their reception on a real-time basis at the forecasting offices. Special encouragement is given to the ships which send vital observations, particularly when a depression or tropical storm is in its formative stage or when it is intensifying into a severe tropical storm. Due recognition is also given to ships which transmit important and very urgent observations even though they do not belong to the IVOF.

The meteorological work of the ships of the IVOF during 1976–77 has been assessed taking into account the quality and quantity of observations and also the percentage of recorded observations which have actually been transmitted to coastal radio stations. Allowance has also been made in many cases to individual ships for the actual number of days spent at sea. The number of ships selected to receive Excellent Awards in the form of books is 15 this year while another 10 ships will receive Certificates of Merit. Special awards have also been offered to the master and officers of the *Jagat Swamini* who sent valuable observations at great personal risk when the vessel passed through the eye of the recent Cyclone 'Andhra'.

The names of the ships to receive Excellent Awards are as follows:

NAME OF SHIP	OWNER
Satyamurthy	Shipping Corporation of India Ltd.
Andamans	Shipping Corporation of India Ltd.
Chidambaram	Shipping Corporation of India Ltd.
State of Himachal Pradesh	Shipping Corporation of India Ltd.
Vishva Kalyan..	Shipping Corporation of India Ltd.
State of Gujarat	Shipping Corporation of India Ltd.
State of Meghalaya	Shipping Corporation of India Ltd.
Jalagopal	Scindia Steam Navigation Co. Ltd.
Jaladuta	Scindia Steam Navigation Co. Ltd.
Jalaveera	Scindia Steam Navigation Co. Ltd.
Jalajyoti	Scindia Steam Navigation Co. Ltd.
Jalaganga	Scindia Steam Navigation Co. Ltd.
Lok Palak	Mogul Line Ltd.
Indian Strength	India Steamship Co.
Daman	Damodar Bulk Carriers

Certificates of Merit have been awarded to the following ships:

Vishva Pratibha	*Vishva Siddhi*
Sarojini Nzidu	*Jaladharati*
Vishva Dharma	*Jalakendra*
Vivekananda	*Dwarka*
Bhaskar	*Indian Reliance*

A Special Award has been made to:

Jagat Swamini — Dempo Steamship Co. Ltd.

AURORA NOTES FOR 1977

BY R. J. LIVESEY

(Co-ordinator of Auroral Observing, the Solar Section of the British Astronomical Association)

Observations of auroral activity have been received from the weather ships in the North Atlantic and from members of the Voluntary Observing Fleet; details are given in the table below. The information is passed to the British Astronomical Association (BAA) who co-ordinate amateur observing of auroral activity and compare the marine-observed data with that from land observatories. The collected data is then made available to professional and amateur research teams such as Universities and the Radio Society of Great Britain. Studies include comparison of aurora with fluctuations in the earth's magnetic field and with the intensity of the layers in the ionosphere affecting radio communications. Although the Balfour

Stewart Auroral Laboratory at Edinburgh has closed its doors there is still a need for auroral observations and the BAA will continue to organize a service to provide them. Further reports from mariners are always welcome, especially as the sun has now entered a new cycle and all signs are that it will be an active one.

On 11–12 January 1977 activity seen by the *Ross Castle* and the *Weather Reporter* was also seen in south Scotland. On 30–31 January the Aurora Australis detected by the *Flinders Bay* correlated with the Aurora Borealis observed in central Scotland. The RRS *Shackleton* saw activity leading to an overhead corona which was part of the same storm seen over the edge of the horizon, as it were, in Scotland and Finland, while on 18–19 October the *Admiral FitzRoy* reported active rays and bands, part of a storm widely seen in Finland. On 20–21 September the *Sugar Trader* reported a spiral ray, rather like a whirlpool, seen west of the Faroes.

The value of having many observers widely spread is that some may observe activity while others are closed out with cloud. Miss C. Botley, an astute peruser of astronomical literature, drew attention to an entry in the *Yorkshire Evening Post* stating that on the night of 13–14 October brilliant aurora was seen from Flamborough Head northwards. At Seaham it was alleged that the coastguards had called out the lifeboat in the belief that a ship was in distress. No regular aurora observer has confirmed this apparition on that night, but the date is followed by a confirmed observation while the Seaham incident ties in with the 27-day recurrence period of aurora experienced before and after the event in September and November.

Several recurrence periods for aurora have been noted, two of which included marine observations. The first began on 23, 24 and 26 October 1976 followed by 20 November, 17, 18 and 19 December, 10–15 January 1977, 11 February, 8 and 9 March, 6–8 April and 12 May. The second began on 24 August 1977, continued to 19–22 September, 18 and 19 October, 13 and 14 November and finished on 11 December. Storms were not generally brilliant and very active when seen in the south but more spectacular in more northerly geomagnetic latitudes. These more frequently originated in longer lived magnetic 'M' regions in the sun's corona and tended to be quiet events caused by the outpouring of a stream of ionized particles from these regions. As the sunspot cycle develops more explosive outbursts from sudden flare events above sunspots are to be expected showing less tendency to recurrence periods but greater activity which will push the auroral events further to the south when they occur.

Grateful acknowledgement is made to the work of the marine observers who have taken the time to record and send in their observations. There is always a place for their contribution. Best wishes for your future voyages and for good observing.

Date 1977	Ship	Geographic Position		Time (GMT)	Storm Peak (GMT)	Forms
10 Jan. ..	*Weather Reporter* ..	56° 58'N	20° 03'W ..	2150–0048 ..		QN
12 ..	*Ross Castle*	70° 00'N	17° 00'E ..	0100–0300 ..		QA, QRB, QG
12 ..	*Weather Reporter* ..	56° 55'N	20° 00'W ..	0050		QA
13 ..	*Weather Reporter* ..	56° 55'N	20° 03'W ..	2145–0145 ..		QG
14 ..	*Weather Reporter* ..	55° 56'N	20° 28'W ..	0510		QG
15 ..	*Weather Reporter* ..	56° 54'N	20° 22'W ..	2140–0140 ..	2315	QP, QG, QVB, QB
16 ..	*Weather Reporter* ..	57° 00'N	20° 25'W ..	2215–0340 ..		QG
30 ..	*Weather Reporter* ..	56° 39'N	17° 11'W ..	1950–2005 ..		QRA, QRB
30 ..	*Flinders Bay*	49° 00'S	106° 00'E ..	1415–1528 ..	1432	QG, AmRB, C, P QRB
13 Feb. ..	*Weather Surveyor* ..	56° 06'N	20° 49'W ..	0250		QG
14 ..	*Weather Surveyor* ..	50° 05'N	20° 44'W ..	2145–2345 ..		QRB
15 ..	*Weather Surveyor* ..	57° 15'N	20° 03'W ..	0245–0345 ..		QG
16 ..	*Weather Surveyor* ..	57° 14'N	19° 53'W ..	2145		QG
17 ..	*Weather Surveyor* ..	57° 17'N	20° 25'W ..	2150–0345 ..	2325	QG, PB
9 Mar. ..	*Shackleton*	61° 00'N	07° 00'W ..	2115–2200 ..	2140	C, QRA, CR, QRP
6 Apr. ..	*Weather Surveyor* ..	56° 34'N	19° 59'W ..	2144–2345 ..	2144	ARB
19 Aug. ..	*Manchester Courage* ..	55° 06'N	40° 00'W ..	0000–0300 ..		ARG
2 Sep. ..	*Manchester Challenge* ..	52° 04'N	54° 27'W ..	0000–0050 ..		HB, RB
17 ..	*Manchester Courage* ..	51° 30'N	56° 00'W ..	0100–0230 ..		RG
19 ..	*Manchester Courage* ..	52° 00'N	31° 10'W ..	2255–0010 ..		G, AmRA, G, P
21 ..	*London Earl*	57° 29'N	32° 55'W ..	0020–0050 ..		HA, Ry
21 ..	*Sugar Trader*	59° 44'N	09° 10'W ..	0200		AmRA, SpR
1 Oct. ..	*Lackenby*	68° 25'N	17° 00'E ..	2200–2300 ..		QR
6 ..	*Pole Star*	60° 24'N	01° 54'W ..	2110–2220 ..		MRA, QG, AmMRA
10 ..	*Fernie*	20° 00'S	06° 31'E ..	2030–2300 ..		QG, QS
13 ..	*Coastguard Seaham* ..	54° 50'N	01° 20'W ..	—		Pi
15 ..	*Admiral FitzRoy* ..	57° 16'N	20° 39'W ..	0145–0300 ..		QN
18 ..	*Admiral FitzRoy* ..	57° 10'N	20° 25'W ..	2312–0445 ..		QS
19 ..	*Admiral FitzRoy* ..	57° 14'N	20° 20'W ..	2135		HA
4 Dec. ..	*Tourmaline*	57° 40'N	06° 15'W ..	1900–2150 ..	2150	QG, PuRB

KEY: A=arc, Am=actively moving, B=band, C=corona, F=flaming, G=glow, H=homogeneous, M=multiple, N=unspecified, P=patch, Pi=patch of light form indefinite, Pu=pulsating, Q=quiet, R=rayed, Ry=ray, S=surfaces, Sp=spiral, V=veiled.

Marine Aurora Observations for 1977

ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM APRIL TO JUNE 1978

The charts on pages 208 to 210 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: 1966–75 (Meteorological Office). Surface pressure: 1951–70 (Meteorological Office). Air temperature: 1951–60 (US Department of Commerce, 1965). Sea-surface temperature: area north of 68°N, 1854–1914 and 1920–50 (Meteorological Office, 1966), area south of 68°N, 1854–1958 (US Navy, 1967).

April

To a large extent pressure anomalies were reversed from those of March; in particular the pressure near Iceland was well above normal during April. Anomalous north-easterly winds gave unusually cold weather over the Barents Sea where ice was well in excess by the end of the month. Over north-east Canada and the Davis Strait air temperatures were lower than normal, though less so than during March; some excesses of ice developed in the Davis Strait and near Newfoundland and south-west Greenland.

May

There were no large anomalies of pressure or temperature. The anomalies in ice coverage largely resulted from persistence with excess in particular in the Barents Sea and deficit south-east of Greenland. Ice melted rather ahead of normal in Hudson Bay, Hudson Strait and the Foxe Basin.

June

Again anomalies of pressure and air temperature were not pronounced. A tendency for off-shore winds extended the ice east of normal off Labrador and in the Davis Strait. The break-up of ice continued generally ahead of normal in Hudson Bay, Foxe Basin and south of Baffin Island. Excesses of ice persisted in the Barents Sea and deficits east of Greenland.

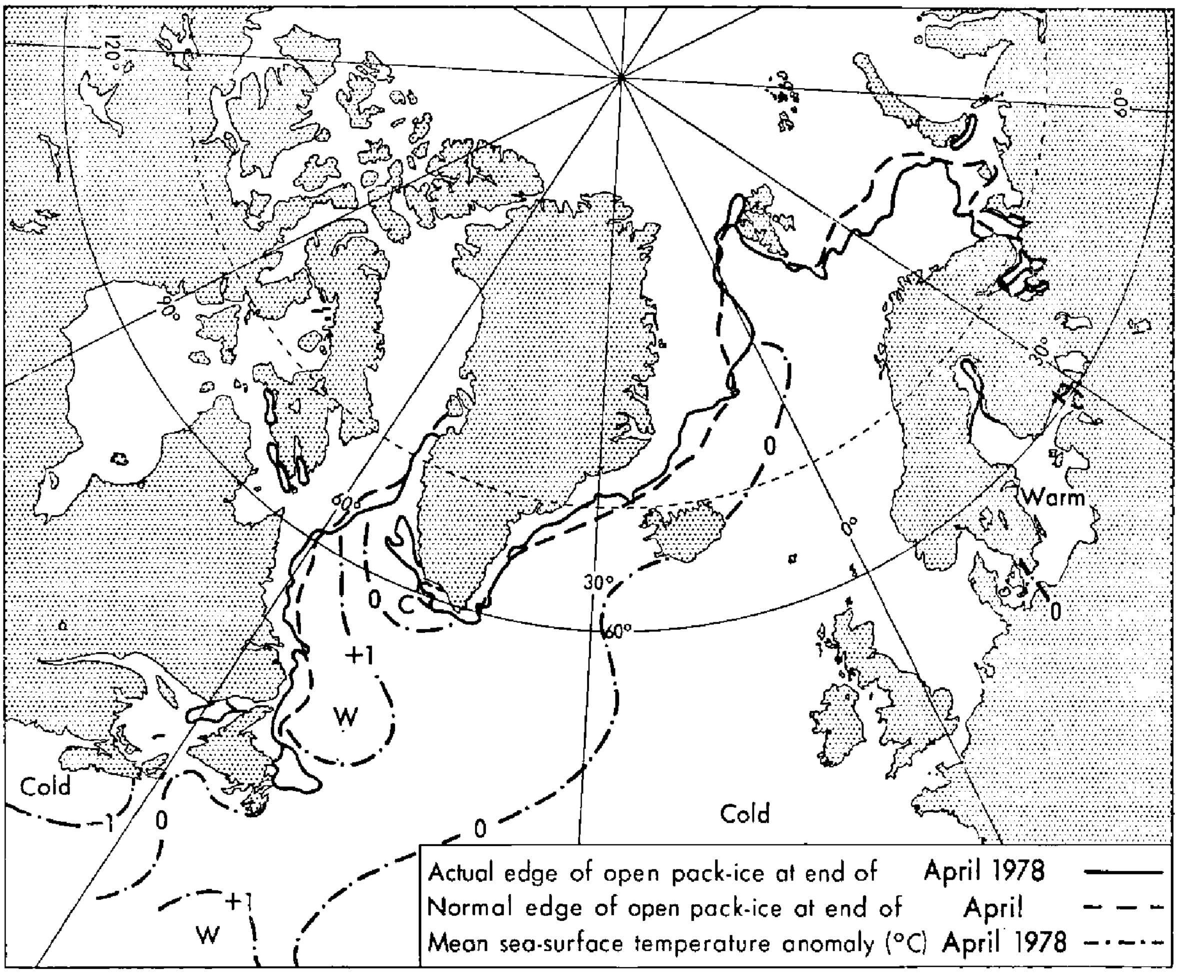
References

Meteorological Office, London — 1966 — Monthly meteorological charts and sea surface current charts of the Greenland and Barents Seas.

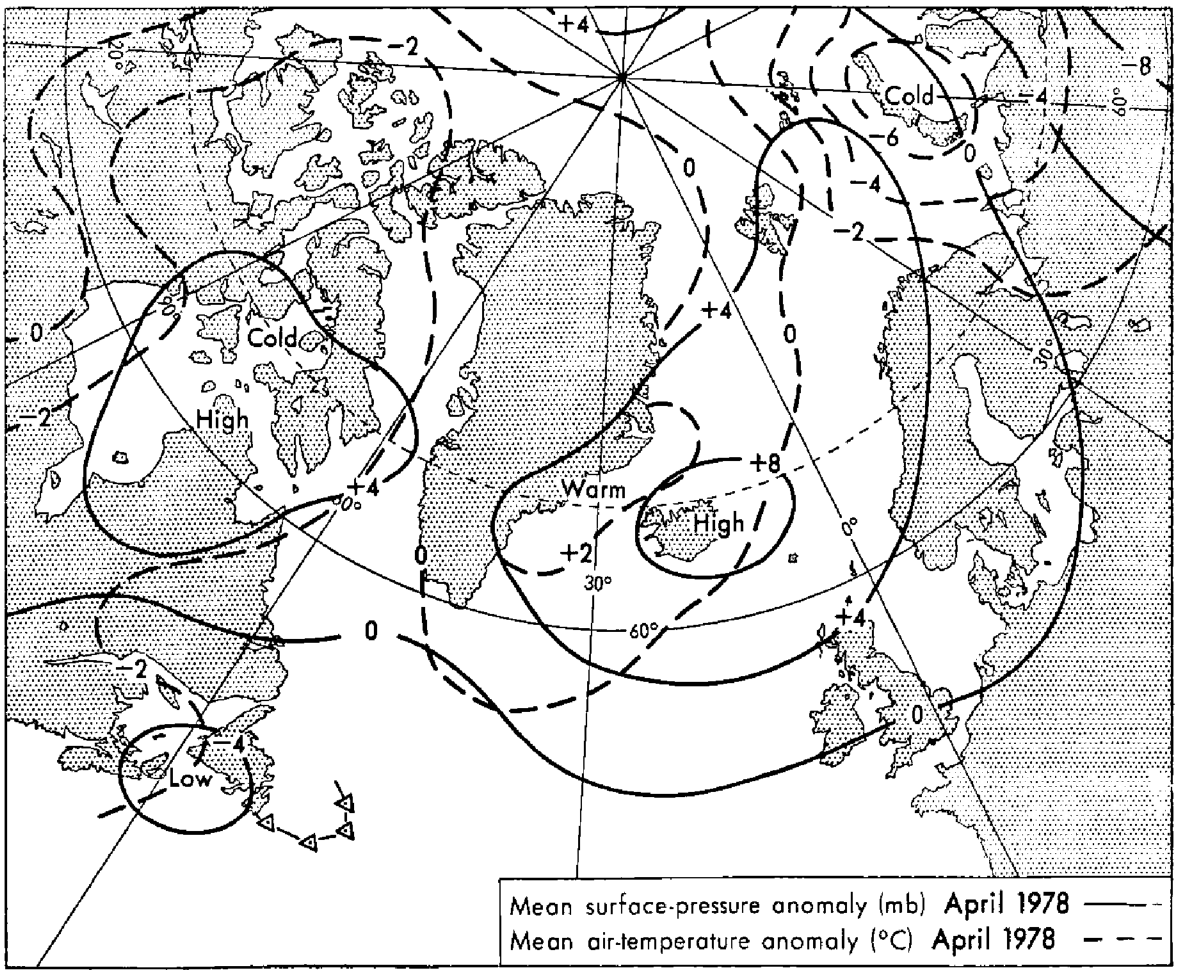
— — Sea ice normals (unpublished) and various publications.

U.S. Department of Commerce Weather Bureau, Washington, D.C. — 1965 — World weather records, 1951–60. North America.

U.S. Naval Oceanographic Office, Washington, D.C. — 1967 — Oceanographic atlas of the North Atlantic Ocean, Section II: Physical properties.



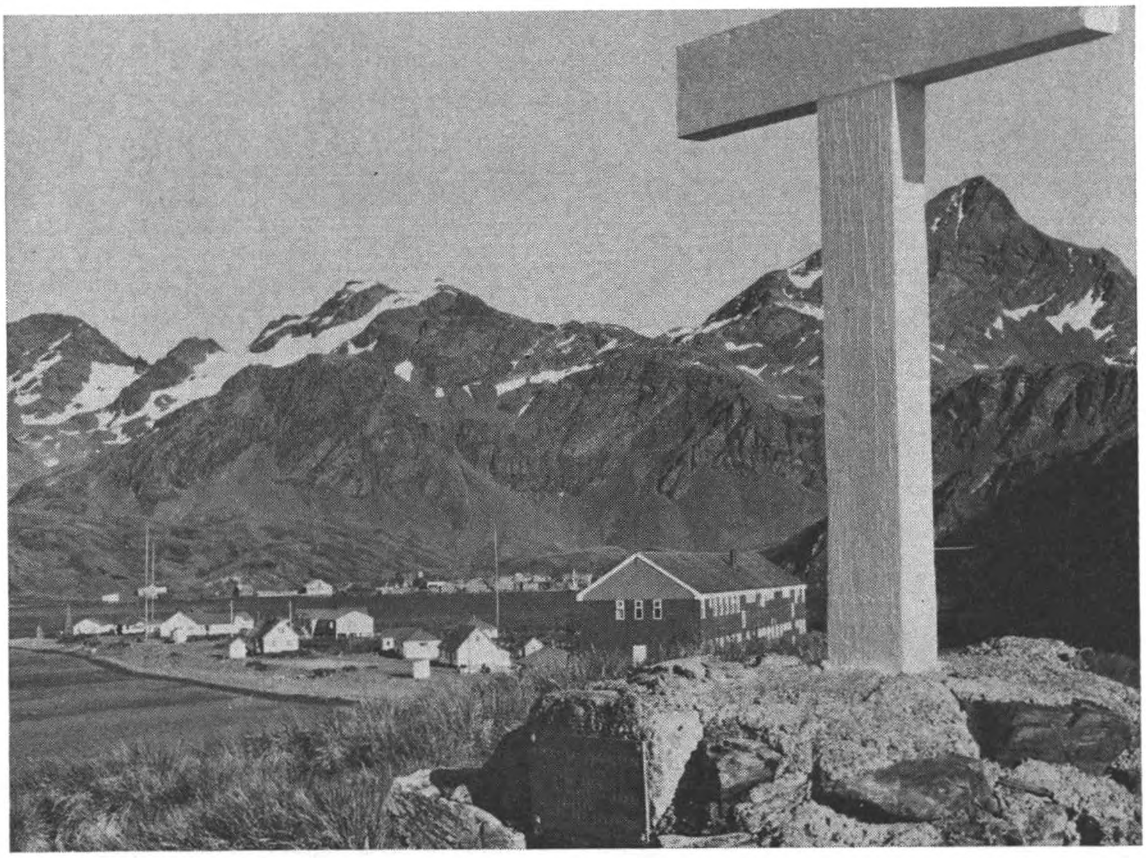
120°
60°
30°
0°
Warm
0
C
+1
W
Cold
-1
Actual edge of open pack-ice at end of April 1978
Normal edge of open pack-ice at end of April
Mean sea-surface temperature anomaly (°C) April 1978



+4
-2
Cold
-8
-4
-6
0
-2
Cold
High
+4
Warm
+8
High
+2
-2
-4
Low
Mean surface-pressure anomaly (mb) April 1978
Mean air-temperature anomaly (°C) April 1978

(*Opposite page* 208)

Sunset at Halley Bay at the end of three-months' continuous summer daylight

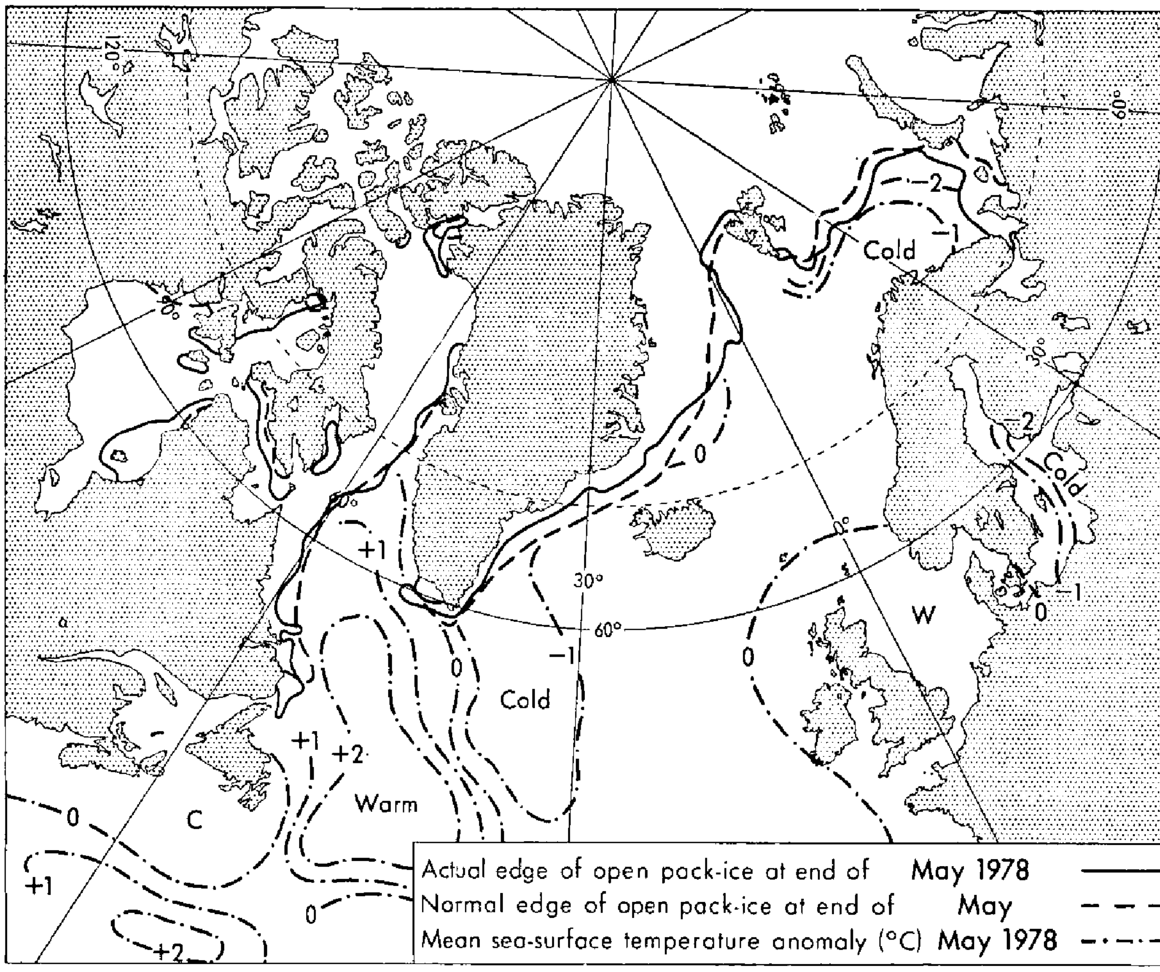


The base at King Edward Point, South Georgia. The memorial in the foreground is to Sir Ernest Shackleton

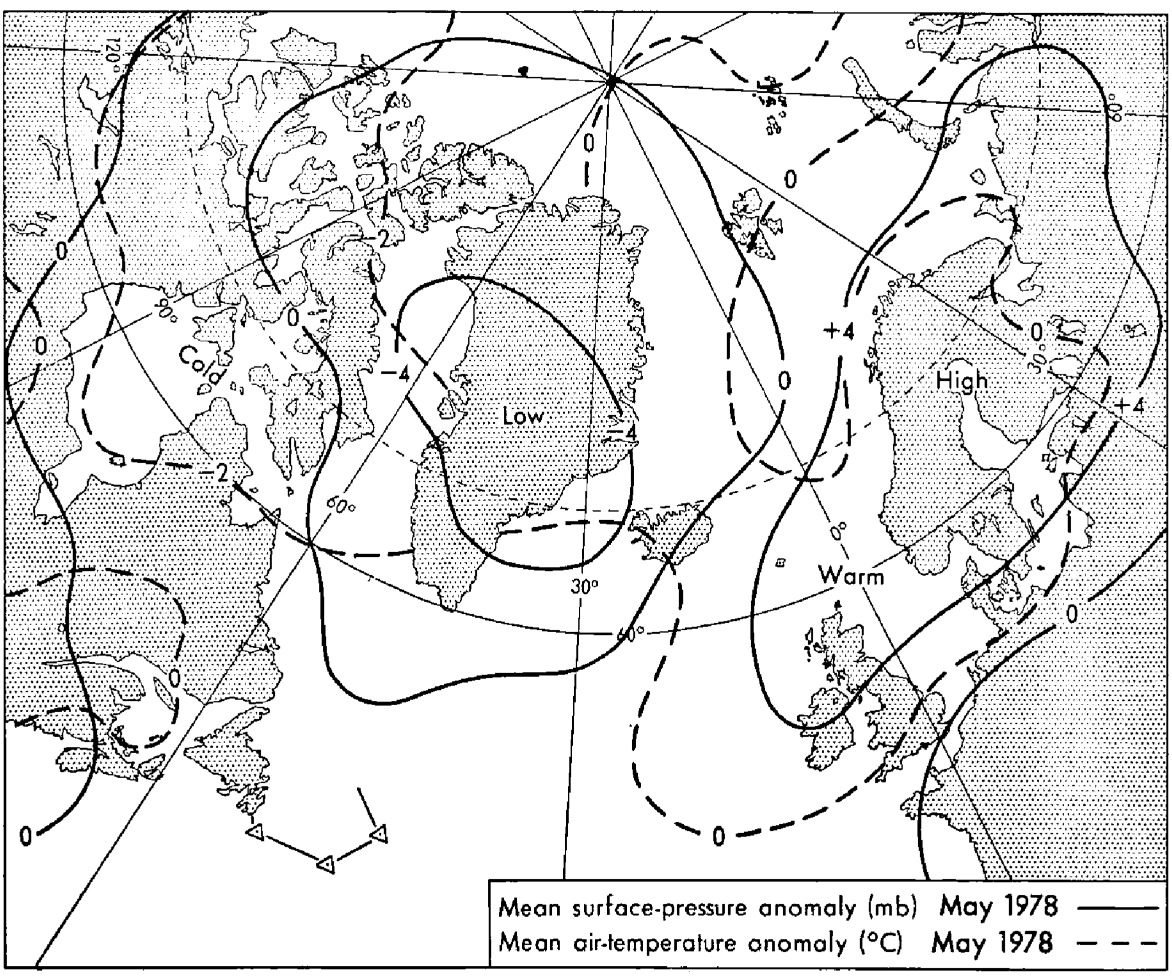
(*see* page 188)

(*Opposite page* 209)

Presentation of Barograph on 23 May 1978 at Bracknell; left to right: Captain E. T. Rowland, Dr B. J. Mason (*see* page 203)

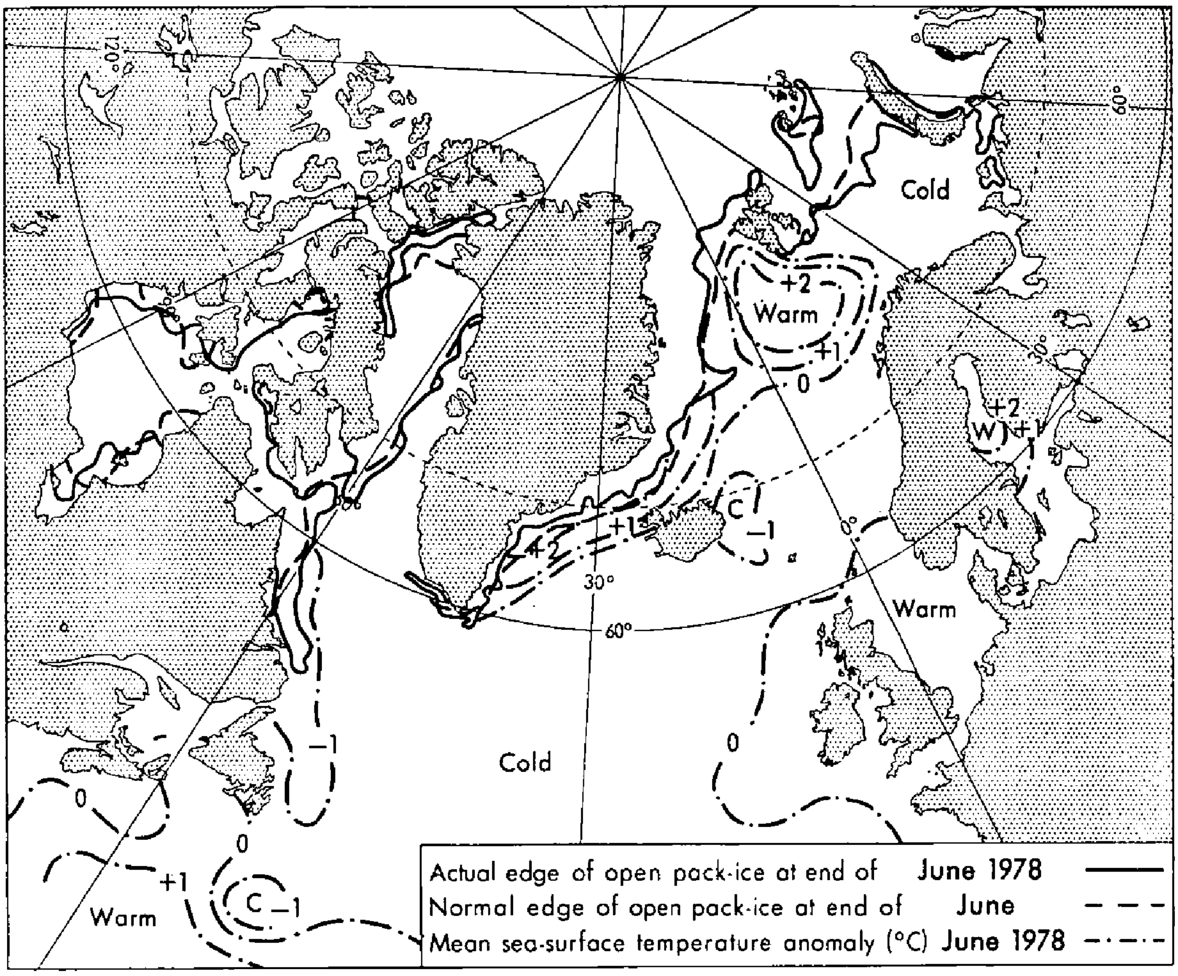


Cold
Cold
Cold
Warm
C
W
Actual edge of open pack-ice at end of May 1978
Normal edge of open pack-ice at end of May
Mean sea-surface temperature anomaly (°C) May 1978

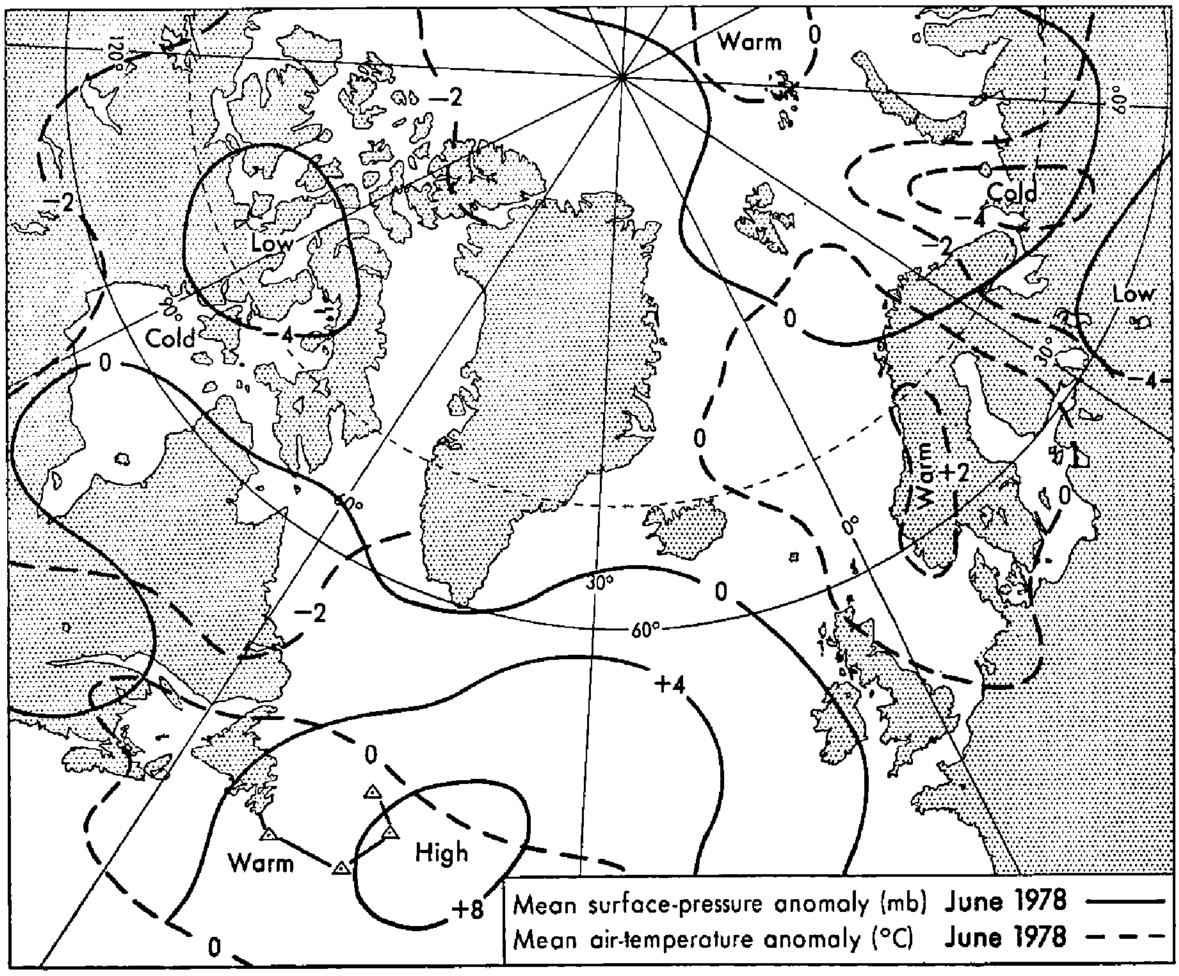


Low
High
Cold
Warm
Mean surface-pressure anomaly (mb) May 1978
Mean air-temperature anomaly (°C) May 1978

C



Cold
+2
Warm
+1
0
+2
W
+1
C
-1
0°
30°
60°
Warm
-1
Cold
0
0
+1
Warm
C -1
Actual edge of open pack-ice at end of June 1978
Normal edge of open pack-ice at end of June
Mean sea-surface temperature anomaly (°C) June 1978



Warm
0
-2
-2
Low
Cold
-4
0
Cold
-4
-2
0
Low
-4
0
Warm
+2
0
30°
0
60°
-2
+4
0
Warm
High
+8
0
Mean surface-pressure anomaly (mb) June 1978
Mean air-temperature anomaly (°C) June 1978

Baltic Ice Summary: April-June 1978

No ice was reported at the following stations during the period: Riga, Ventspils, Mantyluoto, Kalmar, Visby, Emden, Lübeck, Hamburg, Bremerhaven, Kiel, Flensburg, Stettin, Gdansk, Stralsund, Rostock, Aarhus, Copenhagen, Oslo, Kristiansundfjord.

Station	April									May									June								
	Length of Season		Ice Days			Navigation Conditions			Accumulated Degree Days	Length of Season		Ice Days			Navigation Conditions			Accumulated Degree Days	Length of Season		Ice Days			Navigation Conditions			Accumulated Degree Days
	A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I
Leningrad ..	1	28	20	1	19	8	12	0	861	1	8	8	0	8	8	0	0	537	0	0	0	0	0	0	0	0	112
Pyarnu ..	1	22	18	15	3	0	0	18	—	0	0	0	0	0	0	0	0	—	0	0	0	0	0	0	0	0	—
Viborg ..	1	30	30	30	0	0	30	0	—	1	3	3	3	0	0	3	0	—	0	0	0	0	0	0	0	0	—
Klaipeda ..	1	2	2	0	2	2	0	0	—	0	0	0	0	0	0	0	0	—	0	0	0	0	0	0	0	0	—
Tallin ..	1	26	23	0	23	10	11	0	—	0	0	0	0	0	0	0	0	—	0	0	0	0	0	0	0	0	—
Helsinki ..	1	25	24	7	17	0	22	0	648	0	0	0	0	0	0	0	0	322	0	0	0	0	0	0	0	0	—
Mariehamn..	1	15	15	0	15	15	0	0	285	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	—
Turku ..	1	20	20	17	3	0	20	0	579	0	0	0	0	0	0	0	0	260	0	0	0	0	0	0	0	0	—
Vaasa ..	1	30	30	23	7	0	30	0	805	1	5	5	0	5	0	6	0	533	0	0	0	0	0	0	0	0	120
Oulu ..	1	30	30	30	0	0	30	0	1183	1	17	17	17	0	0	21	0	885	0	0	0	0	0	0	0	0	484
Roytaa ..	1	16	16	0	16	0	30	0	—	14	24	4	0	4	0	17	0	—	0	0	0	0	0	0	0	0	—
Lulea ..	1	30	30	30	0	0	30	0	1186	1	19	19	14	5	4	10	4	949	0	0	0	0	0	0	0	0	566
Bredskar ..	1	25	25	0	17	12	12	0	—	0	0	0	0	0	0	0	0	—	0	0	0	0	0	0	0	0	—
Sundsvall ..	1	30	30	27	3	21	9	0	—	1	7	7	0	7	7	0	0	—	0	0	0	0	0	0	0	0	—
Stockholm ..	1	25	25	6	19	25	0	0	202	0	0	0	0	0	0	0	0	—	0	0	0	0	0	0	0	0	—
Skelleftea ..	1	30	30	13	17	0	30	0	—	1	14	11	4	7	0	14	0	—	0	0	0	0	0	0	0	0	—
Göteborg ..	0	0	0	0	0	0	0	0	37	0	0	0	0	0	0	0	0	—	0	0	0	0	0	0	0	0	—

CODE

A First day ice reported.
B Last day ice reported.
C No. of days when ice was reported.
D No. of days continuous land-fast ice.
E No. of days of pack ice.
F No. of days dangerous to navigation, but assistance not required.
G No. of days assistance required.
H No. of days closed to navigation.
I Accumulated degree-days of air temperature (°C) where known.*

* These figures give a rough measure of the first probability of the formation of sea ice, and later the progress of the growth and its thickness. They are derived from daily averages of temperature (00+06+12+18 GMT) and are the sum of the number of the degrees Celsius below zero experienced each day during the period of sustained frost.

Book Review

Comecon Merchant Ships, by Ambrose Greenway. 260 mm×185 mm, pp. 144, including 246 photographs. Kenneth Mason Publications Ltd, 13–14 Homewell, Havant, Hampshire. Price £6·00.

This comprehensive illustrated guide to the ships of Communist countries other than Russia is complementary to the original title in this series—*Soviet Merchant Ships*—reviewed in the July 1977 edition of this journal.

The book presents an up-to-date record of the merchant ships of Bulgaria, Czechoslovakia, East Germany, Hungary, Poland and Romania. Albania, although no longer a member of Comecon, has also been included to cover all European state-owned communist shipping but Yugoslavia has been omitted as being considered beyond the scope of the work.

The book contains a large number of photographs depicting a representative of each type or class of vessel. It follows the same format as that of its companion book insofar as the ships are grouped according to type and listed in descending order of size, with newly built ships preceding second-hand tonnage. Countries have not been dealt with separately as, according to the author, to do so would not give any indication of the total tonnage of shipping available within Comecon and would also entail extensive cross-referencing. The captions to the photographs contain information which includes the builders, dates of delivery, tonnage, main dimensions, engines and other-known details. The book is supported by a comprehensive index of each ship mentioned and the country to which it belongs.

As is its companion volume, the book is in loose-leaf form contained within a file-type binding thereby allowing supplementary information to be inserted. An application form in the book may be completed by the purchaser to receive this further supplementary information as and when it becomes available.

Much of the information contained in the book has been drawn from Lloyd's Register and other technical publications; it should thus provide a useful reference and recognition manual for those interested in Comecon merchant shipping.

C. R. D.

Personalities

OBITUARY.—It is with very great regret that we record the sudden death of MR H. M. KEENAN, Port Meteorological Officer in Glasgow, on 8 July 1978.

Henry Mathieson Keenan—Harry to his many friends both ashore and afloat—was born in Glasgow in 1927 the son of a school headmaster and educated at Skerrys College. He received his pre-sea training at the Royal Technical College in Glasgow and, in 1943, was indentured to H. Hogarth and Sons.

After obtaining his 2nd Mate's Certificate, Mr Keenan joined Anchor Line and was appointed 3rd Officer of the *Egidia*. He remained with this Company until 1962, serving in many of their vessels and attaining the rank of Chief Officer.

From 1962 to 1969, Mr Keenan served in the coastal trade chiefly between Scotland and Ireland in various ships before joining the Ocean Weather Service of the Meteorological Office as 3rd Officer in April 1969. He was promoted to established 2nd Officer of the Service in December 1969 and thereafter sailed frequently as Acting Chief Officer.

In March 1972, Mr Keenan was appointed Port Meteorological Officer in Glasgow where he remained until his tragic death. He will be remembered, not only in the Meteorological Office but also widely within Scottish shipping circles for his keen sense of humour, his unstinting willingness and his conscientious devotion to his many duties. He will be sadly missed by his colleagues in the Marine Division.

We extend our most sincere condolences to his widow and son in their sad loss.

OBITUARY.—It is with great regret that we have to record the sad death of CAPTAIN J. BELL on 24 April 1978.

Captain Bell joined Manchester Liners Ltd, as 2nd Officer, in December 1959 and was appointed to the *Manchester Port*. He was promoted to Master in December 1974 in command of the *Manchester Quest*. Since then he had commanded vessels on the Far East, Pacific, Atlantic and Mediterranean trades. He was a Yorkshireman with a great sense of humour and popular with his colleagues both ashore and at sea.

Captain Bell sent us his first meteorological logbook from the *Manchester Port* in 1960. Thereafter, we received a further 21 logbooks bearing his name.

We extend our sincere condolences to his wife and daughter.

OBITUARY.—We regret to have to record the death, after a short illness of CAPTAIN M. FORSTER, Marine Superintendent of Cunard Brocklebank Ltd on 27 April 1978.

After training in HMS *Conway*, Michael Forster joined Shaw Savill and Albion Company where he served in ships on the Australasian trade until joining Cunard Steamship Company in 1940 as a junior officer. Following service in the passenger fleet he was appointed to command in the North Atlantic cargo service before coming ashore as Assistant Marine Superintendent in London in 1958. With the onset of containerization, Michael Forster was transferred to the Atlantic Container Line as Operations Manager, being responsible for the setting up and operation of the terminals at Liverpool and Greenock.

In 1973 he was transferred back to London as Deputy Marine Superintendent and took over the position of Marine Superintendent of Cunard Brocklebank a year before his tragic death which occurred little more than a year before he was due to retire. He was held in the highest esteem by his colleagues and by the sea-going staff.

We received meteorological logbooks bearing Captain Forster's name from the *Franconia* during 1945–46 and from the *Assyria* in 1951 and 1959. In his various shore appointments he rendered the Meteorological Office much valuable assistance in connection with the voluntary observing ships of Cunard Brocklebank.

We extend our deepest sympathy to his widow and family.

OBITUARY.—It is with much regret that we record the sudden tragic death of CAPTAIN D. HINE on 6 June 1978 in a New Jersey hospital after suffering a stroke on board his vessel the *Dart America*, whilst in New York.

Douglas Hine served as a junior officer with Anglo-Saxon Petroleum Company before joining Bibby Line in 1946 as 3rd Officer. After progressing through the various ranks, he was promoted to command in 1965. Thereafter, he commanded general cargo vessels, car/bulk carriers and, since 1974, the 'Dart' container vessels on the North Atlantic trade.

A native of Wallasey, Captain Hine had lived for several years at Trenddyn, near Mold, in North Wales. He leaves a widow, a son and two daughters.

Captain Hine sent us his first meteorological logbook from the *Devonshire* in 1946. Since then we received a further 31 logbooks bearing his name of which 12 were classified as Excellent. He received Excellent Awards in 1948 and 1976.

We extend our deep sympathy to his wife and family.

OBITUARY.—It is with regret that we have to record the sudden death of MR F. KIRK, Radio Officer, in hospital whilst on sick leave on 20 April 1978.

Francis Kirk joined the sea staff of Marconi International Marine Company in 1954 and served continuously with this Company until his untimely death. During his service he was Radio Officer aboard the Shaw Savill and Albion Company's *Aramaic* from 1963 to 1968 and served thereafter in various vessels owned by Texaco Overseas Tankship Company, the last being the *Texaco Brussels*.

We received the first meteorological logbook bearing Mr Kirk's name from the *British Bugler* in 1956 and, since then, a further 11 books of which no less than 10 were classified as Excellent.

We extend our sincere condolences to his family.

RETIREMENT.—CAPTAIN R. K. C. THOMAS retired from the sea on 31 May 1978.

Captain Thomas was educated at Friars School, Bangor and first went to sea in December 1934 when he joined the *Loriga* owned by the Pacific Steam Navigation Company.

He remained with P.S.N.C. for the whole of his career, obtaining his Master's Certificate in October 1944 and being promoted to command of the *Walsingham* in May 1956.

During most of World War II he served in the troop-ship *Orduna* where, in addition to his watch-keeping duties, he was Gunnery Officer in charge of some 30 servicemen.

Captain Thomas sent us his first meteorological logbook from the *Santander* in 1946. Since then we have received a further 34 logbooks bearing his name.

We wish him a long and happy retirement.

RETIREMENT.—CAPTAIN G. T. ROBINSON retired on 1 August 1978 after serving 40 years at sea.

Captain Robinson received his pre-sea training in HMS *Conway*, and in 1938 was indentured as Apprentice to A. Holt and Company, his first ship being s.s. *Eumaeus*. Whilst serving in m.v. *Alcinous* in the late summer of 1940, the ship was torpedoed but was able to return to Glasgow unaided.

On obtaining his 2nd Mate's Certificate in 1942, Captain Robinson served in Bank Line and Shell Tankers Ltd, before joining Cable and Wireless Ltd in 1944 with whom he remained until his retirement.

Captain Robinson obtained his Master's Certificate in 1947 and was promoted to command of the cable-ship *Lady Denison-Pender* in September 1958. Thereafter, he commanded the cable-ships *Retriever*, *Edward Wilshaw*, *Mirror*, *Stanley Angwin*, *Cable Enterprise*, *Sentinel* and *Mercury*. During his service with Cable and Wireless, Captain Robinson assisted in laying some of the world's longest and highest capacity submarine cables including CANTAT 2 between the UK and Canada and COLUMBUS between the Canary Islands and Venezuela.

Captain Robinson sent us his first meteorological logbook from the *Lady Denison-Pender* in 1960. Since then we have received a further six logbooks from him of which four were classed as Excellent.

We wish him a long, healthy and happy retirement.

Notices to Marine Observers

WEATHER BULLETINS AND GALE WARNINGS FOR SHIPPING BROADCAST ON BBC RADIO

As and from 23 November 1978 the weather bulletins and gale warnings for UK coastal waters presently broadcast on BBC Radio 2 will, from that date, form part of BBC Radio 4 broadcasts although they will continue to be transmitted on 200 kHz (1500 metres).

It has been arranged for the weather bulletins to be broadcast at the following times throughout the week as and from 23 November:

0015–0020	All clock time
0625–0630	
1355–1400	
1750–1755	

Gale warnings will be broadcast at program junctures and also in the hourly news bulletins from 0700 to 1900 daily.

It is anticipated that there will be no changes to the Inshore forecasts broadcast on Radios 3 and 4.

Details of precise times and frequencies will be published in *Radio Times*.

ICE CODE GROUP

Marine Observers are reminded that the new Ice Group—ICE $c_iS_ib_iD_iz_i$—comes into force at 0000 GMT on 1 January 1979 (*see* page 29 of Ships' Code and Decode Book, 9th edition in green cover).

NAUTICAL OFFICERS OF THE MARINE DIVISION OF THE METEOROLOGICAL OFFICE, GREAT BRITAIN

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Captain G. V. Mackie, Deputy Marine Superintendent. (Telephone: 0344 20242, Ext. 2543)
Mr J. D. Brown, Nautical Officer. (Telephone: 0344 20242, Ext. 2461)
Captain C. R. Downes, Nautical Officer. (Telephone: 0344 20242, Ext. 2738)
Mersey.—Mr W. G. Cullen, Master Mariner, Port Meteorlogical Officer, Room 709, Royal Liver Building, Liverpool L3 1HN. (Telephone: 051–236 6565)
Thames.—Captain R. C. Cameron, Port Meteorological Officer, Movement Control Building, South Side, Victoria Dock, London E16 1AS. (Telephone: 01–476 3931)
Bristol Channel.—Captain J. H. Jones, Port Meteorological Officer, 33, The Hayes, Cardiff CF1 6NU. (Telephone: 0222 21423)
Humber.—Captain D. H. Rutherford, Port Meteorological Officer, c/o Dept. of Trade, Posterngate, Hull HU1 2JN. (Telephone: 0482 223066, Ext. 26)
Clyde.—(To be appointed) Port Meteorological Officer, 118, Waterloo Street, Glasgow G2 7DN. (Telephone: 041–248 4379)
Forth.—All enquiries to Glasgow above.
Southampton.—Captain D. R. McWhan, Port Meteorological Officer, Southampton Weather Centre, 160 High Street below Bar, Southampton SO1 0BT. (Telephone: 0703 20632)
Tyne.—Mr D. J. F. Southon, Master Mariner, Port Meteorological Officer, 1–2 Osborne Road, Newcastle upon Tyne NE2 2AA. (Telephone: 0632 811616)
Ship Routeing Service. (Telephone: 0344 20242 Ext. 2577)
Captain A. Phillips, Nautical Officer.
Captain P. B. Hall, Nautical Officer.

ERRATA

The Marine Observer, July 1978, page 137, beginning of fourth paragraph: for 1894 read 1874; page 145: for 1977 read 1978.

INDEX TO VOLUME XLVIII, 1978

Subjects of *Books Reviews, Editorial, Notices to Marine Observers, Notices to Mariners*, Photographs and persons named in *Retirement* and *Obituary* notices are indexed under these general headings.

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