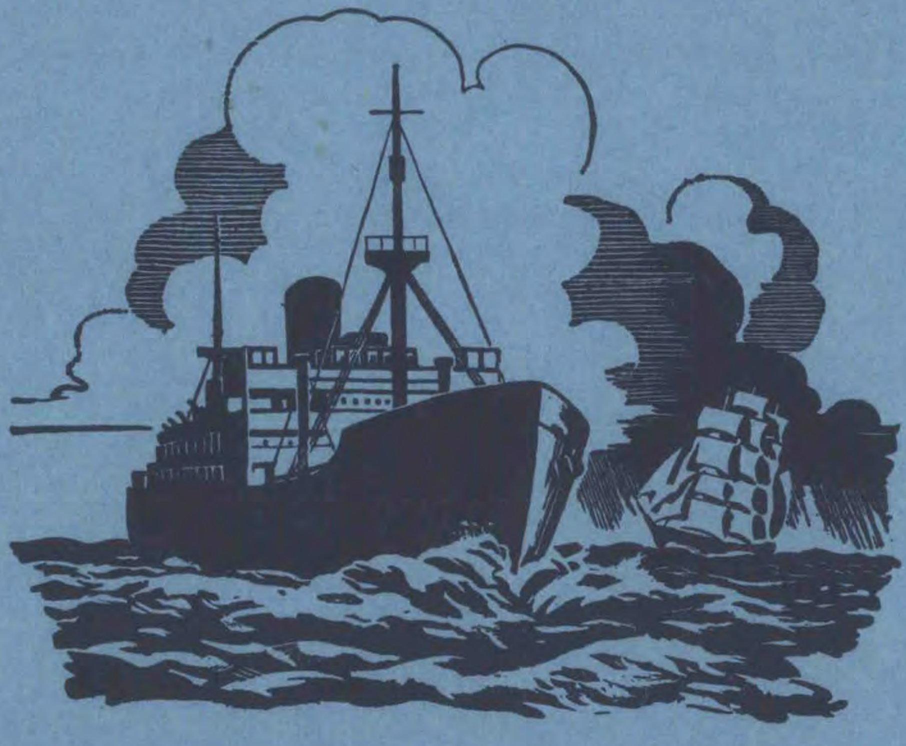
Met.O. 839

The Marine Observer

A quarterly journal of Maritime Meteorology



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October 1971

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THE MARINE OBSERVER

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

VOL. XLI **No. 234** **OCTOBER 1971**

CONTENTS

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October, November, December

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

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

TYPHOON 'JOAN'

South China Sea

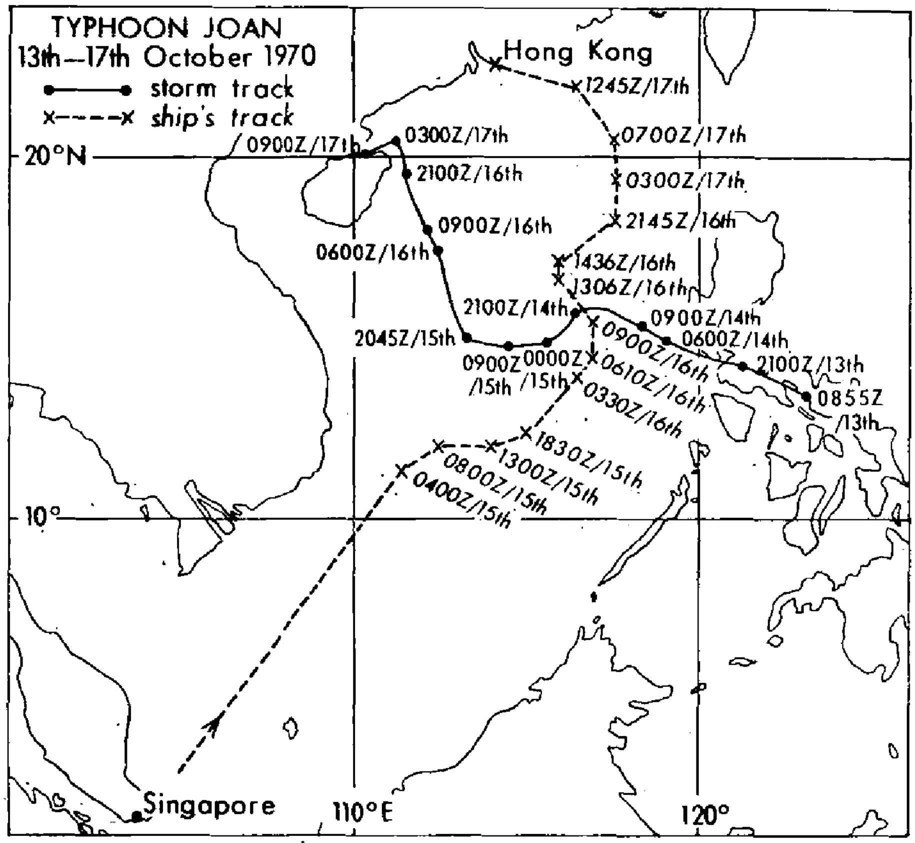
m.v. *Protesilaus*. Captain R. G. Rippon. Singapore to Hong Kong. Observer, Mr. M. S. Browning, 2nd Officer.

13th–17th October 1970. The vessel sailed from Singapore at 1100 GMT on the 13th in conditions of slight sea, overcast and clear. At 1305 we received a warning about Typhoon Joan. Conditions remained the same although rain was frequent. About 0700 on the 14th a swell became prominent, wind W'ly, force 3, and at 0930 we reduced speed to allow Joan to pass ahead.

During the next 12 hours the swell gradually increased to a heavy NE'ly although the W'ly wind was steady force 3. At 0030 on the 15th the wind backed to WSW, force 5; swell still heavy. We received a message from Hong Kong asking all ships to report observations every 3 hours, which we began immediately. Conditions deteriorated at 0050 with very rough seas and a very heavy NE'ly swell. The vessel was rolling and pitching heavily; speed further reduced and course altered to 090° to run parallel to Joan's track. Wind W'N, force 8. As we and the typhoon crossed common longitude at approx. 0900, pressure 996 mb, the swell moved to NW, causing violent rolling and shipping of heavy seas. At 1300 the wind was variable, force 8, then backed to SW, force 9 by 1600.

The typhoon continued on a WNW'ly track (according to reports) but apparently almost stationary at times according to our plotting, something we found strange as reports continued to record a speed of 8 kt.

At 0100 on the 16th conditions were similar except that the swell was confused between WNW and SW; the wind SSW, force 8–9. (The vessel eventually hove to in order to secure cargo as a result of 25° rolling.) During the next 24 hours the swell remained the same although easing at about 0200 on the 17th with wind backing to S'ly, force 7 until 0600 when it decreased to force 3. As the typhoon centre progressed westwards we were able to steer more northerly courses but still having to vary speed considerably because of continuing heavy W'ly swell. We were able to resume



course towards Hong Kong at 0700 although still at reduced speed. At approx. 1500 the swell began to lessen in height and by 1700 was low with an E'ly wind, force 3. The vessel arrived at Hong Kong at 2000. The chart shows both the track of Typhoon Joan and our own courses.

During our passage the wind and pressure could be described as normal for a typhoon area but the continuous swell from the west, together with two distinct periods of very confused swell, despite the fact that we were on the same latitude and later NE of Typhoon Joan, were anything but normal to us. We put this to Hong Kong Observatory. Their plotting, after Joan had passed, showed that she took two loops of 360° on her way from the Philippines to the China coast, thereby explaining confusion and continuous heavy W'ly swell. The observer, an R.N. officer, informed us that this is not uncommon, something none of us was aware of, nor can we find it in any textbook.

In conclusion I would like to say that perhaps it could be brought to the notice of seafarers that such a thing seems to be fairly common, thereby perhaps saving some other ship from being exposed to such conditions as we experienced.

Position of ship at 0001 on 15th: 10° 54'N, 111° 00'E.

Position of ship at 0001 on 16th: 14° 12'N, 116° 06'E.

Note. Typhoon Joan was first detected as a strong E'ly wave on 9th October and by 2300 a tropical storm had formed. Moving in a WNW'ly direction, Joan attained typhoon strength early on the 11th near 11°N, 132°E and passed about 20 miles north of Samar Island, Philippines, with 150-kt winds, early on the 13th. Later that day Joan tore into Luzon Island near Legaspi City, with winds still in excess of 130 kt, passed within 20 miles of Manila and entered the South China Sea early on the 14th. After crossing the northern tip of Hai-nan Tao on the 17th she entered mainland China south of Cham-chiang on the 18th, by then reduced to a tropical storm. The typhoon left more than 600 Filipinos dead, 80,000 homeless and 400,000 in need of assistance. A wrecked ship, believed to be an old Spanish galleon, was washed within 2 miles of the shore of Panay Island. There was extensive damage to property and crops.

Increasing data from satellite sources may well show that complete loops in tropical revolving storm tracks occur more frequently than past data revealed. However, it has been known for some time that such tracks are possible and the mariners' attention is drawn to this in *The Mariners' Handbook* (N.P.100), in the *China Sea Pilot*, Vol. II (N.P.31) and in *Meteorology for Mariners* (Met.O. 593).

TROPICAL STORM 'IRIS'

South China Sea

s.s. *Benlomond.* Captain C. Donnelly. Durban to Hong Kong. Observers, the Master, Mr. P. A. Smith, 2nd Officer and Mr. T. T. Veitch, Cadet.

7th October 1970. While the vessel was on passage to Hong Kong the following observations were made in the wake of Typhoon Iris.

GMT

1400: The wind, which had been NW'ly, force 3–4, freshened and began to veer to the NE. Moderate to heavy rain showers persisted with the visibility reduced to 2–4 miles or even less at times. Shortly afterwards the barograph showed a steep fall in pressure with the rain easing a little and the associated C_L breaking up.

1445: The barograph trace 'dipped' 3 mb in position 20° 24'N, 113° 54'E, our course at the time being 017° at 14 kt.

1515: Wind steadied at NE, force 7–8 and the rain showers became lighter with some lightning in the east.

1540: Air temp. 25·2°C, wet bulb 24·5°, sea 26·0°. Pressure 1006·7 mb. Precipitation had ceased.

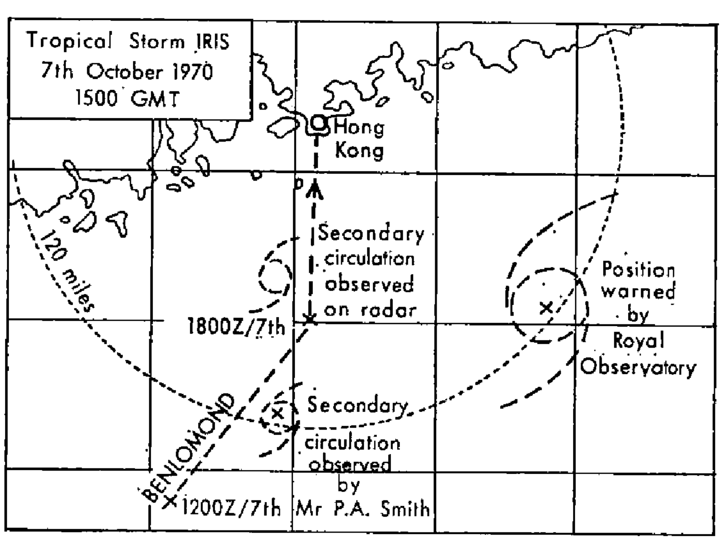
1550: Wind ENE, force 7, apparently subsiding. Sky constantly changing with 5–7/8 cloud. By 1630, cloud 2–5/8 C_L3 with traces of C_H1.

1800: Position of ship: 21° 00'N, 114° 06'E. Wind NE'E, force 6. Pressure 1007·3. Small amounts of cloud.

1820: C_L8 clouds forming in the north.

Note. On arrival at Hong Kong, Mr. Smith sent the above details to the Royal Observatory and asked if there was an explanation of what appeared to be the passage of a secondary tropical revolving storm. Mr. E. W. K. Chu, Port Meteorological Officer, replied as follows:

"It is possible that you had passed one of the secondary circulations in the wake of Iris during that period. However, the circulation must have been relatively shallow because our radar photograph taken at 1500 GMT did not show any rain echoes in that area. A map indicating the centre of Iris and its associated secondary circulations is enclosed for your information. It would be of interest to see that there was a very well-marked secondary circulation about 50 miles north of the circulation you observed. The information supplied is very helpful to our post-analysis. Please accept our thanks for your keen interest in weather reporting."



ST. ELMO'S FIRE

Western North Atlantic

s.s. *Atlantic Conveyor*. Captain R. O. Venn. Baltimore to Gothenburg. Observers, the Master, Mr. C. Allport, 2nd Officer, Mr. R. Bunce, 3rd Officer and Mr. W. J. Mullarkey, Radio Officer.

7th December 1970. At 0001 GMT the weather was overcast with driving sleet and snow and an ESE'ly wind, force 7. When making these observations it was noticed that a plume of blue light (similar to oxy-acetylene flame) was being emitted from the sharp corners of a deck light (current off) and from the sharp steel corners of the bridge wing dodger. Upon further investigation it was found that holding one's hand in the full force of the wind would produce this same effect from one's finger-nails. Further tests followed: a fluorescent lamp tube, when held in the wind and path of the charged water particles, was struck. When the whole main whip aerial was isolated from earth it showed a corona discharge in the full top section. During the whole period it lasted—approx. 1 hr—no radio communication was possible from the vessel. Air temp. 1·7°C, wet bulb 1·7°.

Position of ship: 44° 54'N, 56° 48'W.

Note. Dr. J. Latham, Department of Physics, The University of Manchester Institute of Science and Technology, comments:

"The above report describes very graphically a classical case of severe corona or St. Elmo's Fire which consists of a luminous electrical discharge from pointed objects in the strongly electrified regions below thunder clouds. Further interesting accounts of this and similar phenomena are given in *The Flight of Thunderbolts* by B. F. J. Schonland (1964), Clarendon Press, Oxford."

Indian Ocean

s.s. *Orcades*. Captain P. C. Reed. Fremantle to Durban. Observers, Mr. R. S. Holt, Jnr. 4th Officer and Mr. T. Neill, Q.M.

10th December 1970. At 2000 GMT, during heavy local thunderstorms, what was believed to be corposants or St. Elmo's Fire was seen emanating from a mounted signalling light on the starboard bridge wing. The phenomenon gave the appearance of a patch of very faint blue light flickering about the sights on top of the light. The discharge was about ½ inch high and appeared intermittently for about 5 or 10 sec at a time. To one observer it seemed as if a faint crackling was heard while the light was visible. Air temp. 23·7°C, dew-point 22°, sea 23·9°. Pressure 1011.9 mb. Heavy rain squall with thunder and lightning occurred shortly afterwards. Cloud Cb, As and Cs.

Position of ship: 30° 22'S, 52° 18'E.

UNUSUAL VAPOUR TRAIL

North Pacific Ocean

m.v. *Nurmahal*. Captain J. Murray. Cristobal to Honolulu. Observer, Mr. R. T. Lindsey, Chief Officer.

19th October 1970. At about 0130 GMT (1630 SMT on the 18th) a vapour trail was observed, originating approx. 15° above the horizon on a bearing of 025°. The aircraft making the trail was not visible and its apparent movement was very slow. No special attention was paid to it until 0300 when it was realized that the complete trail was still visible and in no way distorted. (The far end of the trail disappeared on a bearing of 200° at an altitude of about 25° above the horizon.) The trail was clearly defined until obscured by darkness at 0335. When last visible the trail was a straight line narrowing to nothing at both ends and becoming broader in the centre. At the widest point it was equal to four diameters of Venus which appeared close to the far end of the trail at twilight.

The reason for this report is that there were absolutely no signs of the vapour spreading out, dispersing or being bent by air currents. The bearings were taken at 0300 as were the following observations. Air temp. 24·4°C, wet bulb 21·2°. Wind NE'E, force 4. Pressure 1014 mb. Cloud, 2/8 Fc at 3,000 ft, ⅛ Ac and a little Cc. Course 283° at 13 kt.

Position of ship: 18° 25'N, 139° 12'W.

Note. Condensation trails rarely last for more than a few minutes without considerable distortion and dispersion. Those which do, broaden out into wide bands of cirriform cloud. The slow apparent lengthening of the trail and its persistence suggest, at first, that it was formed at a very high level, but if that were so it would have remained visible for some considerable time after the onset of nautical twilight at 0335. For these reasons no explanation can be offered for this phenomenon.

LARGE FALL IN SEA TEMPERATURE

Gulf of Tehuantepec

m.v. *Strathbrora.* Captain L. C. Kingswood, R.D. Kobe to Balboa. Observer, Mr. M. E. Skipper, 3rd Officer.

17th November 1970. A strong SW'ly set was experienced from the western shore of the Gulf of Tehuantepec and the sea temperature fell from 28·9°C to 22·0° between 1900 and 1940 GMT. At 1935 the vessel yawed 4° off course which had previously been held steady at 117°, 22 kt.

There had been a NW'ly gale in the area for the past three days, but the wind at 1930 on the 17th was E'S, force 4.

Position of ship: 14° 51'N, 96° 55'W.

Note. Strong off-shore winds in the Gulf of Tehuantepec produce up-welling of cold water and abnormal currents which may last for several days after the cession of the strong winds. In the above report both the unusual currents and the large fall in sea-surface temperature are due to the NW'ly gale which had lately prevailed. (See *West Coasts of Central America and United States Pilot*, 7th edition, 1961, pp. 46–49.)

CONFLUENCE OF CURRENTS

vicinity of Galapagos Islands

m.v. *Hertford.* Captain J. M. Burn. Balboa to Auckland. Observers, Mr. J. W. Gill, Chief Officer, Mr. R. J. Vincent, 2nd Officer, Mr. H. M. Close, 3rd Officer and Mr. G. W. Adkin, 4th Officer.

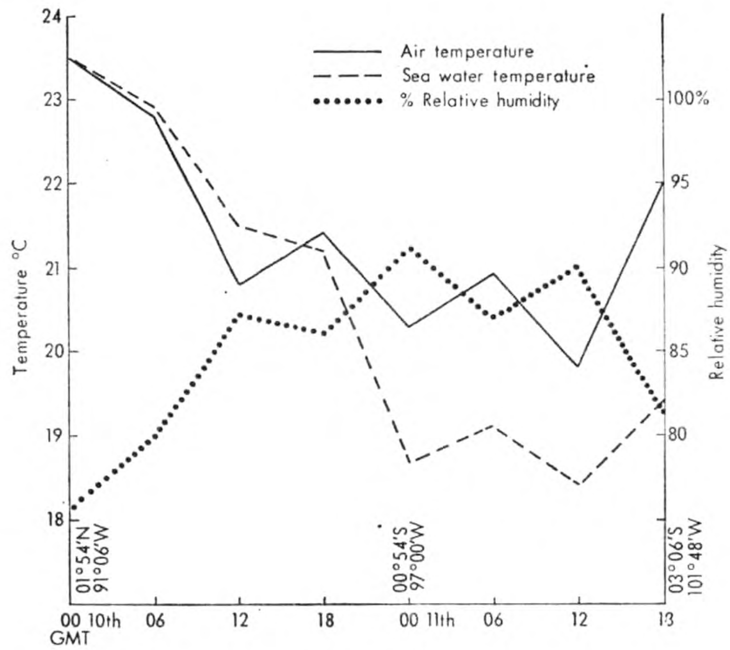
10th–11th October 1970. Between 0001 GMT on the 10th and 1800 on the 11th it was estimated that the vessel's course took her through the area of confluence of the South Pacific Equatorial and the Peru Currents.

In addition to the considerable sea-temperature change between 1800 on the 10th and 0001 on the 11th, the high humidity and the prevailing cloud characteristics were taken as further evidence of a change of conditions. The cloud between 1000 on the 10th and 0001 on the 11th was of the Cu type but at a very low level, the base never being more than 100 m above sea-level and frequently descending to the surface to give patches of mist in which visibility was about 1½–2 miles. This was thought to result from the mixing of the air masses over the two currents.

Several large schools of dolphin were seen and these were thought to be an indication of the unusual intensity of marine life in this area of upwelling.

The graph was plotted using the readings taken at the synoptic hours during the relevant period.

Position of ship at 0001 on 10th: 01° 54'N, 91° 06'W.



Note. Similar reports and an explanation were published in the July 1971 number of *The Marine Observer* when the *Cumberland* and the *Manapouri* were in this zone where the waters of the Peru Current diverge.

ICEBERG

off N.W. Iceland

m.t. *Ross Renown.* Skipper B. McCall. Fishing. Observers, the Master and Mr. J. L. Thorpe, Radio Operator.

4th November 1970. At 1400 GMT, during fishing operations, we sighted on the radar at a range of 24 miles an object which resembled a large ship. At a distance of 16 miles, with good visibility, the object was clearly seen visually to be a large iceberg. It was in position 66° 55·30'N, 23° 51·50'W and in exactly 100 fm of water, anchored to the sea bottom. Getting closer, it was estimated to be about 300 ft high and about 200 ft long with a piece 100 ft long protruding at 90°, giving it a crude L shape. At a distance of $\frac{1}{2}$ mile a large crack could be seen extending from one end into about the middle of one side then upwards. The base perimeter was extremely smooth and the reason for this was made apparent by the waves breaking against it. Four very small bits of ice were seen but no other ice was seen either visually or up to 48 miles by radar. As this iceberg was stationary in a known position it was of great help when using it for radar cross-bearings with the land while fishing in the area. Wind E'ly, force 6.

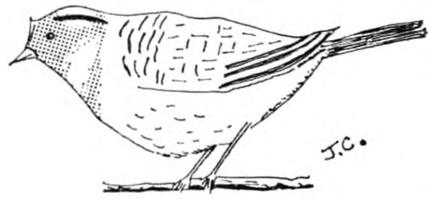
Position of ship: 66° 30'N, 25° 12'W.

BIRDS

North Pacific Ocean

m.v. *Menestheus.* Captain D. Campbell. Kobe to Balboa. Observers, Mr. J. R. K. Corrin, 2nd Officer and all other officers.

5th November 1970. At 2330 GMT a land-bird, a little smaller than a European thrush, came aboard the vessel and stayed several days. It had a pointed beak with a light-brown crested head separated from a rust-red patch on the chest by a white collar. There was a black bar on each side of its head with a broad white band in between. The wings were brown with black bars, the flight feathers black and



canary yellow. Tail feathers were dark brown/black. The underside had thick, downy off-white feathers. The nearest land at the time was the Aleutian Islands over 500 miles to the north. The wind had been N–NW for the preceding days.

Position of ship: 43° 34′N, 178° 23′W.

Note. Captain G. S. Tuck, Chairman of the Royal Naval Birdwatching Society identified this bird as a McKay's Bunting.

Pacific Ocean and Panama Canal

m.v. *Mataura*. Captain K. Barnett, R.D. Timaru, N.Z. to Liverpool. Observers, Mr. H. C. Hunard, Chief Officer and ship's company.

15th–30th December 1970. Whilst loading in Timaru a mixed group of house sparrows were frequently seen feeding on the spilled grass seed being loaded into No. 1 hatch. The vessel sailed at 1600 SMT on the 15th. The following day three hen sparrows were observed on board under the overhang of the fo'c'sle feeding on seed. One was accidently hosed down and was found dead the following day. The remaining two kept together and were fed scraps and given fresh water until the morning of the 21st when one failed to appear. The vessel had passed I. Manga Reva during the early hours of the morning and at dawn the island was still visible about 40 miles astern. Ship's course 063°. Wind E'ly, force 3–4. Was it possible that this bird made the land?

The sole survivor of the trio remained on board and was quite healthy and kept under the lee of the fo'c'sle during the passage through the trade-wind belt (E–SE, force 4–5). Ship's speed 19 kt. It was discovered that some field (bird) peas had been spilt behind some drums of deck cargo and were growing in some oddments of rope. The sparrow frequently spent a part of each day pecking in the area. On crossing the equator the wind went round to S'ly (starboard quarter) and the bird made frequent sorties all around the ship.

On the 30th at dawn the vessel was in Miraflores locks, Panama Canal. The sparrow was seen flying around the ship for the last time after a voyage of 6,783 miles in 15½ days.

On my previous voyage to New Zealand (in the *Hinakura*) we carried two sparrows (again both hens—they say Kiwi birds get around) from Lyttelton to Cabo Mala, Panama.

Position of ship at 0001 GMT on 22nd: 21° 18′S, 131° 24′W (approx. midway).

Eastern North Pacific

s.s. *Perseus*. Captain S. E. Allerton. Balboa to Nagoya. Observer, Mr. S. L. Russell, 2nd Officer.

22nd December 1970. At 1900 GMT a pure white heron-like bird was observed attempting to land on board. After several attempts it managed to land on the edge of a skylight. It appeared rather exhausted as it was having some difficulty in making a landing. The bird was pure white with a long beak (pale yellow) and long dark-grey legs with off-white claws. While on deck the bird was photographed but before a close inspection could be made it flew off and circled the ship, finally

disappearing from view. In flight the bird's long legs trailed behind it, extending beyond its tail.

Position of ship: 20° 16'N, 134° 29'W.

Note. Captain N. B. J. Stapleton of the Royal Naval Birdwatching Society comments:

"From the sketch and photograph the bird has been identified as an American White Egret (*Casmerodius alba*) which has a yellow bill and black legs and is the only one with this combination. It winters in America, at least on the east side of Texas."

Eastern North Atlantic

s.s. *Hector*. Captain A. Mackenzie. Rotterdam to Durban. Observer, the Master and all officers.

2nd–4th December 1970. At 0900 GMT, in position about 10 miles west of Cape Verde, a small bird was found on deck apparently exhausted and unable to fly. It was put in a sheltered spot on the monkey island above the bridge deck in the hope that it would recover. The bird was black except for a white bar at the base of its tail feathers and had black eyes. The black beak was slightly hooked at the tip and at the top was a protruding breathing hole. Its legs were thin with fine, black, webbed feet. It was about 8 inches long from breast to tail and had a wing span of about 14 inches, delta-shaped akin to a swallow.

After 24 hours the bird was still with us. On closer inspection it was found that it was unable to move its wings due to oil coagulating the feathers on the underside of its wings and body. This was cleaned off, using a light detergent; some feathers had to be cut as there was too much oil on them. The feathers were then washed with fresh water and, when dried out, a small quantity of natural oil was applied to the bird which by this time was making an effort to preen itself. The bird stayed for a further 24 hours during which time it would accept milk drops dispensed from an eye-dropper but no solid foods that were offered. At 0800 on the 4th the bird took off and headed north.

Position of ship at 0900 on 2nd: 14° 21'N, 17° 36'W.

Position of ship at 0600 on 4th: 03° 18'N, 11° 30'W.

Note. Captain Stapleton comments:

"The bird which you took so much trouble to care for has been identified as a storm-petrel, probably a Madeiran (*Oceanodroma castro*) or Leach's Storm-petrel (*Oceanodroma leucorhoa*) from its length but there was no mention, to guide us, as to whether the tail was forked or if the white rump patch was divided by dark feathers. We greatly appreciate this very interesting account, particularly as regards the bird's oiled condition and the great interest taken to try to overcome this."

North Atlantic Ocean

s.s. *Nevasa*. Captain I. K. Bowerman. Las Palmas to Martinique. Observers, the Master, Mr. M. L. Benchley, 2nd Officer, Mr. J. A. H. Cartlidge, Extra 2nd Officer, Dr. Anna Cochrane, Assistant Surgeon and Miss C. Watson, Nursing Sister.

26th December 1970. During the afternoon of Boxing Day, when the vessel was

1,200 miles from land, a Red-billed Tropic Bird alighted inadvertently on A deck (a covered-in area), showing signs of oil pollution. After being cleaned and displaying a somewhat irascible temper, it was possible to identify more thoroughly, largely through the descriptions in *The Marine Observer* of October 1970 and in *Ocean Birds* by Ted Stokes. The markings on the back were particularly distinct and almost zebra-like in appearance. The general hue was slightly roseate although a well-defined black band 3 inches across could be seen on the wings (when the bird permitted its wings to be outstretched for cleaning). The tail feathers were, paradoxically, clean and measured 16 inches in length; the wing span was 34 inches. We fed the bird on sardines (fresh), cold cod, fresh and salt water and after two days it devoured anything put in front of it including the Assistant Surgeon's finger.

Position of ship (approx): 20° 20′N, 41° 21′W.

Note. Captain Stapleton comments:

"Your bird was definitely a Red-billed Tropic Bird. They breed both in the West Indies and on the Cape Verde Islands. The family of Tropic Birds are noted as great oceanic wanderers and we have one or two rather similar oceanic plots though yours seems to be the extreme in distance. The bird might well have originated from the Cape Verde area. Thank you for all the kind attention which you gave to the distressed bird. We do hope that the Doctor's finger has now recovered."

LOCUSTS

Eastern North Atlantic

m.v. *Ripon*. Captain J. Parsloe. Monrovia to Immingham. Observer, Mr. R. H. Jenkins, Extra 2nd Officer.

28th–30th November 1970. At approx. 1200 SMT on the 28th three locusts were observed on board when the vessel was some 27 miles SW of Dakar. Presumably they had come aboard during the night when vessel was roughly 50–60 miles WSW of the mouth of the River Gambia. The light wind experienced during this period had, however, been slightly onshore, varying between NNW and N'E. Weather fine and clear throughout. Two of the locusts were caught two days later when the vessel was passing between Tenerife and Gran Canaria and, on arrival at Immingham, were taken by the Hull Port Meteorological Officer for forwarding to London.

Position of ship at 1200 on 28th: 14° 24′N, 17° 48′W.

Note. Mr. F. T. Bullen of the Desert Locust Information Service, Centre for Overseas Pest Research, London, comments:

"Thank you for sending us the information and, in particular, for sending us specimens. The large grey insect was a Tree Locust (*Anacridium melanorhodon*) and the smaller yellow one an African Migratory Locust (*Locusta migratoria migratorioides*). Both species are of economic importance in West Africa, making these reports of special interest to us.

"Locusts are frequently reported by ships off the coast of West Africa during October, November and early December and these reports are extremely valuable to us. Together with the associated meteorological data they enable us to warn the countries concerned of potentially dangerous locust populations in nearby coastal areas."

m.v. *Cape Howe*. Captain A. MacKinley, O.B.E. Monrovia to River Tyne. Observers, Mr. C. S. MacDonald, 2nd Officer (i/c cage and feeding), Mr. R. Mullen, 3rd Officer (handler), Mr. C Hurst and Mr. G. Adams, Cadets (trappers).

11th December 1970. On passing Cape Verde strong off-shore winds blew from the NE during the morning watches and, following this, two grey locusts were found on deck. Attempts to catch them were unsuccessful. Both locusts were about 4½ inches in length and seemed in very good condition. The vessel's closest approach to Cape Verde was 3·5 miles.

14th December 1970. The vessel was abeam of Las Palmas at 0600 GMT and later in the morning a further grey locust was found on deck, presumably having come aboard at the same time as those previously found. Cadets caught this one and details were sent by W/T to ANTILOCUST LONDON.

The insect was kept alive on cabbage leaves damped with fresh water in a cage with a polythene top which allowed sunlight in during the day. At night it was kept in the gyro room. On arrival in South Shields the beast was still in excellent health and was forwarded, via British Rail, to the Desert Locust Information Service in London.

Position of ship at 0600 on 14th: 28° 00'N, 15° 00'W.

Note. Mr. F. T. Bullen comments:

"Thank you for the information and the specimen which arrived in excellent condition and is now in a cage with others of the same species. It is a female Tree Locust (*Anacridium melanorhodon*), a species of economic importance in a zone of Africa just south of the Sahara extending from Senegal to Sudan. This species prefers to feed on broad-leaved vegetation so the diet of cabbage which you provided was correct."

BEETLE

Bay of Bengal

m.v. *Tairea*. Captain T. E. Kelso. Bombay to Chittagong then Chalna to Colombo. Observer, Mr. J. H. Clark, 3rd Officer.

13th October 1970. After leaving Chalna a highly coloured beetle was discovered on board [and was later forwarded to the Natural History Museum].

Position of ship (approx.): 22° 36'N, 89° 31'E.

Note 1. Mr. R. D. Pope, Officer-in-Charge, Coleoptera Section, Department of Entomology, Natural History Museum, comments:

"The insect belongs to the family Buprestidae (jewel beetles). These are usually compact, rather elongate beetles of medium size and frequently of a bright metallic coloration, which has led to their being used in various parts of the world as ornaments. The adults fly readily in the sunshine but are mostly found in flowering shrubs and trees. The specimen from the *Tairea* is of a species called *Chrysochroa ocellata*. It is distributed through India, Burma and the Andaman Islands. Nothing appears to be known of the biology of *C. ocellata*, but a closely related species feeds as a grub in the sapwood and bark of Jarul (*Lagerstromia flosreginae*) and Chickrassi (*Chickrassi tabularis*). These beetles are pretty tough creatures so there is no means of knowing when it came on board. It may have been on the wing in the area logged or it may have stowed away at Bombay."

Note 2. The *Tairea* is an Australian Selected Ship.

SPIDER

Caribbean Sea

m.v. *Hyala*. Captain J. G. Cormack. Banana, Congo to Curaçao and Punta Cardón, Venezuela to U.K. Observers, Mr. K. J. Sprowles and Mr. A. C. Brooking, 3rd Officers.

3rd–11th October 1970. At 1930 SMT on the 3rd, when the vessel was 12 days out from Banana, our pet spider Albert made his first appearance. This had rather startling effects as he was first sighted running across Mr. Brooking's foot. Whether Albert meant Mr. Brooking to be surprised at finding a large spider on his foot we have been unable to ascertain but, if these were Albert's intentions, they succeeded as Mr. Brooking proceeded out of the chart room post-haste! Mr. Brooking's next move was to assure himself that he was not having hallucinations so he re-entered the chart room armed with a torch and, sure enough, there was Albert as large as life!

When I relieved Mr. Brooking at 2000 Albert was standing quite unconcerned by the radar. Plans were made for his capture. By 2015 all was ready for the spider hunt but, alas, Albert used all of his spider cunning, disappeared inside the radar set in the chart room and remained there despite all our attempts to oust him. Albert presumably remained in the radar as he did not make another appearance for 8 days. If Albert did stay in the radar he must have been heat-proof as the radar was used during his temporary tenancy.

Eight days later on the 11th at 2130, in approx. position 16° 18′N, 66° 18′W (the vessel being on passage to the U.K.), when the radio officer was investigating a minor fault in the chart-room radar, Albert re-emerged. This time we were lucky and, after a wary approach, managed to catch him with the aid of an empty tin and a piece of cardboard.

When Albert died after 7 days of captivity it was unfortunately impossible to preserve him and, during the ensuing days prior to our arrival at Swansea where he was handed over to the Port Meteorological Officer, he dehydrated to half his original size. Albert's original size with his legs stretched out was 2½ inches across. His body was dark brown with short, black, spiky hairs. It is to be assumed that Albert boarded the ship on the West African coast either in Freetown, Bonny, Port Gentil or Banana.

Position of ship (approx.) at 1930 on 3rd: 11° 18′N, 62° 18′W.

Note. Mr. D. J. Clark of the Department of Zoology, Natural History Museum, comments:

"The spider captured on board the *Hyala* is a female of *Heteropoda venatoria* (Linnaeus), sometimes known as the 'Huntsman spider'. This spider is now found in most tropical and sub-tropical regions of the world, having been carried from its original locality, probably India, in ships' cargoes, etc. It is a very well-known 'house-spider' in the tropics and regarded as completely harmless, indeed often encouraged because of the useful service performed in destroying insect pests, particularly cockroaches."

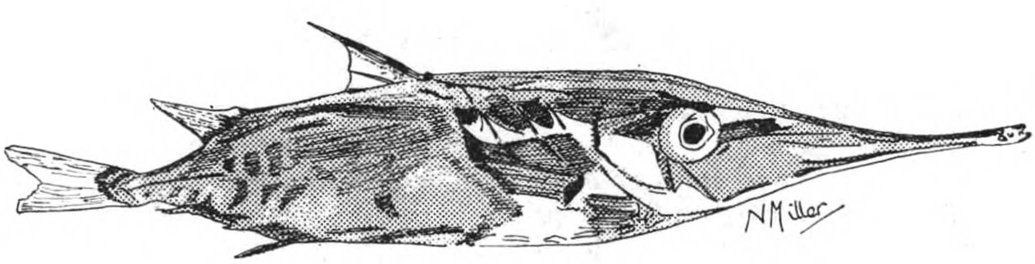
FISH

Eastern North Atlantic

m.v. *Rievaulx*. Captain M. W. Siddle. Nouadhibou, Mauritania to Glasgow. Observers, Mr. D. Fullwood, Chief Officer, Mr. D. Spelman, 3rd Officer and Mr. N. Miller, Cadet.

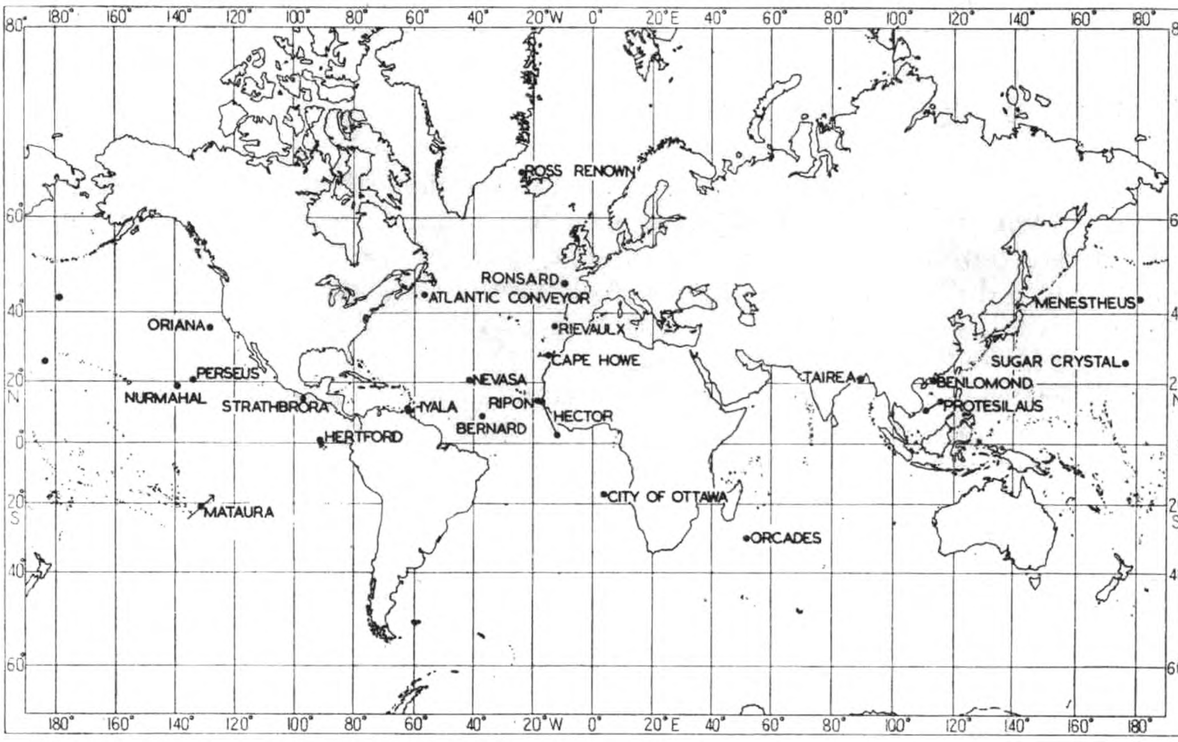
28th October 1970. At approx. 1600 GMT this small fish was found on deck by the bos'n and handed to the Chief Officer for observation. The fish was 10 cm long with a dark grey/blue back and its belly was silver tinged with orange. The markings behind the gills and the actual gill section were light grey. There were also two light-grey stripes on top of its head, one over each eye. Wind NNE, force 4–5. Sea temp. 19°C.

Position of ship: 37° 20′N, 12° 37′W.



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

"The fish is almost certainly an example of the slender snipe fish, *Macrorhamphosus gracilis* (Lowe), and was close to the maximum size this fish is known to reach. These fish, with a small terminal mouth at the end of the long snout, probably feed on small crustaceans."



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

MARINE LIFE

South Atlantic Ocean

s.s. *City of Ottawa.* Captain M. W. Hartley. Durban to Dakar. Observers, Mr. G. E. Shearer, 2nd Officer and Mr. G. D. Taylor, 3rd Officer.

3rd December 1970. At 0840 GMT long streaks of discoloured water were observed ahead, lying in a N/S direction. They were rust-brown in varying shades and appeared to be the result of tank cleaning but on closer examination their limits were clearly defined as being something semi-soluble in water. The streaks were approx. 4–5 ft in width, 1–2 ft in depth, stretching for anything up to twice the ship's length (1,000 ft). The total area covered by the discoloration was about 2 miles square, the ship's course dividing it roughly in two. By 0850 the vessel had passed clear of the streaks. A sample of the water was taken from the fo'c'sle head (to avoid disturbance by the ship's wash), using the rubber bucket. The sample gave off a strong fishy smell and was seen to contain a quantity of small jelly-like creatures which were observed for 15 min prior to bottling.

The creatures, probably a type of *Thalia democratica* [pelagic salps], averaged 1 cm in length with two antennae of the same length. The transparent body was made up of a cage of 7 or 8 circular 'ribs' and 2 'backbones'. Basically the body was a tube into and out of which was forced water, by muscular action, causing the creature to be propelled through the water; thus the swimming motion was spasmodic, in no particular direction other than forward movements. At the 'head' of the creature was a small orange speck (which could have been the brain, stomach or heart) about the size of a pin-head which, nevertheless, was apparently the cause of the discoloration of the water—altogether an incredible number of creatures to have formed such prominent streaks!

The specimens were put into a solution of formalin ($1\frac{1}{2}$ parts to $9\frac{1}{2}$ parts sample) and after about 5 sec they died and floated to the surface. Two hours later they were seen lying at the bottom of the bottle.

A careful lookout was kept for any whales or large fish that might have been feeding in the area but none were seen. Air temp. 21·2°C, sea 20·2°. Course 323° at 15 kt.
Position of ship: 17° 06′S, 3° 15′E.

15th December. Since being preserved, the samples [there were 4 others, not connected with the above report] have been kept in the Officers' domestic fridge at a temperature of approx. 5–8°C. The orange speck of the 'beasties' had gradually changed to a dull black/brown colour. Although not certain, they may be slightly smaller than originally; if so, it is probably due to the gradual expulsion/seepage of the liquid in the body when preserved.

In all fairness to those concerned, due thanks should be given to all who, under protest, gave up such valuable beer-can space in the fridge so that these samples could be kept at as steady a temperature as possible. Had any more samples been obtained, it is a shuddering thought as to what might have been the fate of one of your observing officers!

Note. Miss A. M. Clark of the Echinoderm and Protochordate Sections, Department of Zoology, Natural History Museum, comments:

"Thank you for the specimens. They are nicely preserved and will be a useful addition to our collections. Will you also please thank the officers concerned for the details about the specimens in life. I agree that they are probably *Thalia democratica*; the posterior tentacle-like processes are particularly long. The coloured 'nucleus' is made up by the convoluted gut. The density of these shoals must be fantastic since these pigmented areas are so small but still colour the whole area of the sea. Most of these salps are world-wide in distribution."

LUMINESCENCE

Eastern North Atlantic

m.v. *Ronsard.* Captain J. I. Jones, D.S.O., D.S.C., R.D. Swansea to Montevideo. Observer, Mr. C. Bufton, 2nd Officer.

24th–25th November 1970. During the night the vessel was navigating in a SE'ly storm, force 10+ (later becoming S'ly then SSW). At about 0130 GMT what looked like a couple of lighted cigarette ends were seen to pass over the vessel just forward of the bridge, carried in the water and spray coming on to the ship and passing over from port to starboard. As there were no lights shining forward of the bridge it was assumed that this red effect was a reflection of the port-side light in the spray.

About 10 min after this first sighting the vessel shipped a wave over the fo'c'sle and the spray from this wave passed well over the monkey island. The water that struck the wheel-house windows broke up into a mass of red and green 'sparks', as if something had been thrown on to an open log fire. When the water had cleared from the windows, it was observed that the wave crests around the vessel were glowing with the usual green bioluminescence with red flecks mixed in with the green. The red flecks in the water ruled out the earlier assumption that the colour was caused by a reflection of the port-side light.

The vessel was in this luminous water for the next half-hour. The water that was continuously being taken across the vessel during this period had bits of red and green glowing in it (green being the dominant colour). During this period five more waves were taken over the fo'c'sle, which carried over the monkey island and the effect of the spray breaking against the wheel-house windows was the same as previously stated.

Just after 0205 the ship passed out of this luminous water and did not encounter any more during the night. It is not the green in the water that is unusual as this has often been observed and the reason for this is clearly stated in *Meteorology for*

Mariners, but I can find no explanation in this book for the red luminescence observed or in either of the other two books on marine meteorology aboard the vessel. Courses various. Speed 2 kt. Sea temp. by engine intake, 13°C.

Position of ship at 0200: 47° 05′N, 09° 07′W.

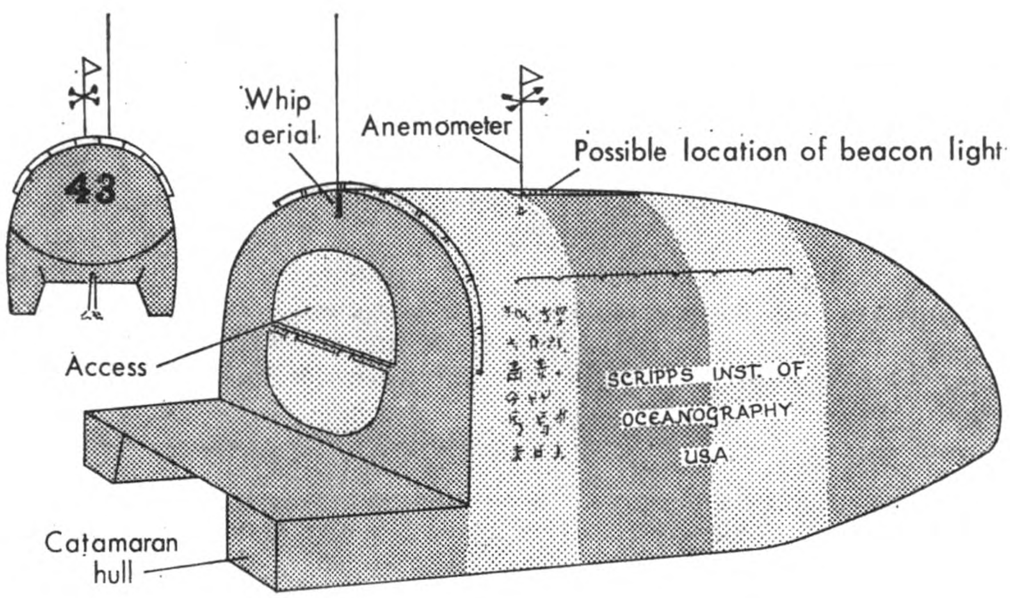
Note. Almost all the main groups of plants and animals in the sea include numerous examples of organisms possessing the power of luminescence in a variety of colours so it is impossible to say what may have caused the red 'sparks'. While luminescence is not unknown in November in the North Atlantic it is considerably less likely than during the summer months.

OCEANOGRAPHIC BUOY

North Pacific Ocean

m.v. *Sugar Crystal.* Captain J. E. Leaver. Cristobal to Japan. Observers, the Master, Mr. W. Cowan, Chief Officer, Mr. J. Green, Chief Engineer, Mr. D. Callendor and Mr. C. Lewis, Cadets, Mr. A. Handson and Mr. P. Colquhoun, Seamen, and others.

23rd October 1970. At first light (0630 SMT) an object was sighted floating unlit on the sea. The vessel was manoeuvred around for a closer inspection and the following observations were made.



The object was presumably an oceanographical observation raft (see sketch). The craft was basically a twin-hulled floating platform with a canopied superstructure with orange and yellow bands and a small boarding deck. It was heavily encrusted with barnacles along the water-line. Its dimensions were in the region of 12 ft long by 5 ft beam. The access hatch was in the open position and it had a 4 ft-square hole in the canopy amidships on the starboard side (taking boarding to be forward) allowing us to view the interior which, in the main, consisted of a white oblong box with 'No. 18' on it. Presumably this contained batteries. The anemometer was not operational in a force 3 wind, the tube at the fore end was going vertically into the water and was heavily encrusted and the beacon light was missing. It had 'No. 43' marked on rear and some Japanese-character writing and labelled 'SCRIPPS INST. OF OCEANOGRAPHY U.S.A.'.

After this observation, telegraphic advice was transmitted to U.S. Coast Guard, Honolulu with instructions to pass information on to an interested party.

Position of ship: 26° 24·6′N, 177° 01·3′E.

Note. The above report and sketch were forwarded to the Scripps Institution of Oceanography, University of California and Mr. R. A. Schwartzlose then supplied very full details concerning such buoys and Buoy No. 43 in particular—as summarized below:

"Deep-moored instrument stations that record oceanographic and meteorological data for long periods of time have been in use at Scripps Institution of Oceanography for a number of years. Recently the ability of these stations to survive very heavy sea conditions has been greatly improved and the data-recording capability enhanced and increased. Test moorings and operational deployments have shown that many stations will survive for periods of one year or more in the central North Pacific Ocean, including the winter storm season."

"Buoy No. 43 moored on 27 September 1968 in position 35° 05'N, 157° 49'W. Reported in position in December 1968. Reported at 30°N, 162°W on 16th October 1969 with 4 ft diam. hole on port side."

Mr. Schwartzlose said that since the sighting reported by the *Sugar Crystal* the buoy had been reported by the m.v. *American Racer* at 28° 12'N, 173° 18'E on 5th November 1970 and he added:

"We are always indebted for the assistance rendered by men like Captain Leaver. Please convey our thanks and appreciation.

"The North Pacific Study Program at Scripps Institution of Oceanography is probably one of the most significant investigations currently underway in the United States and has implications of profound importance to the whole northern hemisphere. Data from these buoys and the analytical studies initiated here have already provided strong evidence towards the realization of accurate long-range weather and climatic predictions."

ABANDONED LIFE-RAFT

Southern North Atlantic

m.v. *Bernard.* Captain J. Souter. Belém, Brazil to Las Palmas. Observer, Mr. J. G. Prebble, 3rd Officer.

30th October 1970. At 1000 GMT an overturned life-raft was sighted. Colour, high-visibility orange. Markings in black print were: 'No. 2, capacity 16 persons, *Marpessa* Willemstad'. Raft derelict and holed through centre; remains of rubber or plastic canopy trailing below raft and astern. Large amount of marine growth on raft and some fish seen in vicinity. No sign of life or remains. Raft no danger to navigation. The raft appeared to be of solid construction, non-inflatable, carley float type.

Position of ship: 9° 12'N, 37° 03'W.

Note. The above report was forwarded to the Netherlands Embassy in London. Lloyd's *Casualty Returns* for December 1969 gives the following report on the Dutch tanker *Marpessa* (104,373 tons gross, Rotterdam to Mina' al Ahmadi, in ballast): "Fire and explosion in No. 5 centre tank when about 100 miles off Dakar. Fire spread. Engine-room, pump-room and No. 5 tank flooded. Two crew reported killed. Tanker *Serenia* (Br.) standing by. Abandoned by crew. Vessel subsequently sank in approx. position 16° 30'N, 17° 45'W."

UNIDENTIFIED PHENOMENON

Eastern North Pacific

s.s. *Oriana.* Captain R. J. H. Cutler. Honolulu to San Francisco. Observers, Mr. M. S. Cavaghan, 1st Officer, Captain P. W. Love, Staff Captain and Mr. T. P. Watkins, Navigator.

24th December 1970. At 0158 GMT—evening twilight—an object was first observed, bearing 075°, altitude 15°. It appeared similar to a planet, about the same size as Jupiter, and was travelling fast. A big delta-shaped glow emanated from it and it was leaving a vast trail which glowed green/white. The object stopped leaving a trail when it was bearing approx. 150°, thereafter appearing only as a bright point, still moving at great speed. It finally disappeared from view 4 min after first sighting at an altitude of approx. 60°, bearing 175°. The trail still remained visible for about

3 min after the object had disappeared, glowing a bright luminous green towards the first point of observation, fading to a faint whitish glow towards the point where it vanished. There was no sound from the object throughout the observation. Air temp. 12·2°C, wet bulb 9·4°. Pressure 1017·5 mb. Wind N'ly, force 1. Cloud 3/10 Sc, 4/10 Cs almost too thin to be visible. Course 068° at 25 kt.

Position of ship: 36° 03'N, 127° 53'W.

Note. When forwarding the above report, the Administrator of the Canadian Meteorological Service enclosed the following comments from the Astronomer Dr. P. M. Millman, Head of Upper Atmospheric Research in the National Research Council of Canada:

"The sighting has all the earmarks of a slow bright fireball entering the atmosphere at near-orbital velocity, except for the unusually long time of flight. This is near the extreme possible but since the timing is only to the nearest minute there is some leeway in the interpretation. We have no records of a satellite decay on this date, and the description of the luminous train agrees very well with what one would expect from the typical but uncommon brilliant evening fireball overtaking the earth in its orbit around the sun. With only one observation we cannot, of course, identify this with 100 per cent certainty."

AURORA

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

"We list here, briefly, reports of aurora received at the Balfour Stewart Auroral Laboratory of the University of Edinburgh from British ships during the months October–December 1970 (and some earlier reports).

"There were no periods of sustained high planetary geomagnetic activity during the three months covered by these notes. The highest figure occurred during daylight hours of 14th December. But reports were received of spectacular displays at times of even moderate magnetic activity. This was instanced by the report and sketch from Mr. Dawson of the *Nina Bowater* of the display on 22nd/23rd October, when the magnetic index figure was no more than half way up the 10-point scale. The display reached a brilliant climax over the ship around 2315 GMT. There was good coverage of the display generally, with reports from the Western Atlantic to Sweden.

"Russian scientists, according to the Novosti Press Agency, have discovered a link between sunspot activity and flu viruses. Flu epidemics are said to follow the pattern of the 11-year (approx.) sunspot cycle, the viruses increasing at times of high geomagnetic activity. In the interests of world health, we should obviously no longer regret the recent lack of associated aurora. Perhaps we shall yet be asked to contribute to the medical press.

"We very much appreciate your help and welcome the new names among those listed. We also pay tribute once again to the Marine Division of the Meteorological Office for their efforts on our behalf to enlist your cooperation."

Date (1970)	Ship	Geographic Position		Λ	Φ	I	Time (GMT)	Forms
5th Jan.	*Kingston Pearl*	65°39′N	08°42′E	100	66	+75	2315–2335	R
7th	*Kingston Pearl*	70°20′N	17°15′E	120	68	+77	1715–1810	HA
13th	*Kingston Pearl*	70°33′N	19°03′E	120	68	+78	2305–2312	RB
7th Aug.	*Inishowen Head*	55°30′N	37°30′W	040	66	+73	0305–0345	N
27th Sep.	*Antrim*	60°00′N	29°32′W	050	68	+75	0100–0400	RB, N
4th Oct.	*Weather Adviser*	59°04′N	19°18′W	070	65	+72	0400	N
12th	*Norse Viking*	55°04′N	46°10′W	030	65	+74	0025–0112	RA, RB, N
22nd	*Nina Bowater*	51°10′N	54°05′W	020	62	+74	2200–0600	All forms
23rd	*Weather Monitor*	59°12′N	18°14′W	070	65	+72	2140–0320	HA, RR, V
24th	*Silversand*	60°30′N	01°55′E	090	62	+73	0001—	RB, P
	Weather Monitor	58°54′N	19°32′W	070	65	+72	2140–2150	V
26th	*Weather Monitor*	58°58′N	18°44′W	070	65	+72	0545	HA, N
27th	*Weather Monitor*	58°53′N	19°13′W	070	65	+72	2120–2353	RR, V, N
	Silversand	71°00′N	29°00′E	130	67	+78	2130–2225	HA, RB, P, V
28th	*Tamworth*	61°12′N	85°40′W	350	72	+85	0245–0345	HB, RR
29th	*Weather Monitor*	59°01′N	18°38′W	070	65	+72	2150–2400	RR, V, N
30th	*Tamworth*	61°25′N	66°40′W	360	73	+81	0222	HB
3rd Nov.	*Weather Monitor*	58°46′N	18°41′W	070	65	+72	0240–0610	HA, RR, N
4th	*Weather Monitor*	58°59′N	18°19′W	070	65	+72	1940–2300	RR, V
5th	*Weather Monitor*	58°46′N	17°51′W	070	64	+72	0240–0545	N
8th	*Weather Reporter*	59°03′N	19°12′W	070	65	+72	0550, 0645	N
9th	*Weather Reporter*	58°54′N	19°30′W	070	65	+72	0550, 0650	N
10th	*Weather Reporter*	58°54′N	18°50′W	070	65	+72	0550 0625–0635	N
11th	*Weather Reporter*	59°03′N	19°06′W	070	65	+72	0550	N
18th	*Beechwood*	50°11′N	66°25′W	360	62	+76	2245–2255	RA, RR
19th	*Weather Reporter*	58°57′N	18°24′W	070	65	+72	0001–0200	RB, RR P
22nd	*Weather Reporter*	59°06′N	19°14′W	070	65	+72	0300, 0400	RB
	Trinculo	57°11′N	35°11′W	050	66	+74	1950–1955	RB, P
23rd	*Weather Reporter*	59°00′N	19°10′W	070	65	+72	2100	RB
24th	*Trinculo*	54°54′N	45°47′W	030	65	+74	0215—	HA
	Weather Reporter	58°58′N	19°08′W	070	65	+72	0300	RA
25th	*Weather Reporter*	58°58′N	19°10′W	070	65	+72	0300, 0550	N
2nd Dec.	*Edenmore*	60°00′N	02°30′W	080	63	+73	0100–0500	N
3rd	*Edenmore*	63°00′N	01°30′E	090	65	+74	0030–0300	HA, RA, RB, RR, N
	Weather Monitor	59°10′N	18°40′W	070	65	+72	2050	N
	Edenmore	66°00′N	08°30′E	100	66	+76	2355–0105	HB, RA, RB, RR
6th	*Weather Monitor*	58°53′N	19°29′W	070	65	+72	2150	N
7th	*Weather Monitor*	59°04′N	19°21′W	070	65	+72	2305–2320	RR
14th	*Weather Monitor*	59°00′N	19°12′W	070	65	+72	2255–2315	HB, RB, V, P, N
19th	*Weather Monitor*	59°00′N	19°23′W	070	65	+72	1950–2310	HA, RA, RB, RR, N
20th	*Weather Monitor*	58°08′N	15°58′W	070	64	+72	2040–2150	N
23rd	*Weather Adviser*	59°04′N	18°55′W	070	65	+72	0300	RB
24th	*Weather Adviser*	59°00′N	19°16′W	070	65	+72	0100–0800	RB, N
27th	*Weather Adviser*	59°07′N	19°00′W	070	65	+72	0350	N
28th	*Weather Adviser*	59°02′N	18°41′W	070	65	+72	0050, 0400	N
		58°51′N	18°30′W	070	65	+72	1900–2400	HA, RR, N
29th	*Weather Adviser*	58°47′N	18°59′W	070	65	+72	2300–0400	HA, RA, N

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

551.553.22:551.581:551.465.5:551.467

Ice-edge Movements in the Greenland Sea

By R. M. Sanderson
(Meteorological Office)

Sea-ice conditions over the Greenland Sea have shown considerable variability since observations first became available at the beginning of the nineteenth century. In the 109 years of available observations up to 1919, ice was observed near the north coast of Iceland in 4 years out of 5, and in about 1 year in 3 the ice remained near this coast for more than 3 months. The winter of 1917/18, when polar bears were sighted on Iceland, is recorded as the worst in this long period. (Winter is here defined as the period October to May.) There followed a period of comparatively ice-free conditions from 1920 to 1964, though the winters of 1931/32 and 1943/44 produced severe ice conditions near north Iceland.[1] Since 1960 the Meteorological Office has prepared routine sea-ice charts[2] of the area (monthly only at first with the addition of 10-day from 1963 and daily from January 1966). Although the charts of the first few years were based on fairly sparse observations, conditions can be said to have been near normal. In the second half of the 1960s more and more data became available, mainly from commercial aircraft overflying the Greenland Sea on polar routes from north-west Europe to Japan, and from satellites which now produce useful infra-red pictures as well as the more conventional televised display.

Since 1965 it is clear that sea-ice conditions have deteriorated over the Greenland Sea and a return to the severe conditions typical of the early part of this century is indicated. The winter of 1967/68 was particularly severe[3] and after an absence of 50 years polar bears were again unwelcome visitors to Iceland.

Attempts to relate the movement of the ice edge over the Greenland Sea with the mean wind, as has been done successfully elsewhere, at least over periods of a few days,[4] have failed to account satisfactorily for the abnormal rates of advance that have sometimes occurred, even when the effects of current, new freezing etc. have been taken into account. It is suggested that this is mainly because the prevailing wind direction over the area is such that it has only a small component at right angles to the ice edge. In the present article it is shown that if the ice-edge movement is related instead to the mean wind anomaly, i.e. to the departure of the mean wind from its long-term value, then abnormal rates of advance are more satisfactorily explained, being associated with substantial wind anomalies from the north-west or west quadrants.

The formation and movement of sea ice

The formation of sea ice depends on the air and sea temperatures and the depth and salinity of the water. For a given depth and salinity there is a relationship between the integrated deficiency of air temperature below 0°C and the formation and later growth of ice.[5] This temperature deficiency is calculated over a freezing season as the accumulated degree-days below 0°C—thus a day on which the mean air temperature is −3°C contributes 3 degree-days to the total. The movement of the ice is due partly to wind stress on the ice floes, moving them approximately downwind, and partly to the current, which carries the floes along with it.

Over the Greenland Sea a wind from a northerly point brings about a lowering of air temperature, which in turn brings about a lowering of sea temperature. South-flowing currents also lower the sea temperature in a particular area by bringing colder water from the Arctic Ocean. Thus air- and sea-temperature changes are largely due to changes in the surface pressure and current patterns of the region. Since the wind itself considerably influences the sea surface currents, it follows that the wind is the chief factor in producing anomalous sea-ice conditions.

Skov[6] concluded that the annual variations in the ice cover over the Greenland Sea are primarily caused by current variations but that shorter term variations are also due to changes in the air flow over the region. Strübing[7] deduced that the general pattern of variation in the areal cover of ice over the Greenland Sea depends on surface pressure gradients along selected profiles across the main ice streams within the Arctic Basin, but added that the extent of the ice is modified by local factors.

The data

Only well-defined ice edges observed by aircraft or satellite, and extracted from the 10-day ice charts prepared in the Meteorological Office, have been used in assessing the movement of the edge of open pack-ice. For the purpose of this article the ice edge is defined as the outer edge of 4/10 concentration. Data for the winter seasons 1964/65 to 1970/71 only have been used because they were insufficient in earlier years.

Mean wind anomalies were measured directly from 10-day, monthly and seasonal mean surface-pressure anomaly charts regularly prepared by computer in the Meteorological Office and covering a large area centred roughly on the Greenland Sea. The period of the pressure normals on which these charts were based was 1949–62, replaced by 1951–66 from January 1969.

The role of the wind anomaly

Fig. 1 shows the normal mean surface pressure pattern for March and this distribution is typical of the winter months. It also shows the best available average March position of the ice edge, taken from the Oceanographic Atlas of the Polar Seas,[8] which incorporates all available data up to 1956. Although the mean wind in most winter months is strong it lies more or less parallel to the ice edge, being north-north-east to the north and east-north-east to the south of 70°N. Its component at right angles to the ice edge is therefore very small. Nevertheless substantial advances of the ice edge have occurred when the wind has been only a little backed from normal and, although its speed may have been above normal, its component across the edge was still too small to account for the observed movement. Under such conditions, however, it has been noted that the mean wind anomaly component across the ice edge is usually quite strong. Wind anomalies from the north-west quadrant are associated with an advancing edge and those from the south-east with its retreat. Of 36 cases of well-documented changes in the position of the ice edge, about 2/3 were associated with a significant wind anomaly in the same sense and in the remainder the movement opposed the wind anomaly on only 2 occasions. (The results of the analysis are shown in Fig. 4, which will be discussed more fully later.) It would of course have been surprising if there had been no such misfits because there are other factors causing movements of this ice edge. Most of the discrepancies occurred in late spring when melting and the south-westward extension of the head of the 'North Bay' (see Fig. 3 and later discussion) would make a considerable contribution. All cases of substantial advance have occurred in the directions of the semi-permanent branch currents of the area when the rate of the current concerned has been enhanced by a following wind anomaly.

The currents of the Greenland and Norwegian Seas

There are two main currents in the region, the north-going Norwegian Atlantic Current on the eastern side and the south-going East Greenland Current on the western side (see Fig. 2). The former, which later becomes the West Spitsbergen Current, brings warm Atlantic water into the Arctic regions and is the chief reason for the remarkable persistence of open water throughout the year off south-west

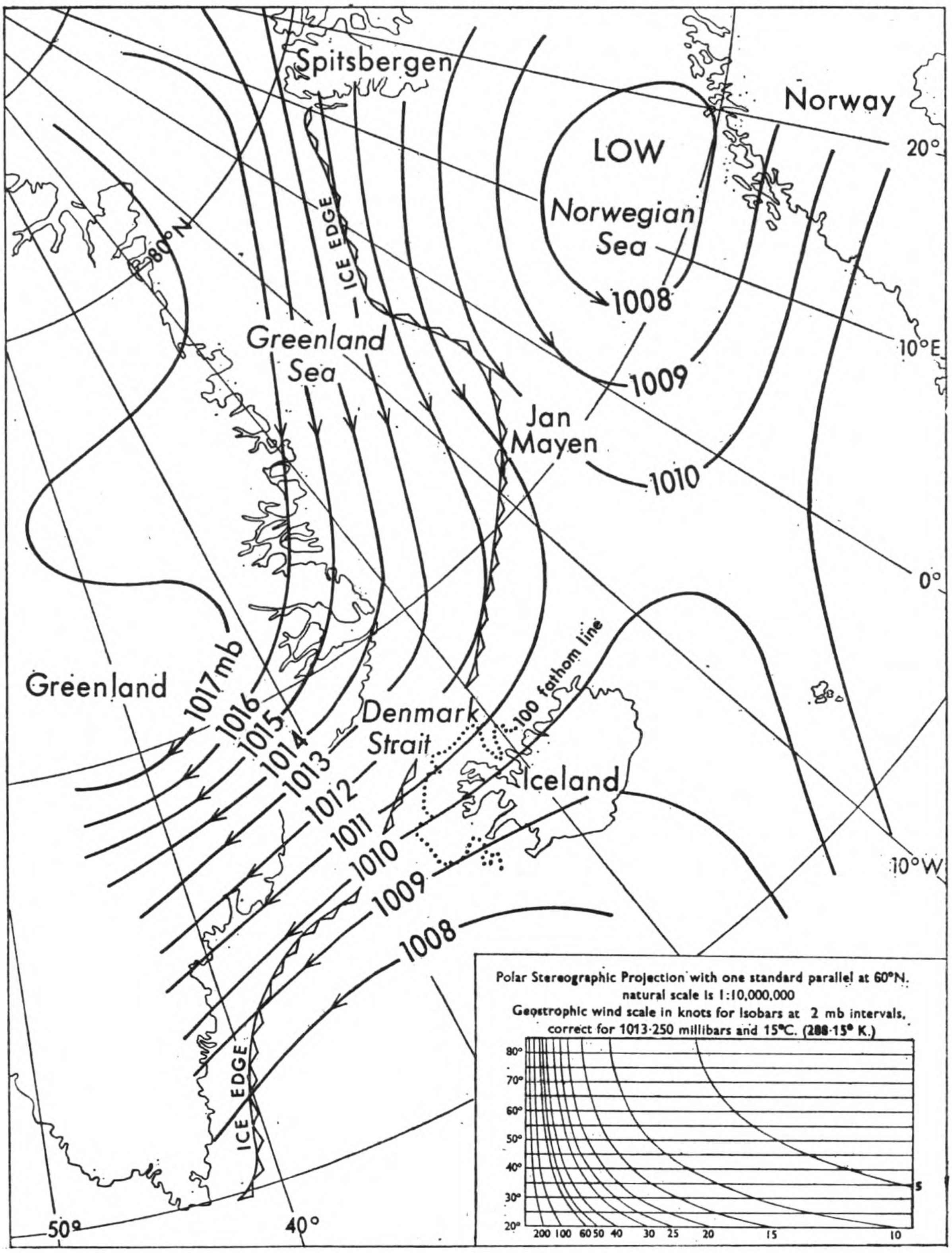


Fig. 1. The edge of open pack-ice (4/10 cover) in March (usually the month of greatest extent) and the normal March mean surface-pressure pattern. (The 100-fm line off north-west Iceland is also shown.)

Spitsbergen. The latter is a cold, ice-bearing stream. Between the two the currents are more variable but there is a pattern of semi-permanent branch currents. The East Greenland Current has three branch currents which are of great importance to the ice situation. Starting in the north, the first is the Jan Mayen Current which sets south-east and later east on the north side of Jan Mayen. The second is the East Iceland Current which leaves the main stream in about latitude 71°N and

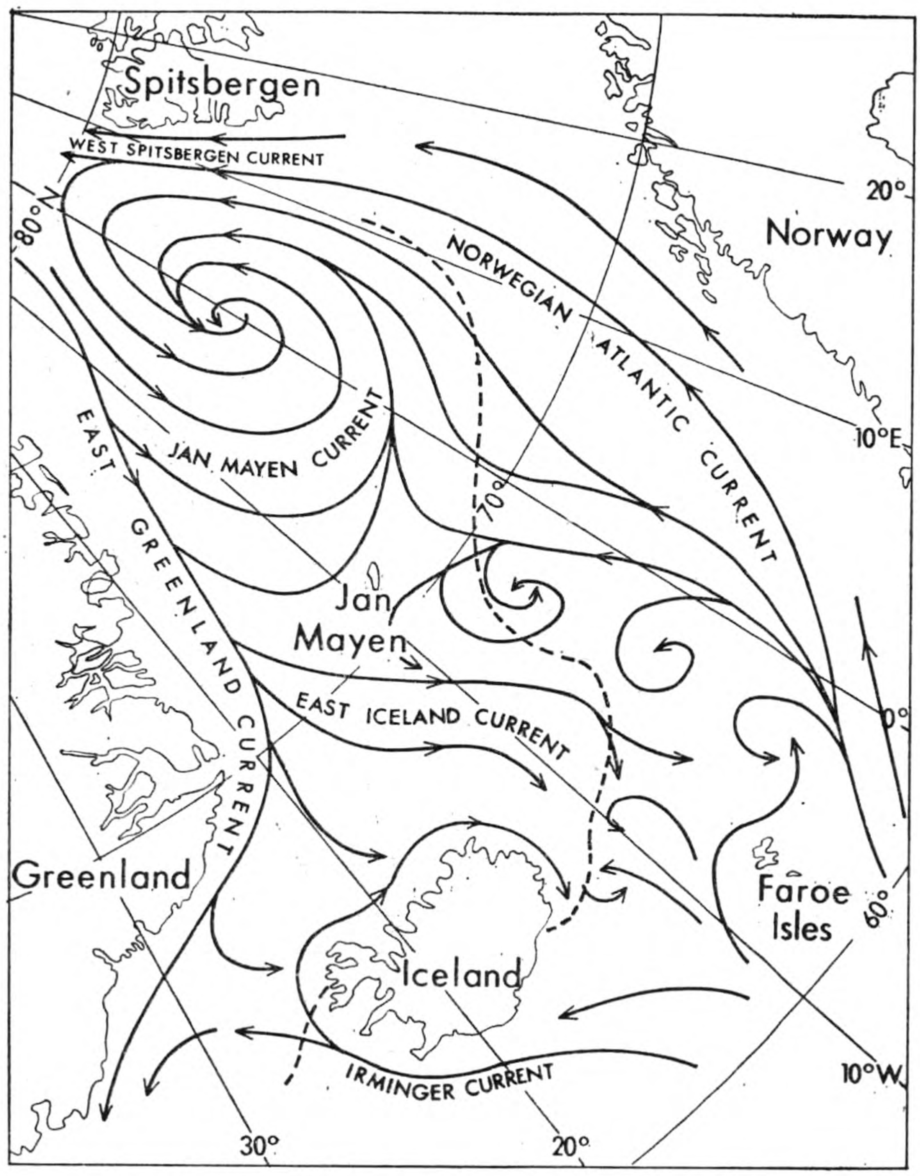


Fig. 2. The general surface-current circulation of the Greenland and Norwegian Seas. (The broken line is an estimate of the position of the main sea-surface temperature gradients when the ice edge has approached the extreme position.)

sets south-south-east towards north-east Iceland, and the third is a small south-easterly setting branch in the narrows of the Denmark Strait. On the eastern side of the region several small branches probe westward to provide an eastern boundary to the East Iceland Current, but the most important is the branch which leaves the western flank of the West Spitsbergen Current, recurves to the south-west and later enters the counter-clockwise gyre centred on the Greenwich meridian in about latitude 76°N. This feed of relatively warm Atlantic water towards the south-west and later south is an important factor in the formation of the 'North Bay'. One last current, of particular importance to Icelandic waters, is the Irminger Current, a branch of the North Atlantic Current, which leaves its parent stream southward of latitude 60°N and sets north-westward towards south-west Iceland. The greater part of this branch crosses the Denmark Strait and recurves south-westward as it meets the East Greenland Current, but a significant part flows clockwise around Iceland to meet the East Iceland Current off the north-east coast and later loses its identity in the mixed waters off the east coast of Iceland.

Under normal early winter conditions, with north-north-easterly winds in the north and east-north-easterly winds in the south, the East Greenland Current, carrying large quantities of pack-ice, sets relatively strongly along the coast of East

Greenland. The only branch current which can be said to be important in these circumstances is that which recurves off Spitsbergen so providing an eastern boundary, at least south of about latitude 79°N, to this stream of pack-ice. However, any backing of the wind, persisting for at least ten days but preferably a month or more, producing a wind anomaly from the north-west or west quadrants, will enhance the rates of the south-east and east-setting branch currents. When this occurs north of latitude 70°N, the rate of the Jan Mayen Current is increased and large quantities of pack-ice may spread eastward as far as 10°E in latitude 74°N as a result. Fig. 3 shows an example of this. Further south, a similar boosting of the East Iceland Current results in the advance of the ice edge towards north-east Iceland, while a similar wind anomaly in the Denmark Strait enhances the south-east-setting branch in the Strait, sending a tongue of ice towards the North Cape of Iceland.

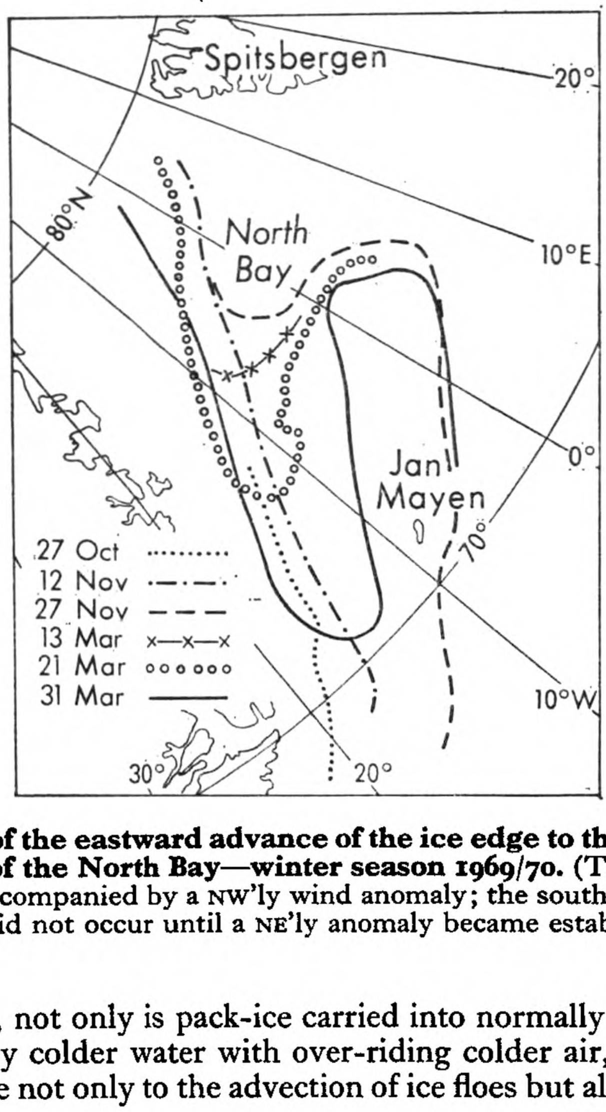


Fig. 3. An example of the eastward advance of the ice edge to the north of Jan Mayen and the formation of the North Bay—winter season 1969/70. (The eastward advance in late November was accompanied by a NW'ly wind anomaly; the south-westward extension of the North Bay did not occur until a NE'ly anomaly became established in March.)

In all these cases, not only is pack-ice carried into normally ice-free regions, but it is accompanied by colder water with over-riding colder air, so that the advance of the ice edge is due not only to the advection of ice floes but also to the local formation of ice.

The 'North Bay' mentioned earlier and shown in Fig. 3 is a feature of the Greenland Sea ice edge which was well known to sealers and whalers of the last century. It is formed when a period of wind anomaly from the north-west or west quadrants, causing a broad tongue of ice to spread eastwards between latitudes 70° and 75°N, is followed by a change to a north-north-easterly wind anomaly. The tongue itself is maintained by a reduced but still effective Jan Mayen Current, but the branch of the West Spitsbergen Current which recurves to the west and later south off Spitsbergen is boosted by the stronger than normal north-north-easterly wind and relatively warm water is driven on to and under the ice. The resulting drift of ice, aided by some melting due to warmer water, form the North Bay.

The pattern of the advance of the ice edge and its approach to North Iceland

An examination of the data for the past six winters (1964/65–1969/70) has revealed the following sequence of events in the development of a severe ice season. It begins some time between October and January when a wind anomaly from the north-west and west quadrants has established an eastward extension of the ice edge to the north of about latitude 70°N as shown in Fig. 3. A return to normal north-north-east winds in this area results in a slow advance south-eastwards of the edge south of latitude 70°N due to the 'head' of ice to the north-east and east of Jan Mayen. Should the north-north-easterly winds be stronger than normal, the North Bay is developed. A period of north-westerly anomaly south of about latitude 71°N during the months December to June results in a boosted East Iceland Current which advances the ice edge towards north Iceland and, if sufficiently persistent, close to the north and north-east coasts with, perhaps, an extension eastward to about the meridian of 10°W. More persistent wind anomalies from a north-westerly point or even, in the case of the eastward extension, a return to normal east-north-easterly winds will drive the ice edge on to the north coast of Iceland. Further persistence of winds from a northerly point will keep the ice on the north coast for many weeks and close the Denmark Strait for a prolonged period. In the case of a wind anomaly from the north-west quadrant the pack-ice will be driven down the east coast of Iceland.

A marked wind anomaly from the north-west quadrant across the Denmark Strait boosts the south-easterly branch current and results in a rapid advance of the ice across the strait towards the 100-fathom line about 40 miles off north-west Iceland, known to fishermen as the Hindenburg Line (see Fig. 1). This effect, which can happen in any month in which ice exists on the north-western side of the strait, seldom, on its own, results in the closing of the strait, due to the relatively warm water of the Irminger Current which has its north-western boundary at about the Hindenburg Line[9] (see Figs. 1 and 2).

On some occasions close pack-ice (concentration 7/10 or more) has affected the north coast of Iceland for several weeks. At these times the warm Irminger waters apparently fail to round the North Cape and, since these conditions are usually associated with strong 'northerly' winds, it would appear that almost all of the surface flow of the Irminger current is diverted across the Denmark Strait to recurve later to the south-west.

An earlier investigation, covering the years 1932–45 and referred to in the *Arctic Pilot*,[1] associated the arrival of sea-ice on the north coasts of Iceland with a preceding period, of ten days or so, of south-westerly winds in the Denmark Strait. In the present investigation mean winds from this direction preceded the arrival of ice in the 1965 season only, and even then not immediately—in the ten-day period immediately prior to the arrival of the ice the actual wind was north-westerly, producing a westerly wind anomaly.

Estimation of the rate of advance of the ice edge

Melting, freezing, the effects of current and long periods without reliable data all contribute in making it difficult to determine a direct relationship between the movement of the ice edge and the associated wind anomaly. However, Fig. 4 presents the results obtained in the form of a scatter diagram, giving also the line of regression of movement on wind anomaly at right angles to the ice edge. (The period of observed movement varies from 4 to 33 days according to the availability of the data. Ice-edge data and associated wind data are from April 1965 to December 1970, from the area of the Greenland Sea between latitude 75°N and the Denmark Strait.) The slope of the regression line indicates that the ice edge moves at approximately 1/64 of the wind anomaly or, in more practical terms, the movement in miles per day is 3/8 of the wind anomaly at right angles to the edge, in knots, meaned over

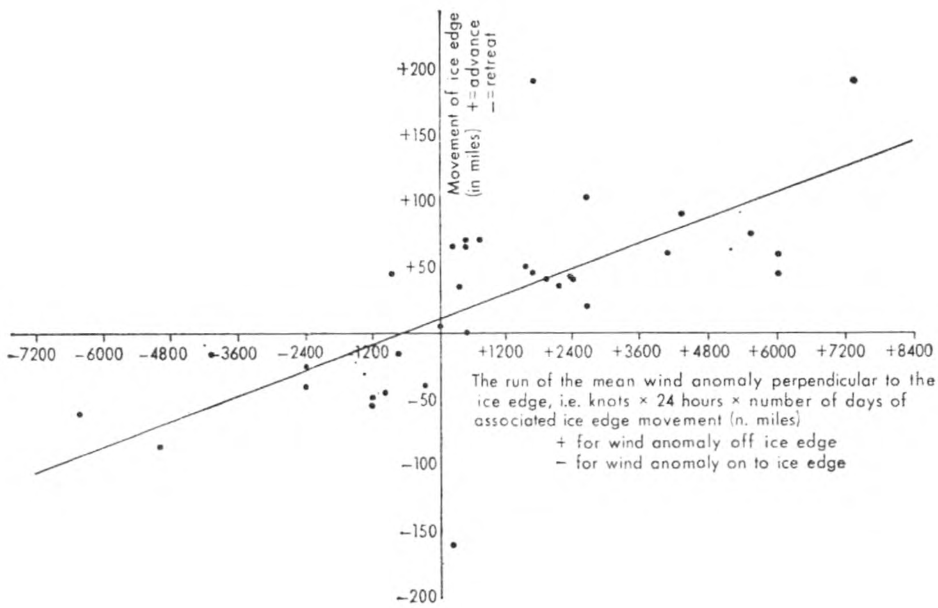


Fig. 4. Scatter diagram of the run of the mean wind anomaly perpendicular to ice edge against observed movement of ice edge. (The line of regression of movement on wind from the equation $y = 11{\cdot}35 + 0{\cdot}0158x$ is also shown.)

the period of the movement. The correlation coefficient is 0·69 and this is significant at the 0·1 per cent level.

The positive intercept on the ordinate in Fig. 4 is the contribution of spatially-meaned current to the movement of the ice edge and it is small. In individual cases, however, as the dispersion of the data shows, the effect of current may be considerable and must be allowed for in applying the relationship. Thus, where the ice edge advances along the main branch currents (the Jan Mayen and East Iceland Currents), the factor 1/64 underestimates the movement and where the advance proceeds against the current (the most likely areas for this are to the south-east of Jan Mayen and off the west coast of Iceland) the movement is over-estimated.

From an inspection of the progress of the 1970/71 winter (until 31st January) it would appear that where the advance occurs along the axis of strongest flow of a branch current (roughly the line along which its name is printed in Fig. 2) a factor of 1/30 of the wind anomaly should be used and where the advance proceeds against the current a factor of 1/150 is more appropriate.

The process of extrapolating the ice edge by means of a fraction of the wind anomaly cannot, obviously, continue indefinitely no matter how favourable the wind conditions. In general, the ice edge will cease to advance when it meets relatively strong surface temperature gradients close to the extreme position of the edge (these gradients themselves will be increased by the proximity of the ice). An estimate of the position of these temperature gradients is shown in Fig. 2.

The 1967/68 winter season

This winter produced the worst ice conditions in the Iceland area for 50 years. Fig. 5 shows the progress of the advance of the ice edge over the Greenland Sea towards and on to the coasts of Iceland; the edges shown are those obtained from aircraft reconnaissance and from satellite pictures. The mean monthly wind anomalies through the winter are shown in Table 1.

In October the edge was located within 50 miles of its normal position but a north-westerly wind anomaly later in that month and in November advanced the ice edge to 5°E at latitude $74\frac{1}{2}$°N. Few or no aircraft reports were received for most of December, January and early February and at these times there is insufficient light north of latitude 60°N to show any ice details on satellite pictures. However, the

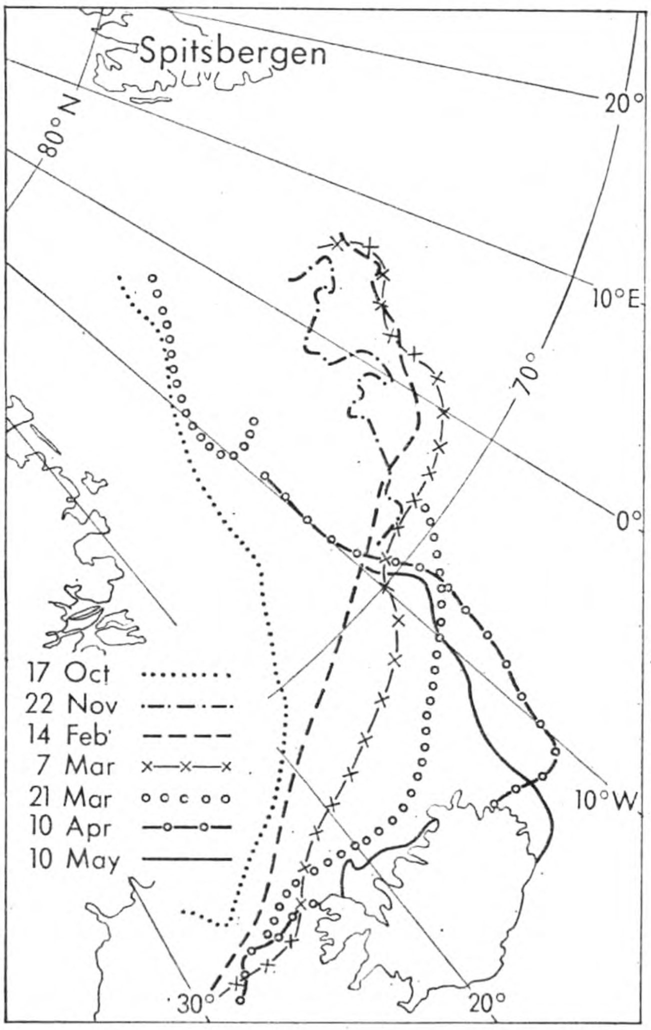


Fig. 5. The advance of the ice edge (4/10 cover) over the Greenland Sea during the severe winter of 1967/68.

mean anomaly throughout this period was about north-easterly and this resulted, as suggested earlier, in a slow advance of the ice edge to the mid-February position shown. During March the mean wind anomaly was north-north-easterly, resulting in a continued advance due to the large sea-ice reservoir north-east of Jan Mayen. By mid-April the edge had advanced on to the north coast of Iceland between longitudes 23°W and 14°W. During April the wind anomaly was west-north-westerly and this pinned the ice on to the coast for the remainder of the month. In early May the ice edge retreated a little from the north coast, perhaps due to melting with the advance of spring, though the moderate north-westerly wind anomaly advanced the ice edge around the east coast of Iceland. In June, with a change to a south-easterly wind anomaly, the ice edge retreated rapidly. Fig. 6 shows the mean surface pressure anomaly from August 1967 to March 1968, the period terminating with the approach of the sea ice to the north coast of Iceland, while Fig. 7 shows the mean surface-pressure anomaly for April when the ice arrived and stayed on the north coast. (A comparison of the normal wind pattern and that at the peak of a severe ice season may be made by a glance at Fig. 1.)

Forecasting ice-edge movements

Having established that an advancing ice edge is associated with a wind anomaly from the north-west quadrant, the question arises as to how such an anomaly may be produced. In the few years of available data since 1964 such wind anomalies usually resulted from a north-eastward displacement of the Icelandic low into the

Table 1. The mean monthly wind anomalies through the winter of 1967/68

North of Latitude 70°N		South of Latitude 70°N						
Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
NE 15 kt	NW 9 kt	NNE 9 kt	NE 8 kt	Light var.	NNE 8 kt	WNW 6 kt	NW 6 kt	SE 4 kt

Norwegian Sea; this, in turn, being associated with a southward extension of the Greenland anticyclone. The resultant surface-pressure anomaly chart will often show a strong positive anomaly over or to the south-east of south Greenland and a strong negative anomaly over the Norwegian Sea. April 1968, a month of very severe ice conditions around north Iceland, is a good example (see Fig. 6).

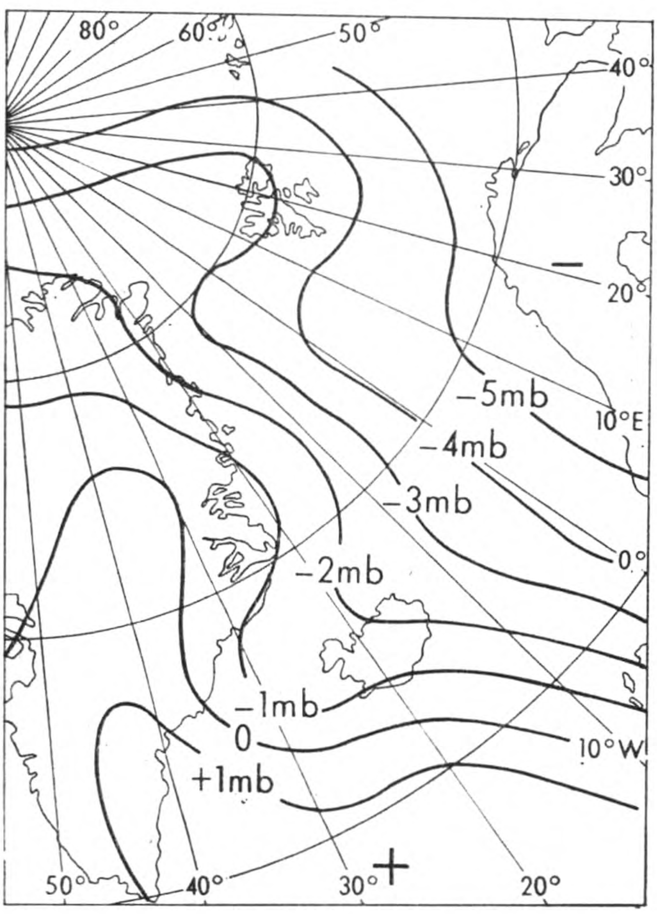


Fig. 6. The mean surface-pressure anomaly from August 1967 to March 1968 inclusive.

If monthly forecasts of surface pressure become available for these areas it follows that an estimate of the movement of the ice edge over the Greenland Sea in the following month may be made by using the derived wind anomalies, adjusted as necessary for current.

Conclusion

Since reliable information on the position of long sections of the Greenland Sea ice edge became increasingly available in 1965, it has been noted that anomalous advances and retreats of the ice edge can be associated with wind anomalies from the north-west quadrant, in the case of an advancing edge, and from the south-east for a retreating one. Wind anomalies from the north-west quadrant boost the south-easterly and easterly-setting branches from the East Greenland Current which

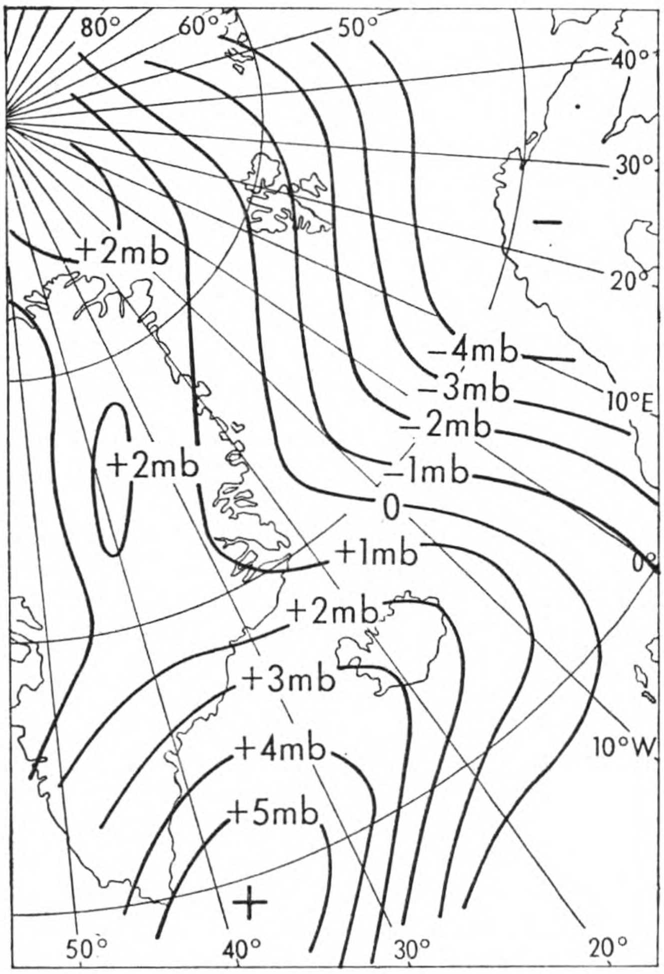


Fig. 7. The mean surface-pressure anomaly for April 1968.

greatly assist the transport of pack-ice (and also lead to the local formation of ice) into areas which are normally ice-free. If sufficiently strong and persistent, these wind anomalies eventually lead to sea-ice reaching the north and sometimes the east coast of Iceland and result in the closing of the Denmark Strait. A good estimate of the rate of advance can be obtained by applying a fraction of the wind anomaly with which it is associated. Eventually it is hoped that monthly forecasts of the sea-ice conditions over the Greenland Sea may be made, as forecast charts of the mean monthly surface-pressure become available.

I am indebted to Mr. G. P. Davis for the discussions which have led to this paper and for preparing some of the diagrams.

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Editor's note. An abstract of this paper was presented at the International Sea-Ice Conference in Reykjavik, Iceland, 10th–13th May 1971.

Isopod Fish Parasites

By Roger J. Lincoln, Ph.D.
(Department of Zoology, British Museum (Natural History))

The January 1971 edition of *The Marine Observer* published the record of a flying fish found on the foredeck of m.v. *Northumberland* when in mid Atlantic on route from Durban to Tenerife. In the mouth of the fish were "several types of live parasite . . . one which was grey in colour was approx. 1½ inches wide with feeler-like legs. (The others appeared to be the normal sea lice.) . . . It was thought that the creature might be some kind of sea scorpion."

I examined the material at the British Museum (Natural History) and identified the parasite as *Ceratothoa impressa*; the large specimen mentioned was a female and the smaller "normal sea lice" was a male of the same species. Photographs of the parasites were published in a later volume of the journal (July 1971) showing the adult female and male, and also the female attached to the inside of the mouth of the flying fish. These fish parasites are members of a very interesting group of animals, and in this short article some of the main features of the group will be outlined.

First of all it is necessary to look briefly at the systematic position of these animals to understand their relationships with other better known groups. The Isopoda, the Order to which they belong, is one of the large divisions of the Class Crustacea containing animals from a wide variety of habitats. Most are marine, but some are freshwater and there are a number of terrestrial forms as well. Isopods of terrestrial habit familiar to all of us are the common woodlice (slaters) and pill-bugs found frequently under stones in our gardens during the summer. A parasitic mode of life has been adopted by quite a large group of isopods and these fall into two major types—those which parasitize other crustaceans and those which attack various types of fishes. Here, we are concerned only with the latter type, and these form a fairly natural group in the Family Cymothoidae within the sub-Order Flabellifera. There are a few members of other families which attack fishes but they tend to be only temporary parasites and spend the rest of their time free-living. The cymothoids are all permanent parasites in the adult stage and have lost the capability to move independently. They show interesting morphological adaptations to this type of existence.

When looking at the morphology of the parasites it is necessary to bear in mind at the same time the position which the animal occupies on the host fish. As might be expected, the form of the animal is closely determined by the nature of its immediate environment. The isopod *Ceratothoa*, photographed in the July edition, is a good example to begin with. It lives in the mouth cavity of the flying fish *Exocoetus* and, as the photograph shows, it is large enough to fill most of the mouth space. Although somewhat bizarre in appearance the shape of the parasite is well suited to withstand the forces of its particular habitat. The body is long and slender, more or less round in cross-section and tapering towards the head end. (The parasite locates itself with its head directed to the outside of the mouth.) This, together with the neat contour of the body segments, offers a minimum resistance to water flow. Also quite prominent are the cup-shaped structures at the bases of the front legs which presumably give a streamlined form to the sides of the body. The main attachment is of course provided by the enormous curved hooks on the ends of the legs. These hooks or dactyls (*see* photograph 3 opposite page 186) have strongly articulated bases and are driven deeply into the lower jaw of the fish to give a formidable grip. It is in fact often quite difficult to dislodge one of these animals when one wishes to examine it. Many other features of the parasite, such as the smallness of the sensory antennae and eyes and the lateral flattening of the legs, are adaptations to this mode of life. As a prevention against being crushed by the jaws of the fish the cuticle is very heavily thickened and calcified, especially at the more vulnerable front end. The above comments refer only to the adult female parasite; the male is very much smaller and is usually found under the abdomen of the larger female, or attached to the sides of the gill arches of the fish. The male shows less extreme modification of form (the ship's personnel describe them as "normal sea lice" in the original report) but is still equipped with the strong dactyls for attachment. More about this sexual dimorphism will be said later.

Not all the parasitic isopods which live in the mouth of their fish hosts locate themselves head outwards. As a single example, *Lironeca convexa* lives on the carangid fish *Chloroscombrus orqueta*, a fish used for bait by the Californian tuna fisheries. The parasite is always found facing inwards, a move which brings the head next to the gill rakers and thus close to a ready supply of food. Although quite a number of cymothoids have become mouth parasites, a large proportion take up residence either on the outer surface of the fish or are hidden beneath the gill operculum. Two genera which attach to the outside of the host's body, *Anilocra* and *Nerocila* (*see* photographs 1 and 2 opposite page 186), can be found in the north-eastern Atlantic. *Anilocra physodes* is a particularly common species found on a variety of shore fish around the British Isles, especially *Labrus* species (wrasses, corkwings) but also gobies, blennies and even sticklebacks. The body shape of these parasites differs markedly from *Ceratothoa*. The body is flattened dorso-ventrally and somewhat oval in outline. This enables the animal to fit closely with the contour of the fish's body, thus offering as little disturbance to water flow as possible. A strong grip is again provided by the sharp curved dactyls—in fact the presence of these hooks on all the legs is a character diagnostic of the family Cymothoidae. Other related families have only some of the legs with 'prehensile' dactyls. Looking at *Nerocila* one sees that the front three pairs of hooks are orientated forwards to cope with acceleration forces produced by the fish, while the posterior ones are directed backwards to counter opposing stresses. In this way the animal is able to retain a firm grip in spite of rapid changes of the direction of movement.

Three cymothoid genera, *Ichthyoxenus* from S.E. Asia, *Riggia* and *Artystone* from South America, show a most unusual choice of site. The parasites bore a hole into the side of the fish's body in the region of the abdominal cavity and live within a membranous sac which invaginates into the body cavity. The aperture is kept open by the leaf-like abdominal appendages of the isopod, which also produce the necessary circulation of water through the sac (*see* photograph 4 opposite page 187).

Cymothoids are distributed widely around the world and occur in all the major seas and oceans. A number have penetrated into fresh water; in South America, for example, they are found in many of the river systems. Recent reports have shown them to be present on the African continent in the Congo basin and in Lake Tanganyika, and they are also recorded from fresh waters of Asia. Apparently they do not occur in any of the rivers of Europe. Some members of the group are host specific and attach themselves to one particular fish species. The Congo river parasite is a good example and, although it is quite common, it is always found on the same host species and never on a closely related species of the same genus. *Lironeca convexa*, mentioned earlier, has only been recorded from the one species of carangid fish. Others, like the local *Anilocra*, are less concerned about the type of fish they adopt as a host.

The life history of many of the parasites is very little understood, largely because of the scarcity of the samples and the difficulties of keeping individuals under laboratory conditions. The biology and behaviour of a few common species have been studied in detail in recent years and this has greatly improved our knowledge of the group. In common with all isopods the adult female carries the developing eggs in a special brood pouch or marsupium formed on the ventral side of the body (*see* photograph 3 opposite page 186). The marsupium provides protection and aeration of the contained embryos. The young animals hatch within the brood pouch and undergo the first moult while still held by the parent. They finally escape from the pouch and are for some time free living; the body has a typical isopod shape and is well equipped for swimming with long hair-like setae on the margins of the appendages. Also, the eyes are prominently developed. From time to time the juveniles attach to a passing fish in order to feed, but are able to detach voluntarily and move about independently. After a period of freedom the young animals fix themselves to their final host and find the required resting site. During the following moults the parasite loses its swimming setae and is no longer motile. The eyes undergo gradual regression also. One very complex but interesting feature of the cymothoids is the question of the determination of the sex of the individual. The animals are in fact hermaphrodites and undergo a sex change during their life history. When first attached to the host they are of male sex and are of small body size. Later, the male organs regress and the reproductive apparatus of the female is developed to maturity. To simplify the life history it is possible to describe 8 separate phases. The first two are passed within the brood pouch, the animals being released as a motile stage 3. Stage 4 is represented by the young male, the sex organs reaching maturity at stage 5—the active male. Stage 6 is the first transition phase marked by the regression of the male apparatus; the female organs beginning to develop in stage 7 by which time the male characters are quite rudimentary. The last stage, 8, is the adult ovigerous female and is the final step in the life cycle. The factors affecting the progressive change from the male stage 5 through to the female stage 8 are complex, and depend upon such things as the presence or absence of other individuals of a particular sex, especially other females. Development beyond stage 5 is likely to be retarded if there is an adult female in close association but may pass quickly in the presence of another male.

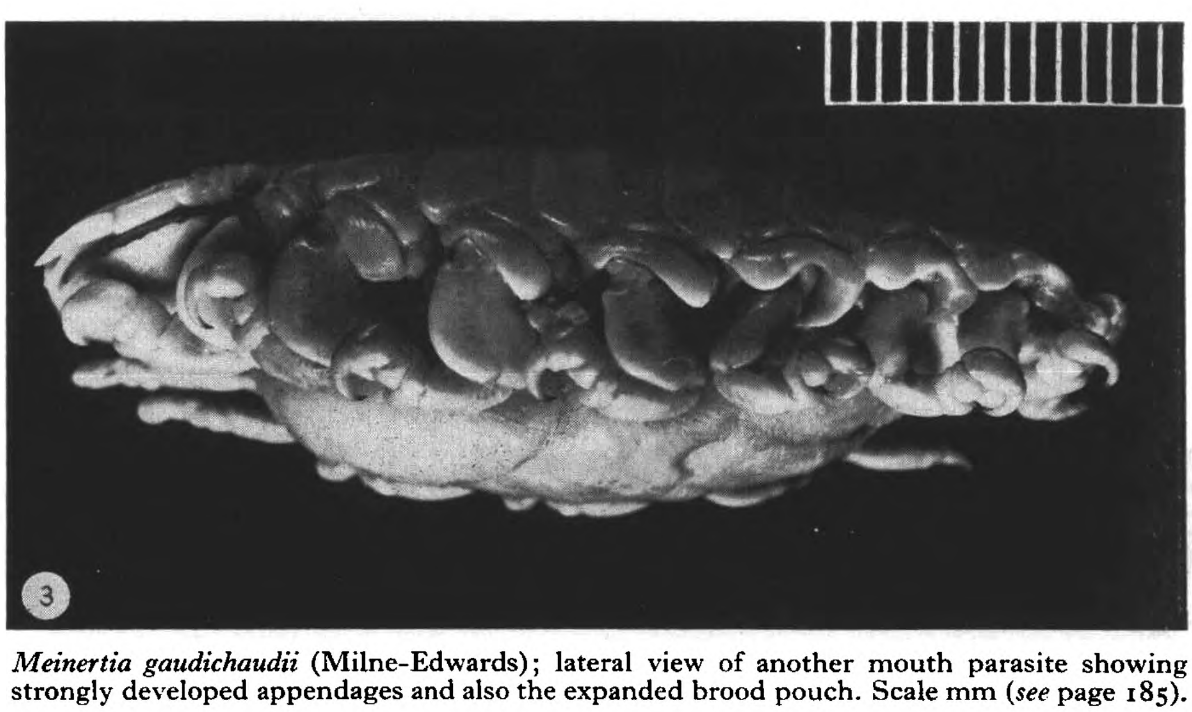
In spite of the large size of some of the parasites and the apparently hazardous places they occupy, the host fishes somehow manage to survive. One wonders how the flying fish is able to feed with its mouth space filled out with an enormous *Ceratothoa*. Equally remarkable is the case of the Tanganyika cichlid fishes; some of these are carnivorous feeders and still seem to cope with a mouth full of parasite (*see* photograph 5 opposite page 187). Those which occupy the gill chambers must seriously impair the water flow through the gill and considerable reduce the efficiency of oxygen uptake. Assuming that the fish outlives its parasite, and remembering the powerful grip the isopod has on the host, it is difficult to see how the fish ever rids itself of its burden. Infestation rates are not normally high, but may occasionally become so, as in the case of *Lironeca convexa* which reached over 80 per cent in the Ecuador region.

The one infrequent encounter that the 'man in the street' has with cymothoids is when they turn up in tinned fish products having passed through the processing plant attached firmly to a fish. The somewhat bizarre shape is a little off-putting and has led to them being referred to as sea scorpions.

A good understanding of the life history of these animals is desirable but because of the sporadic nature of the collections (often of solitary specimens) progress is slow. Any material which is, or becomes available, will be most welcome at the Natural History Museum; freshly collected parasites, preferably attached to the host fish, can be preserved quite satisfactorily in formalin or 70 per cent alcohol.

(*Opposite page* 186)

Anilocra physodes (L.); dorsal view to show smooth outline of body (left) and *Nerocila orbignyi* (Guérin-Meneville); ventral view; note the orientation and powerful development of the dactyls. Scales in millimetres (*see* page 185).



Meinertia gaudichaudii (Milne-Edwards); lateral view of another mouth parasite showing strongly developed appendages and also the expanded brood pouch. Scale mm (*see* page 185).

(*Opposite page* 187)

Artystone trysibia Schioedte; note the parasite enclosed in a membranous sac within the body cavity of the host fish. Scale mm (*see* page 185).

Lironeca africana Lincoln; parasite in the mouth cavity of the cichlid fish host. The side of the fish's mouth has been cut away. Note the large size of the parasite in relation to the mouth of the host. Scale mm (*see* page 186).

NOTES ON ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM APRIL TO JUNE 1971

April

A large anticyclone centred over north-west Greenland dominated the mean pressure pattern over the area. Depressions forming off the American seaboard were less vigorous as they tracked north-eastwards towards the Kara Sea. In general, winds were lighter than normal and in many regions air temperatures were above average, resulting in a fairly widespread, small sea-ice deficit. However, over the northern Greenland Sea, an excessive ice condition persisted and at one time the edge there advanced beyond any known extreme limit.

Canadian Arctic Archipelago, Foxe Basin, Hudson Bay and Strait. Though these areas remained covered by close pack or fast-ice, numerous persistent leads occurred and in most areas, particularly Foxe Basin, ice conditions were less consolidated than usual.

Baffin Bay, Davis Strait, Labrador Sea and Grand Banks. Mainly light and variable winds prevailed and temperatures rose to around 3 degC above normal in the north, though they remained near normal in the south. A slight deficit occurred in the Labrador Sea, while a small excess persisted in the Grand Banks region where the edge was about 50 miles east of normal. On the eastern side of the Davis Strait the belt of close pack-ice extended about 120 miles north-west of its normal position; otherwise ice conditions were near normal.

South Newfoundland, River and Gulf of St. Lawrence. Both areas were ice-free at the end of the month. Existing atlases show that there is normally a little ice at this time, but these areas have been ice-free at the end of this month for 4 out of the past 5 years.

Greenland Sea. A considerable excess persisted to the north of 71°N throughout the month. At one time the bulge north-eastwards of Jan Mayen advanced to 11°E at 74°N, a new extreme limit; north-easterly winds later drove the ice back towards the Greenwich meridian. Nevertheless, at the end of the month the ice edge lay about 100 miles east of normal between 70°N and 75°N. Over the remainder of the Greenland Sea the ice situation was near normal.

Barents Sea and White Sea. Moderate north-easterly winds prevailed towards the end of the month, resulting in air temperatures falling to as much as 11 degC below normal in some places. The Barents Sea deficit of the previous month was thus reduced; nevertheless the edge lay 30 miles back from normal in the south-east, and about 100 miles back in the north-east. In the north-west, near Spitsbergen, the edge lay 20 miles south of its normal position. Despite the wide lead in the White Sea, ice conditions there were near normal.

Baltic. Though temperatures fell to about 4 degC below normal following the onset of north-easterly winds, there was a deficit over those regions which are normally still affected by ice at the end of this month—the Gulfs of Bothnia and Finland and the Swedish coast of the Baltic Sea.

May

Apart from a mean low pressure area near south Iceland, a fairly slack pressure pattern prevailed over the sea-ice regions, resulting in light and variable winds in most areas and a general recovery to near normal temperatures.

Canadian Arctic Archipelago, Foxe Basin, Hudson Bay and Strait. South to south-easterly winds prevailed in Amundsen Gulf where the recurring polynya opened up from the mainland coast and extended from the Mackenzie River in the west to the entrance to Dolphin and Union Strait in the east. A long lead persisted along the west coast of Banks Island and north-east along the west coast of Prince Patrick Island and, in the east, break-up was beginning on the southern side of Lancaster Sound. Wide leads opened up from both the west and east coasts of Hudson Bay, sometimes up to 90 miles wide, while the ice in James Bay broke to very open pack; a wide lead also opened up on the north side of Hudson Strait. Leads and polynyas in Foxe Basin were more frequent than normal. Over all there was a sea-ice deficit in the region.

Baffin Bay, Davis Strait, Labrador Sea and Grand Banks. Light and variable winds prevailed over the greater part of the region and end-of-month temperature anomalies ranged from 2 degC below normal in the north to as much as 4 degC above in the extreme south. The North Water and the west Greenland flaw lead north of Disko were larger than normal. The main ice edge in the Davis Strait retreated about 60 miles though there was little change in its position along the Labrador coast except in the extreme south-east where winds from a westerly point drove the ice eastwards to 54½°N at 50°W. Belle Isle Strait and its approaches

Table 1. Icebergs sighted by aircraft and merchant ships within latitudes 40°N–65°N and longitudes 40°W–65°W

(This does not include growlers or radar echoes)

Limits of Latitude and Longitude		Degrees North and West												
		66	64	62	60	58	56	54	52	50	48	46	44	42
Number of bergs reported south of limit	April	> 208	> 188	> 148	127	127	127	127	127	64	5	4	0	0
	May	> 132	> 128	> 97	> 88	> 88	> 88	> 88	86	67	3	0	0	0
	June	> 90	> 90	68	60	39	39	39	10	1	1	0	0	0
	Total	> 430	> 406	> 313	> 275	> 254	> 254	> 254	223	132	9	4	0	0
Number of bergs reported east of limit	April	> 208	> 208	> 208	> 208	> 208	> 208	> 152	> 124	> 83	37	13	0	0
	May	> 132	> 132	> 132	> 132	> 132	> 132	> 128	> 79	> 22	11	1	0	0
	June	> 90	> 90	> 90	> 90	> 90	> 90	> 60	39	25	23	8	0	0
	Total	> 430	> 430	> 430	> 430	> 430	> 430	> 340	> 242	> 130	71	22	0	0
Extreme southern limit	April	45° 32′N, 48° 47′W on 15.4.71												
	May	46° 17′N, 49° 10′W on 1.5.71												
	June	47° 09′N, 51° 03′W on 6.6.71												
Extreme eastern limit	April	48° 35′N, 44° 25′W on 18.4.71												
	May	48° 20′N, 45° 15′W on 11.5.71												
	June	59° 24′N, 44° 54′W on 3.6.71												

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

Extreme limits during the 3-month period are underlined.

cleared completely during the month though, in the offing, open pack-ice extended southwards to 51°N. The Labrador Sea ice extended 100 miles further south-east than normal. Off south-west Greenland close pack-ice, breaking to open pack, extended westwards to 54°W at 61°N, about 100 miles west of normal.

Greenland Sea. Easterly winds prevailed near north Iceland; otherwise winds were mainly light and variable. As a result air temperatures recovered to near normal and, in the region north of Iceland, sea temperatures rose to 1–2 degC above average. The mean wind anomaly (the departure of the mean wind from its long-term average) in the region between 67°N and 74°N was south-easterly and, as a result, the ice edge retreated north-westwards in this region (see article on page 173), in places by as much as 180 miles, where it lay 80 miles back from its normal position. In the areas north of 75°N and south of 67°N the ice edge lay close to the April position; in these areas ice conditions were near normal.

Barents Sea, White Sea and Baltic. The low temperatures in the south last month quickly recovered to normal but northerly winds late in the month resulted in another drop to around 4 degC below normal. In the north winds were light and variable and temperatures recovered to near normal. The ice edge lay from the eastern side of Storfjord in Spitsbergen south to 75½°N (some very open pack extending to Bear Island) where it turned east to run along that parallel to the coast of Novaya Zemlya. Off the west coast of that island the ice had broken up to very open pack. Close pack closed the gulfs of the mainland coast from 60°E to Mys Kanin Nos, while a narrow belt of close pack extended northwards from Mys Voronov. Within the White Sea, though open water predominated, areas of close pack-ice persisted in the north-west and in the north-east. The Gorlo and the approaches to Arkhangel'sk were unaffected by the latter ice area. In the Baltic a little very open pack-ice remained at the head of the Gulf of Bothnia. A small excess persisted in the north-west Barents Sea, but in the east and south the ice edge lay about 100 miles back from normal. In the White Sea there was an ice deficit, but ice conditions were near normal in the Baltic.

June

The mean pressure chart for this month shows a high pressure area over central Greenland, with a ridge extending westwards into the Beaufort Sea and a low pressure area over Labrador. As a result, winds were mainly from the north-east quadrant over areas to the east of Greenland and mainly from the south-east quadrant over areas to the west.

Canadian Arctic Archipelago, Foxe Basin, Hudson Bay and Strait. Easterly winds prevailed in the south and east while south-easterlies prevailed in the north and west; air temperatures ranged from 2 degC above normal in the north to 2 degC below in the south. In the west the Amundsen Gulf polynya widened northward to approach the south coast of Banks Island and

Table 2. Baltic Ice Summary: April–June 1971

No ice was reported at the following stations during the period: Göteborg, Kalmar, Visby, Mantyluoto, Ventspils, Klaipeda, Gdansk, Stettin, Emden, Bremerhaven, Gluckstadt, Tönning, Husum, Flensburg, Kiel, Lübeck, Copenhagen, Aarhus, Oslo, Kristiansandfjord.
No ice was reported at any of the stations during June.

Station	April									May								
	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
Leningrad	1	7	7	3	0	5	0	0	611	0	0	0	0	0	0	0	0	—
Riga	1	5	5	0	0	2	0	0	157	0	0	0	0	0	0	0	0	—
Pyarnu	1	14	14	10	3	0	13	0	258	0	0	0	0	0	0	0	0	—
Viborg	1	30	30	24	0	5	11	13	—	1	3	3	0	0	3	0	0	—
Tallin	1	20	20	0	15	4	14	0	—	0	0	0	0	0	0	0	0	—
Helsinki	1	11	11	6	1	3	7	0	468	0	0	0	0	0	0	0	0	—
Mariehamn	1	4	4	0	3	4	0	0	260	0	0	0	0	0	0	0	0	—
W. Norrskar	1	30	24	0	0	14	0	0	—	1	1	1	0	0	0	0	0	—
Turku	1	10	10	2	0	8	0	0	378	0	0	0	0	0	0	0	0	—
Vaasa	1	18	18	18	0	0	18	0	706	0	0	0	0	0	0	0	0	—
Oulu	1	30	30	30	0	0	30	0	1147	1	3	3	3	0	0	3	0	957
Roytaa	1	30	30	30	0	0	30	0	—	1	31	31	14	14	0	31	0	—
Lulea	1	30	30	30	0	0	30	0	1280	1	18	18	18	0	4	14	0	1092
Bredskar	1	20	7	0	0	7	0	0	—	0	0	0	0	0	0	0	0	—
Alnosund	1	30	28	9	0	11	8	0	—	1	2	2	0	0	2	0	0	—
Stockholm	1	18	18	0	0	7	0	0	96	0	0	0	0	0	0	0	0	—
Skellefteå	1	30	30	30	0	0	30	0	—	1	5	5	3	0	0	5	0	—

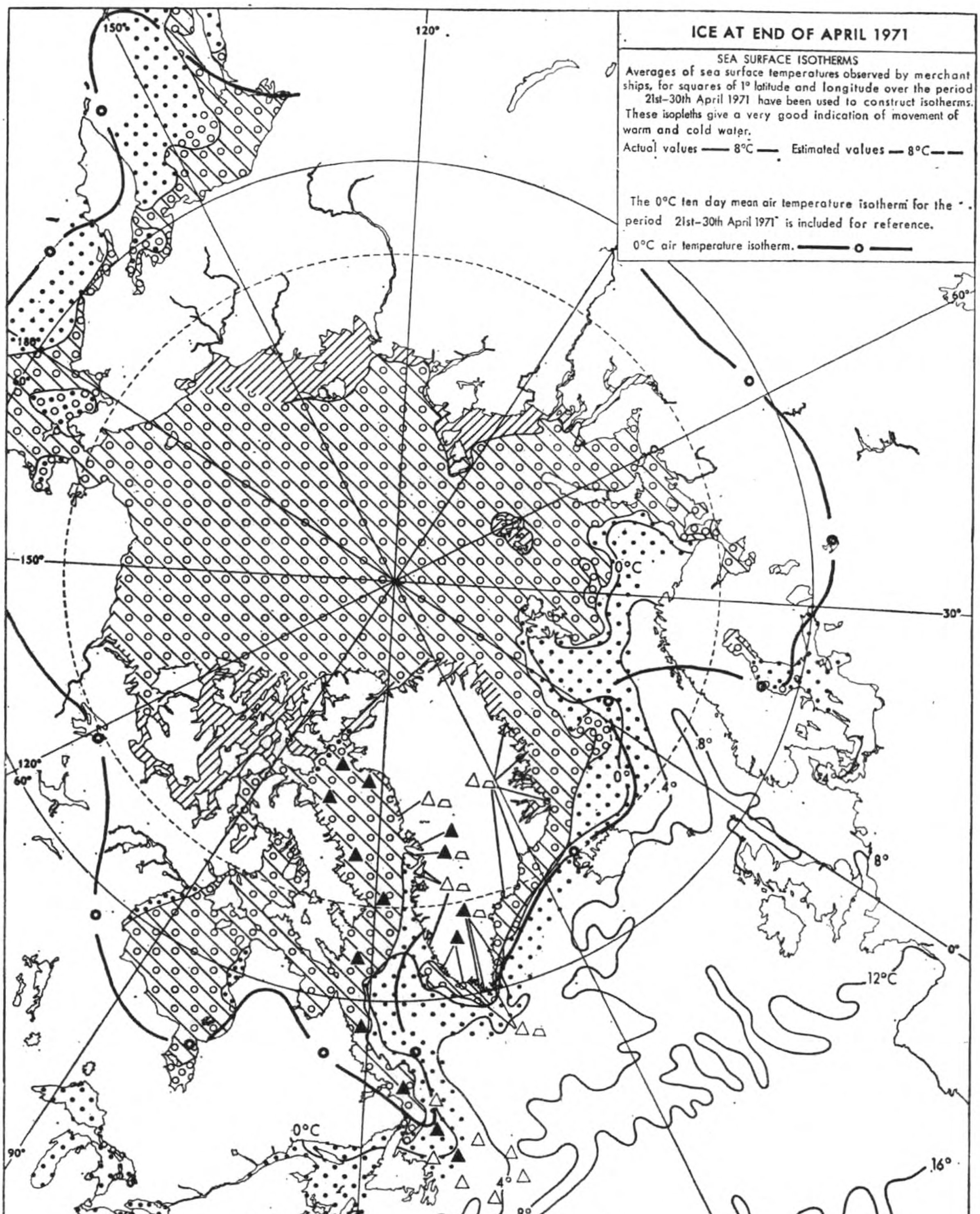
CODE:
A First day ice reported.
B Last day ice reported.
C No. of days that ice was reported.
D No. of days continuous land-fast ice.
E No. of days of pack-ice.
F No. of days dangerous to navigation, but assistance not required.
G No. of days assistance required.
H No. of days closed to navigation.
I 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.

extended westwards along the Alaskan coast to Camden Bay. Further east, the ice in the narrows of Dolphin and Union Strait decreased to open pack concentration, while in the north a wide lead persisted off north-west coasts from Banks Island to Borden Island. An open water off-shoot from this lead reached eastwards to 120°W in McClure Strait, an exceptional condition in any month. In Lancaster Sound break-up was confined to a small area of very open pack-ice between 88° and 90°W with open and close pack further east. In the far north-west of Foxe Basin the ice broke to very open pack while in Foxe Channel break-up progressed to open pack concentration. Easterly winds closed the western shore lead in Hudson Bay but widened the eastern lead until its western edge lay from the western side of the Belcher Islands to the eastern end of Coats Island, where open water existed off the north and west coasts. An open water channel linked the ice-free eastern side of Hudson Bay with a large open water area in the eastern and southern parts of James Bay. Within Hudson Strait a wide lead persisted off the north-east shore from 67° to 75°W.

In the far west of the archipelago there was a substantial sea-ice deficit, while in the east break-up in Lancaster Sound was behindhand. Over the more southern areas the ice situation was near normal.

Baffin Bay, Davis Strait and Labrador Sea. Winds were light and variable in the north and mainly easterly or south-easterly in the south; air temperatures were generally around 2 degC below normal, while sea temperatures were close to normal. At the end of the month the ice edge, leaving the coast of Greenland in 71½°N, passed through 65°N, 60°W and 61½°N, 65°W before turning south-east to meander along the Labrador coast in a 20–100 mile-wide belt, finally terminating at about 54½°N, 54½°W; isolated small fields of very open pack-ice and detached belts of ice persisted beyond this south-eastern limit. The m.v. *Daghestan* struck such a belt 40–50 miles long, in fog, on 19th June at 53° 38′N, 51° 40′W, about 120 miles beyond the main edge. Southwards of 60°N, the concentration within the Labrador ice field gradually decreased from close to very open pack-ice. On the eastern side of the Davis Strait, off south-west Greenland, a belt of close pack-ice extended westwards to 54°W and northwards to 63°N. (The normal very open pack-ice limit for this month is 61°N, 49°W.)



Open water	Fast-ice	N New ice or Nilas	Few bergs (<20)	Radar boundary
Lead	Ridged ice	P Pancake	Many bergs (>20)	Known boundary
Polynya	Rafted ice	Y Young ice	Few growlers (<100)	Assumed boundary
New or degenerate ice	Puddled ice	F First-year ice	Many growlers (>100)	
Very open pack-ice (1/10–3/10 inc.)	Hummocked ice	S Second-year ice	Cracks	
Open pack-ice (4/10–6/10 inc.)	(The symbols for hummocked and ridged ice etc. are superimposed on those giving concentration)	M Multi-year ice	Radar target (probable ice)	Note:- The plotted symbols indicate predominating conditions within the given boundary. Data represented by shading with no boundary are estimated
Close, very close or consolidated pack-ice (7/10–10/10)				

Excessive ice conditions existed in Baffin Bay, where the North Water and the west Greenland shore lead were smaller than usual, over the Labrador Sea where the edge of open pack-ice, at 54½°N, 56½°W, extended about 200 miles south-east of normal, and off south-west Greenland. On the western side of the Davis Strait, however, there was a small sea-ice deficit.

Greenland Sea. At the end of the month the edge of close pack-ice meandered south-westwards from north-west Spitsbergen through the following points: 80½°N, 0°; 77°N, 2½°W; 73°N, 11°W; 69½°N, 19°W; 67°N, 24°W; 64°N, 40°W; the edge finally rounded Cape Farewell about 30 miles in the offing. The mean wind anomaly accounts for a great deal of the ice-edge movement. North of 73°N the wind anomaly was east-north-easterly; here the ice edge continued to retreat more rapidly than normal, especially around 75°N where it was located as far as 100 miles back from normal. Between 70°N and 73°N the wind anomaly was northerly, resulting in a reduction of last month's deficit, though the edge still lay 30–90 miles back from normal. Over the Denmark Strait the wind anomaly was north-westerly and therefore favourable for the advance of the ice edge; by the end of the month the edge of very open pack-ice moved south-eastward to the Hindenburg Line (about 40 miles off the north-west coast of Iceland: some 30 miles beyond its normal position).

Barents Sea. Mainly northerly winds prevailed over the area though latterly the northerlies were replaced by strong easterly winds. Air temperatures, near normal in the north, remained about 4 degC below normal in the south. The edge of close pack-ice lay from south-west Spitsbergen to 75½°N, 25°E then turned east and meandered through the following points: 75½°N, 35°E; 77½°N, 51°E and 76°N, 52°E before finally closing the coast of Novaya Zemlya at 62°E. Beyond this edge lay a 30 mile-wide fringe of very open pack-ice. In the south-east of the area the coast eastward of 54°E was blockaded by a belt of close pack-ice, while to the west of this point some very open pack fringed the coast to Cheshskaya Guba. In the north the ice situation was finally restored to normal after five months of relatively light ice conditions. In the south-east there was more ice than usual.

White Sea and Baltic. Both areas, as normal, became ice-free during the first half of the month.

R. M. S.

Note. The notes in this article are based on information plotted on ice charts similar to the map shown opposite but on a much larger scale (39 in × 27 in). These charts are published at ten-day intervals and are available at the price of reproduction on application to the Director-General, Meteorological Office (Met.O.10a, D.W.R.), London Road, Bracknell, Berks. Alternatively, they may be seen at any Port Meteorological Office or Merchant Navy Agency. Up-to-date ice charts are broadcast daily by facsimile.

SPECIAL LONG-SERVICE AWARDS

Each year since 1948 the Director-General of the Meteorological Office has made special awards to the four voluntary marine observers whose long and zealous work on behalf of the Meteorological Office is considered as deserving special recognition. All officers who have been observing for us in fifteen actual years or more and who have compiled at least one meteorological logbook during the previous year come within the zone of the special award scheme and each year their personal records are scrutinized. However, the vagaries of shipping, shipping depressions, time spent ashore studying for certificates, time spent in non-observing ships or time spent in observing ships in a capacity not involved in the observing, etc. will often spread the fifteen years over a much longer period; even forty years is by no means unknown.

This year there were 83 shipmasters in the zone and the Director-General is pleased to make the special awards to the following shipmasters:

1. Captain J. Illingworth of Manchester Liners whose first meteorological logbook was received here from the *Manchester Shipper* in 1951. During 20 years as a voluntary observer he has sent us 32 meteorological logbooks of which 22 have been classed 'Excellent'.

2. CAPTAIN I. Y. BATLEY of the New Zealand Shipping Co. During 19 years service as voluntary observer, since his first meteorological logbook came here in 1947 from the *Ruahine*, he has sent us 32 records of which 26 have been classed 'Excellent'.

3. CAPTAIN H. D. T. LOCKYER of the British and Commonwealth Shipping Co. Ltd. Captain Lockyer's first meteorological logbook came here in 1929 when he was in the *Clan Macindoe* and in 21 years of observing he has sent us 41 books of which 18 have been classed 'Excellent'.

4. CAPTAIN W. J. LAW, R.D. of the Cunard Line. Since his first meteorological logbook was received in 1934 from the *Silverwalnut* he has, in 21 years of observing, sent us 52 meteorological logbooks, 20 of which have been classed 'Excellent'.

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

L.B.P.

CANADIAN EXCELLENT AWARDS

(The following statement has been received from the Administrator of the Canadian Meteorological Service.)

The winners of the annual Canadian Excellent Awards for voluntary marine weather observing in 1970 have been announced and are listed on pages 193 to 194.

Traditionally our awards take the form of suitably inscribed books which we think will be of interest to mariners. There are three categories of awards:

The Ship Award, for excellence in regard to quality and quantity of reports. The book is presented to the master for the ship's library for all to enjoy. The award in 1970 was *Great Sea Battles*, by Oliver Warner.

The Principal Observing Officer Award, for excellent individual effort in regard to quality and quantity of reports. A copy of *The Atlas of the Universe*, by Patrick Moore, was presented to the top fifteen officers.

The Radio Officer Award, for transmitting the greatest number of weather reports. A copy of *The Strange Voyage of Donald Crowhurst*, by Nicholas Tomalin and Ron Hall, was presented to the top fifteen Radio Officers.

We wish to express our sincere gratitude to all those who participated in the marine weather observing programme sponsored by the Canadian Meteorological Service.

PRESENTATION OF AWARDS AT HONG KONG

The following nineteen officers from five of the Hong Kong Voluntary Observing Ships were selected for awards and each officer was presented with a weather instrument or a book on meteorology, together with a certificate of appreciation, at a brief ceremony at the Royal Observatory on 10th March 1971 (*see* photograph opposite page 194).

Eastern Rover: Mr. J. A. Cameron, Mr. I. W. McGerty, Mr. I. F. Godber, Mr. P. C. Chan.

Hai Meng: Mr. I. Hestholm, Mr. B. Egeland, Mr. K. Karlsen, Mr. M. L. Narasimhan.

Hoi Wong: Mr. L. Moen, Mr. Rolf G. Rasmussen, Mr. Chan Shiu Wing, Mr. T. E. Johnsen.

Kweichow: Mr. I. D. Fletcher, Mr. T. W. Robertson, Mr. M. A. J. Dawes, Mr. Kwong Shek Hee.

Tai Wah Shan: Mr. Yu Chi Tai, Mr. Ip Hung Wai, Mr. Wong Che Ying.

Recipients of Canadian Excellent Awards—1970

Name of Vessel	Captain(s)	Principal Observing Officers	Radio Officers	Owner/Agent
Baffin	P. M. Brick	D. Deer	J. E. Furness	Government of Canada
Belblue	P. H. Hansen, K. Hoversholm	—	—	North Pacific Shipping Co. Ltd.
Bluenose	W. H. Crocker	D. Vail, H. Whitehead	—	Canadian National Railways
Canberra	E. G. H. Riddelsdell, W. B. Vickers	J. B. Kilner	R. J. Hawkins	P. & O. Orient Lines
Cornish City	D. L. Beynon, F. J. Johns	—	—	Sir Wm. Reardon Smith & Sons Ltd.
Dawson	F. W. Mauger, W. J. Vieau, M. J. A. Wagner	B. R. Smith	G. Rayne	Government of Canada
Emerillon	C. A. Bradshaw	P. L. P. Kee	—	Shell Canadian Tankers Ltd.
Gypsum Countess	R. Koppel, R. T. Luckey	—	E. M. O'Sullivan	Fundy Gypsum Co. Ltd.
Gypsum Empress	C. H. Brook, E. S. Creaser, O. K. Langdon	—	D. J. Webb	Fundy Gypsum Co. Ltd.
Gypsum Prince	R. H. Behnan, N. Crowe, R. S. Kelly	C. R. Coste	—	Fundy Gypsum Co. Ltd.
Gypsum Queen	J. A. Blinn, O. K. Langdon	—	I. R. Dodd	Fundy Gypsum Co. Ltd.
H. R. MacMillan	G. E. Gamblin, B. G. Roberts, J. Waling	—	—	Canadian Pacific S.S. Ltd.
Hudson	D. W. Butler, F. W. Mauger	L. A. Griffin	P. B. Rafuse	Government of Canada
H 1070	G. Blaney, J. Harding, P. Potts	—	D. V. Cruise	Kent Line Ltd.
Irving Glen	J. Harding, K. Milburn, H. Olthafer	—	R. Phillips	Kent Line Ltd.
Isabel Erica	W. Newman	—	—	Mitsui O.S.K. Lines Ltd.
Ixia	J. H. Gray, W. R. Hunter, G. W. Mortimer	E. B. Bertelsen	W. Anderson	Stag Lines Ltd.
John A. Macdonald	G. S. Burdock, P. M. Fournier, G. S. Yarn	—	N. T. Kristensen	Government of Canada
J. V. Clyne	G. E. Gamblin, J. W. Hooley, D. Tranter, J. Waling	P. B. Bell	—	Canadian Pacific S.S. Ltd.
Kapuskasing	J. W. C. Taylor, W. J. Vieau	—	N. G. Best	Government of Canada
Mare Tranquillo	B. M. Manzetti	—	—	North Pacific Shipping Co. Ltd.
Nego Anne	E. Fosse, H. Oskarsson	—	—	Willem Co. A/S
North Breeze	J. E. Hall	D. O. Booth	P. W. Kamath	Manners Navigation Co. Ltd.
N. R. Crump	J. Richardson, P. J. Roberts, A. R. Whyte, W. E. Williams	—	—	Canadian Pacific S.S. Ltd.
Oriana	R. J. H. Cutler, W. B. Vickers	—	—	P. & O. Orient Lines

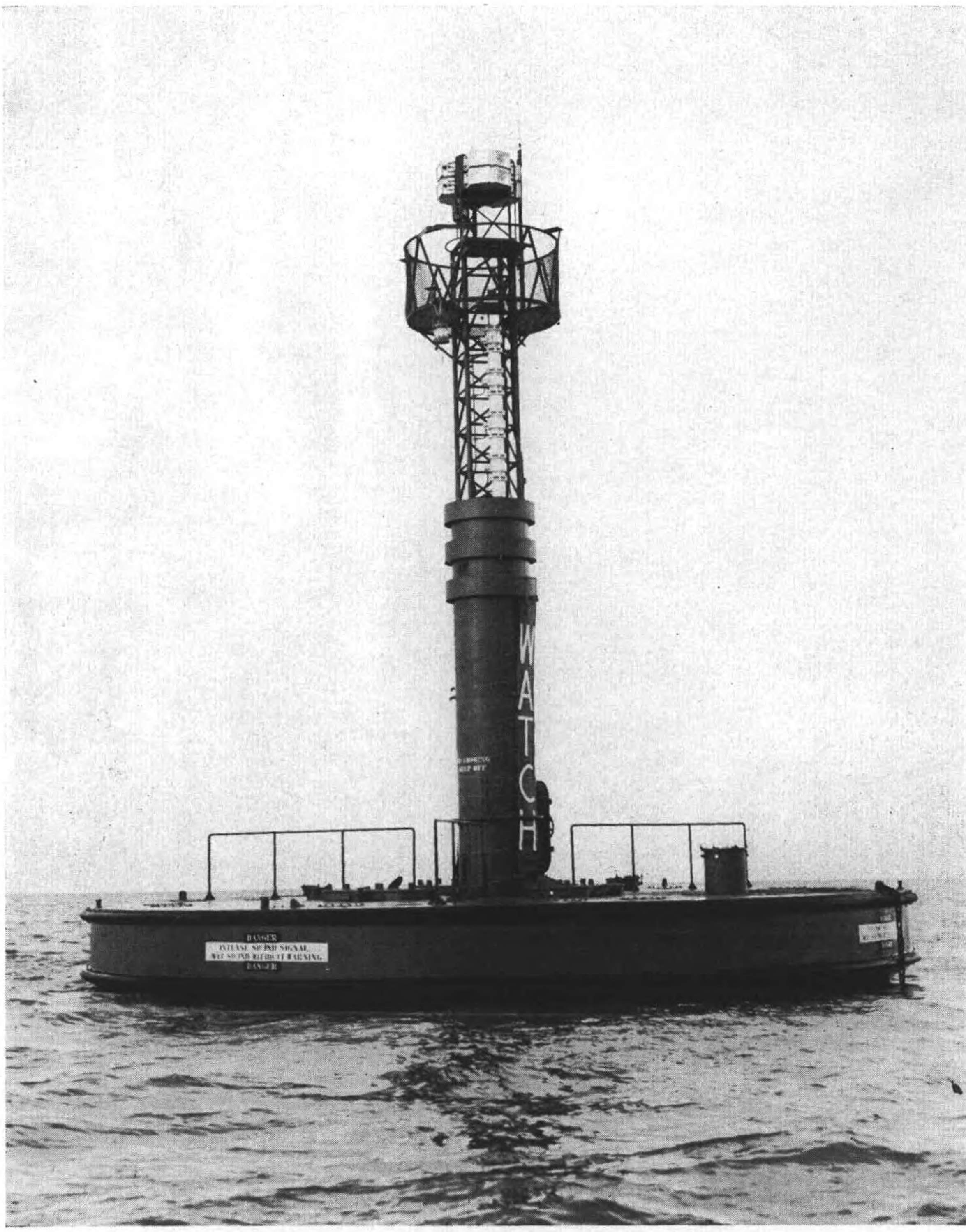
Canadian Excellent Awards (*contd.*)

Name of Vessel	Captain(s)	Principal Observing Officers	Radio Officers	Owner/Agent
Princess of Acadia	J. A. Blinn	P. Petrovitch	—	Canadian Pacific Railways
Queen of Prince Rupert	J. Hicks, C. C. Ruddick	—	R. B. Barrie	British Columbia Ferry Authority
Sedneth I	—	K. A. Strach	—	Shell Canada Ltd.
Silvercape	D. W. Bowen, M. R. Duke, R. W. Safe	D. Fielden	J. D. Leahy	Silver Lines Ltd.
Sir Humphrey Gilbert	G. W. Brown, J. Rose	D. Daly	—	Government of Canada
Star Columbia	G. Y. Hjerto, H. Rossback	—	—	Star Bulk Shipping Co. Ltd.
Stove Caledonia	S. Askim, A. Almehaben	—	—	Stove Shipping Co.
Worcestershire	D. R. Clayton, R. Weir, J. R. Woodfield	—	—	Bibby Lines Ltd.

(*Opposite page* 194)

Presentation of awards in Hong Kong; left to right: Capt. J. F. O'Connor, Nautical Adviser, China Navigation Co. Ltd., Mr. U Kai Ming, Operations Manager, Shun Cheong S.N. Co. Ltd., Mr. T. Vinde, Manager, Norwegian Asia Line, Mr. G. J. Bell, Director, Royal Observatory, Mr. K. Bergan, Manager, Karsten Larssen & Co. Ltd. and Capt. G. P. Parish, Marine Superintendent, Indo-China S.N. Co. Ltd. (*see* page 192).

(*Opposite page 195*)



The Large Automatic Navigation Buoy (LANBY 2) now stationed in Morecambe Bay.

The presentation was made by Mr. G. J. Bell, Director of Royal Observatory, Hong Kong and was attended by managers and port captains of shipping companies, by the senior scientific officer in charge of the Meteorological Services Division, Mr. P. Sham and by Mr. E. W. K. Chu, the Port Meteorological Officer.

Book Reviews

Sailing to the Reefs, by Bernard Moitessier. (Translated from the French by René Hague.) 8¾ in × 5¾ in, pp. 295, *illus*. Hollis & Carter Ltd., 9 Bow Street, London WC2E 7AL. 1971. Price: £2·50.

We first meet this intrepid French lone voyager when he is 85 days out of Singapore on passage towards the Seychelles in his *Marie-Thérèse*, of which we know little except that he had "quite simply fallen in love with this beautiful junk from the Gulf of Siam, with her bold and sturdy lines, fragrant with natural oil, the stem of her bows thrusting forward in a graceful continuation of her pronounced sheer—a finger pointing both to the sky and the horizon, and the lands that lie far beyond the horizon". Neither do we know much about this particular passage except that on that 85th day she was cast ashore on Diego-Garcia Atoll and broke up. Moitessier spent six weeks on the Atoll of whose people he writes "you need to have lived amongst these people to understand what the words 'family' and 'hospitality' mean", and then took passage in the *Loch Glendhu* to Mauritius where, though at first he had some idea of working a passage home to France, he stayed for almost three years, earning a living firstly as a charcoal burner, then managing a fishing and guano business and finally as an assistant secretary in the office of the French Consul. Throughout this period there was but one object in view: to build another boat. In November 1955 he sailed in this new craft, christened *Marie-Thérèse II* on the 1,550-mile passage to Durban; of all the chapters dealing with his sea passages this is perhaps the most interesting because it describes how he surmounted the many teething troubles which are inevitable on any maiden voyage. In Durban he spent a year, once again earning to refit and supply himself for a further leg. Both Durban and Cape Town, where he subsequently stayed for nine months, seem to be rendezvous for many like-minded people who, for want of a better word, one could only term 'sea gypsies'. His meetings with them, their discussions, which almost invariably are about small boats and small boat seamanship, and not least the various ways and means by which they helped each other to continue their respective voyages, is almost a study in amicable international relationships. For the passages from Cape Town to St. Helena, thence to Ascension, to Fernando-Noronha and finally to the West Indies, Moitessier sailed in friendly rivalry with one of these, Henry Wakelam in his yacht *Wanda*, "the son of an English father and a Russian mother, born in Shanghai and resident in South Africa since the age of 7". The end of the story is not perhaps as happy as one could have wished for, in her turn, *Marie-Thérèse II* was cast ashore and lost on the island of St. Vincent (W.I.) whilst the author was taking her back to Trinidad from Martinique on a quick dash to pick up a friend who was coming across from Cape Town by steamer to join him. He writes "and there I remained, paralysed, clinging to the main mast and clasping for the last time what had been my boat: the most beautiful boat in the world".

But that is not the end of the story; there is one more chapter which he calls 'The Dream Boat' and this chapter is of the 'if I could start again . . .' type. And that he did start again and that he did build his dream boat we get from the dust cover of the book (which is, strictly speaking, outside the scope of this review) which tells us that "he has since established his reputation as one of the world's great single-handed sailors by his record-breaking circumnavigation in *Joshua* as an entrant in the *Sunday Times* Round-the-World Single-handed contest. On this voyage he sailed non-stop one and a half times round the world, 37,455 miles in ten months."

Sailing to the Reefs is undoubtedly a book to be read. Apart from the narratives of the long sea passages, the author gives a lot of very sound technical information and advice and, though working on a shoe-string, he never seems to have left anything to chance, at the same time developing his personal ideas on seamanship and yacht maintenance, the products of his own years of trial and error. Like most single-handers he is an individualist and the book contains postscripts by K. Adlard Coles and Michael Richey, who need no introduction, commenting on questions of seamanship and equipment which occur in the text.

Finally the reviewer would commend the author for being so prudent as to seek shelter, if possible, when he received a gale warning. When the gale did not materialize he "forgave the Meteorological Office [in this case the South African Weather Bureau], thanks to which I was now relaxing in the sun, safely anchored, and able to spend three days getting everything dried out and catching up on my sleep". There are not many 'customers' as generous as this!

The book has suffered a little, perhaps, in translation and there are a few minor irritations to disturb the reader's concentration, such as, for instance, "*Marie-Thérèse II* must have had her keel nearly forty-five degrees above the horizon". This hardly seems to mean that her keel was at forty-five degrees from the horizontal for the context goes that she was lying beam-on to the sea; in fact, at the time the author was washed overboard and then washed back aboard. Possibly she was carrying a list of forty-five degrees. But such slips hardly detract from the over-all readability of the book.

L. B. P.

The Haven-Finding Art: A History of Navigation from Odysseus to Captain Cook, by E. G. R. Taylor. 8¾ in × 5¾ in, pp. 310, *illus.* Hollis & Carter, Ltd., 9 Bow Street, London WC2E 7AL. 1971. Price: £2·50.

This is a new edition of a scholarly and very readable book first published in 1956, enriched by the addition of an appendix on Chinese Medieval Navigation based on research by Dr. Joseph Needham, F.R.S. (The first edition was reviewed in the April 1957 edition of *The Marine Observer.*)

The author, now deceased, traces the art of navigation from ancient times to the latter half of the eighteenth century. Many readers of this review will remember Professor Taylor as a much respected Honorary Member of the Institute of Navigation, the author of several erudite books on navigational subjects as well as books on geography and history, and as Emeritus Professor of Geography at London University.

The book is divided into five Parts and the first describes how the ancient navigator with neither compass nor chart, set and kept course for his destination. Nothing was written down; the mariner of that period learned as a youth how to pilot his ship by working beside his master. It is only from hieroglyphic records of events that we know how the ancients managed to navigate. The use of the sun by day and the stars by night served as a compass on long voyages during the three thousand years or more which elapsed before the discovery of the magnetic needle. They relied upon experience and visual memory of the coastal skyline when navigating near land.

Part II includes interesting accounts of voyages made by the Phoenicians and Greeks in the Mediterranean and Indian Ocean. We are told they were familiar with the feel, character and behaviour of winds from different quarters and that 'wind' to them meant practically the same thing as 'direction'. Many of them knew the approximate distance from port to port and when in soundings knew their approximate position from the depth of water obtained by lead and line, the oldest navigating equipment of which there is evidence. Even at this early date it was already customary to put a lump of tallow in the bottom of the lead so that it brought up a specimen of the sea-bed and gave the experienced mariner additional and vital information about the distance and character of the land he was approaching. Distance in those days was reckoned by the total number of days' sailing between ports, one day's sailing being equal to approximately 130 miles.

The other three Parts chronicle such milestones in the slow evolution of navigational practice as the discovery of the lodestone and compass, the notion of the Earth as a sphere, the production of the maritime chart, invention of the back-staff, astrolabe and quadrant, Mercator's projection, the nautical triangle and tide-tables; and, finally, to the dawn of accurate celestial navigation in the eighteenth century with the invention of the sextant by John Hadley in 1732 and the chronometer by John Harrison in 1735, and production of the *Nautical Almanac*, founded by a former Astronomer Royal in 1767, all of which were used by Captain Cook in his historical voyage in the *Resolution* in 1772.

Of special interest to readers of *The Marine Observer* is the recorded fact that towards the end of the seventeenth century the significance of the rise and fall of the barometer in relation to weather and to weather forecasting began to be understood, and Robert Hooke devised a marine barometer for use at sea.

The reviewer echoes entirely the words of Commodore Collins, R.N. in his Foreword written in 1955: "Looking back one finds with surprise how little the instruments changed from that date [the time of Captain Cook] until the modern inventions of the gyro compass, the echo-sounder and radar, all within the last fifty years; in accuracy, a little; in workmanship, a little more perhaps; but in basic principles, not at all!"

The book is very well illustrated: twenty-five plates and twenty-eight figures. It is carefully indexed and includes a useful and interesting bibliography from which the reader will get some idea of the painstaking research put in by the author in writing this book.

Pleasurable reading for all. It would make an ideal gift to anyone interested in navigation.

A. D. W.

WMO Sea-ice Nomenclature. WMO No. 259. TP145. 9 in × 11 in, pp. 147, *illus.* World Meteorological Organization, Geneva, Switzerland. 1970. Price: £5.

The publication of this illustrated glossary is greatly to be welcomed as it represents a significant milestone in the progress of sea-ice technology. Not so many years ago there was no generally accepted terminology for describing sea ice, even among English-speaking people. Many of the terms used were differently interpreted by different users and the lack of standarized definitions was a handicap to efficient observing and reporting. With similar vagueness occurring in other languages there was considerable uncertainty about the precise translation of ice terms from one language to another.

After protracted international negotiations, which started in 1947, ice experts of the various nations concerned have gradually evolved an agreed standard nomenclature wherein such terms as 'open pack-ice', 'pancake ice', etc. are precisely defined and classified. This introduces a new element of precision into ice observing and and charting. The terms here set out are those adopted by WMO in 1968 and have already been incorporated in the 1969 Edition of the *Marine Observer's Handbook.*

Publication by WMO of the verbal nomenclature has been delayed until now so that illustrations of the various terms could be incorporated in the one volume. This is a considerable advantage since a glance at a photograph can often convey more than many a long description.

The book is so arranged that all the ice terms are set out firstly in English, in subject order with a numerical classification. Then they are arranged alphabetically to facilitate easy reference. Then follows the Russian version, similarly in both subject order and alphabetical order. The numerical classification greatly simplifies translation from one language to the other.

Although the cover and introductory pages refer to versions of the nomenclature in all four of the official languages of WMO, only the English and Russian versions are at present available. Preparation of the French and Spanish versions, however, is in hand and will be issued later. These can then be incorporated in the loose-leaf type of binding. Now that an illustrated nomenclature is available with terminologies agreed in both English and Russian, the task of producing a version in any other language is very much simplified.

Following the terminology, provision is made for a description of the codes to be used for the international exchange of ice data. These codes, which have not yet been formally adopted by WMO, are to be issued later.

In the nature of things some modification of the terminology will be required in future. Moreover the illustrations are not in all cases the best which could be produced. Among the illustrations open to criticism is photo 41 on page 66 which, while it may include the feature (Grounded hummock) which it claims to illustrate, does not convey an impression of the characteristics of the feature. However, the book constitutes an authoritative reference work and provides a sound basis upon which to build. It represents the culmination of many years of work, latterly under the auspices of the WMO (Commission for Maritime Meteorology) Working Group on Sea Ice. Among many who contributed to its production special congratulations are due to Dr. J. Heap, Rapporteur on Nomenclature, and Mr. W. E. Markham who was responsible for the illustrations.

B. F. B.

Notice to Mariners

MARINERS TO HAVE A NAUTICAL INSTITUTE

A body of professional mariners which can provide an authoritative opinion on nautical matters—including collision avoidance in the English Channel—is to be formed. The majority of members will come from within the Merchant Navy and be masters and navigating officers of British merchant ships.

Membership will also be open to other suitably qualified members of the profession such as naval officers, pilots, superintendents, harbour masters, lecturers in nautical colleges and yachtsmen, all of whom are in one way or another concerned with nautical science.

The need for such an institution was recognized many years ago but it was not until the suggestion was revived in 1967 by the Marine Society, an old-established marine charity, that definite steps were taken to proceed with the formation of a nautical professional body.

Over 200 masters, pilots and navigating officers met in London at Trinity House in December 1969 when Captain Sir George Barnard, the Deputy Master, was requested to form a committee to take the necessary action. This committee was later constituted as the Nautical Institute Trust and undertook the mammoth task of trying to contact and seek the interest of all members of the profession scattered throughout the world, and estimated to number some 20,000.

In less than a year a response from over 1,400 supporters and more than £12,000 had been received. As a result, the Trustees set up a larger and more representative committee which has now approved a Memorandum and Articles of Association and is seeking incorporation for an Institute under Acts of Parliament.

It was originally proposed that the new body might be called the Institute of Nautical Science but, to meet objections raised by the Institute of Navigation and the Institute of Marine Engineers, the committee has decided to seek registration under the title The Nautical Institution, or possibly The Nautical Institute.

The principal aim of the Institution will be to encourage and promote a high standard of qualification, competence and knowledge among those in control of seagoing craft, and to facilitate the exchange and publication of information and ideas on nautical science.

Although a number of similar bodies have existed for some time, they are all in one way or another restricted in their objects or constitutions so that members of the nautical profession, serving in various appointments both afloat and ashore, have had no common ground on which they could meet to exchange views and discuss matters which vitally affect their vocation and responsibilities.

By establishing branches in various areas of the United Kingdom and overseas and by publishing their transactions, The Nautical Institution will keep in touch with up-to-date ideas concerning the profession and nautical science. It will also ensure that the views of those at sea are given full consideration, particularly with regard to proposals which are frequently formulated by those ashore.

The Memorandum of Association, which is being submitted to the Department of Trade and Industry, has been specially drafted to permit the widest possible development for the Institution in the future and provide for three grades of corporate members: Fellows, Members and Associate Members, depending on their professional qualifications and experience; and two non-corporate grades for unqualified members: Companions and Students who, while being able to take full part in the activities of the Institution and receive its publications, will not be eligible for election to the Council.

An essential requirement which will be included in the Constitution will be that the majority of the Officers and Council must consist of members who are actively engaged in seagoing employment. It is intended that the Institution should be specifically concerned with professional affairs and not with industrial matters for which other organizations already exist. It is hoped that the body will be registered as a charity, and that it will quickly establish a national reputation that will in due course be recognized internationally.

Further information can be obtained from Captain C. W. Malins, Hon. Secretary, Nautical Institute Trust, Hanway House, Clark's Place, London EC2N 4BH. (Telephone 01-283 3687).

Notice to Marine Observers

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

Headquarters.—Captain G. A. White, Marine Superintendent, Meteorological Office (Met.O.1a), Eastern Road, Bracknell, Berks. RG12 2UR. (Telephone: Bracknell 20242, ext. 2456.)

Captain A. D. White, R.D., Lt.-Cdr. R.N.R., Deputy Marine Superintendent. (Telephone: Bracknell 20242, ext. 2543.)

Lieut.-Commander L. B. Philpott, D.S.C., R.D., R.N.R., Nautical Officer. (Telephone: Bracknell 20242, ext. 2461.)

Mersey.—Lieut.-Commander, E. R. Pullan, R.D., R.N.R., Port Meteorological Officer, Room 709, Royal Liver Building, Liverpool L3 1HN. (Telephone: 051-236 6565.)

Thames.—Mr. J. C. Matheson, Master Mariner, Port Meteorological Officer, Movement Control Building, South Side, Victoria Dock, London, E16 1AS. (Telephone: 01-476 3931.)

Bristol Channel.—Captain F. G. C. Jones, Port Meteorological Officer, 2 Bute Crescent, Cardiff CF1 6AN. (Telephone: Cardiff 21423.)

Humber.—Mr. W. G. Cullen, Master Mariner, Port Meteorological Officer, c/o Principal Officer, Dept. of Trade and Industry, Trinity House Yard, Hull, HU1 2LN. (Telephone: Hull 36813, ext. 27.)

Clyde.—Captain R. Reid, Port Meteorological Officer, 118 Waterloo Street, Glasgow, C.2. (Telephone: 041-248 4379.)

Forth.—All enquiries to Captain Reid above.

Tyne.—Captain C. J. D. Sutherland, Merchant Navy Agent, c/o F. B. West & Co., "D" Floor, Milburn House, Newcastle-upon-Tyne, NE1 3DE. (Telephone: Newcastle 23203.)

Southampton.—Captain D. R. McWhan, Port Meteorological Officer, Southampton Weather Centre, 160 High Street below Bar, Southampton SO1 0BT. (Telephone: Southampton 20632 or 28844.)

INDEX TO VOLUME XLI, 1971

[*Subjects of* Book Reviews, Editorials, 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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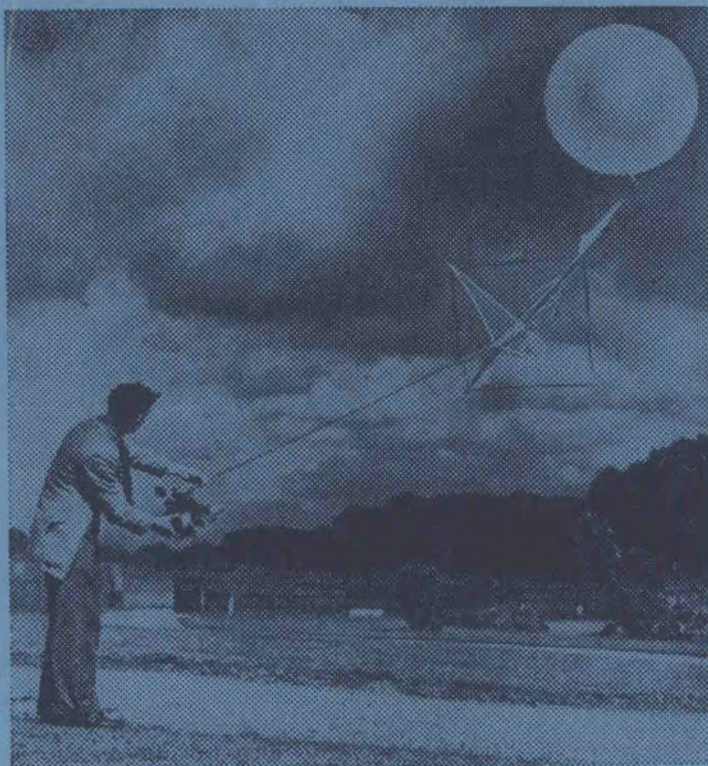

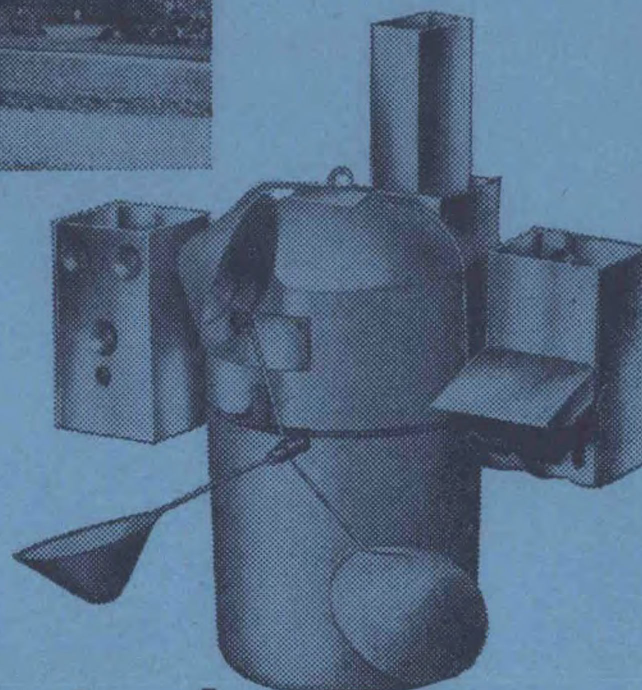

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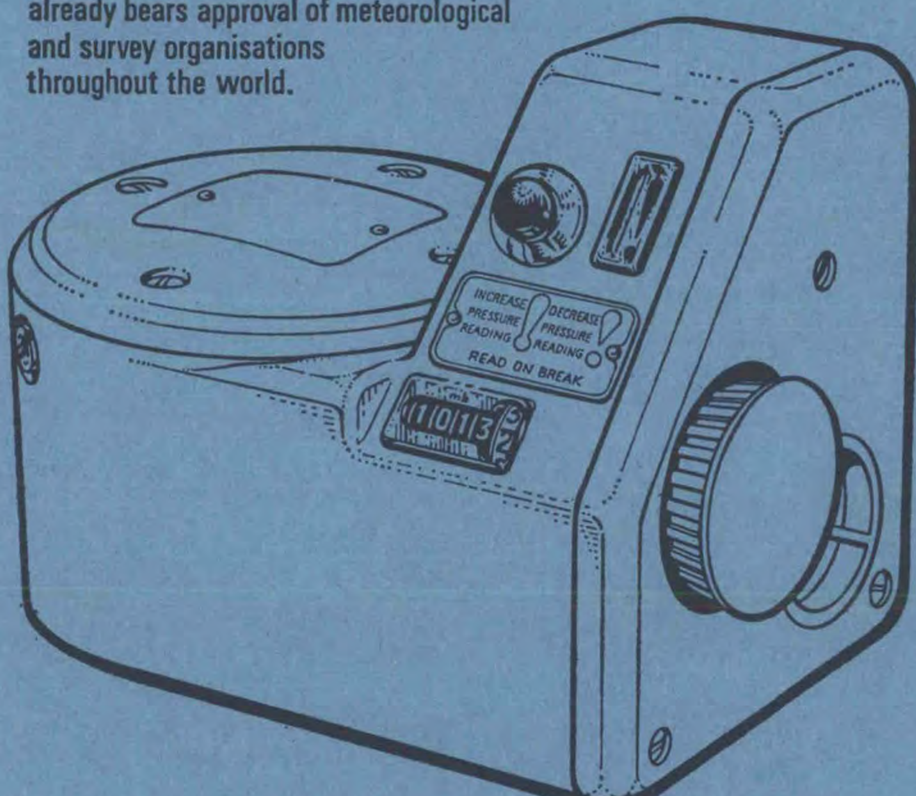

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