

The critical size—that is, the size beyond which aneurysms suddenly become unstable and likely to rupture—was a maximum external diameter of 4 mm.

Aneurysms can probably form or begin at any age and may enlarge and rupture rapidly.

In patients with multiple aneurysms the largest aneurysm had ruptured in 88%.

When combinations of middle cerebral and internal carotid aneurysms were present on the same side the proximal aneurysm was more often ruptured.

Infiltration of the wall of the aneurysm with white blood cells and fibrin was thought to precede enlargement or rupture. This was thought to be due to endothelial damage as a result of pulsation, turbulent flow, or ischaemia resulting from mural thrombosis.

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Dogger Bank Itch: Survey of Trawlermen

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Bonnevie (1948) gave the first account of an allergic dermatitis known as Dogger Bank itch or weed rash. In the late 1930s an increasing number of fishermen based on the port of Esbjerg in Denmark complained of a skin complaint which they alleged was due to contact with a seaweed known as the sea-chervil. This proved to be a coralline of the phylum Bryozoa identified as the *Alcyonidium hirsutum* (Fig. 1) found in the shallow waters of the North Sea, particularly on the Dogger Bank. Patch tests with the alcyonidium on affected patients were positive. According to Bonnevie, it is the only known allergic dermatitis caused by a live animal.

In 1939 the Danish Workmen's Compensation Act was extended to include skin diseases caused by this organism. Under the Danish law only men incapacitated for three months or longer, or those requiring change of occupation, are eligible for compensation. During the war the North Sea was mined and there was no fishing. After the war Guldager (1959) reported 95 cases seen at his fishermen's hospital in Esbjerg, and during this same period 15 to 20 fishermen were compensated annually. In more recent years the number receiving compensation has dropped to 4 to 6 a year (H. F. H. Reiter, personal communication, 1965).

In the East Coast ports of England the condition is well known and has become much more common, particularly among fishermen based on Lowestoft. The sea-chervil has again been incriminated, but specimens from the Dogger Bank brought home by English fishermen have been identified as *Alcyonidium gelatinosum* (Ryland, 1962). There has been no recent Danish work on the alcyonidium (Bonnevie, personal communication, 1965), and the prevailing species in the North

Sea may have changed in the intervening years. This organism flourishes in the summer and dies off in the winter; the areas infested by it appear to vary from year to year and the impression among Lowestoft fishermen is that it covers an increasing area. The survey described in this paper was undertaken in May 1965 at the request of the White Fish Authority because many trawlermen were being incapacitated by Dogger Bank itch.

Trawl Fishing

At Lowestoft there are approximately 1,200 fishermen, of whom about 900 are in trawlers and the remainder in drifters. In drifting the net does not reach the sea-bed and there is no contact with the sea-chervil, which is sessile. Thus driftermen are not affected by Dogger Bank itch. The Lowestoft trawlers are owned by various fishing companies, but the design of ships and the pattern of fishing are common to the port. The trawlers spend 12 days at sea and two in port; this rhythm is maintained throughout the year unless the vessel is sent for a refit. Although there is good fishing for cod and haddock within six to seven hours' sailing off the East Anglian coast, their main fishing-grounds are on the Dogger Bank and in its vicinity, where the more lucrative catches of plaice are found (Fig. 2).

In trawl fishing the net is shot over the side or stern of the ship. Two flexible steel wire ropes trail down under the water to the two otter boards weighted to float upright. As the ship moves slowly forward these boards are held open by the pressure of the water, and open the mouth of the net. The lower half of the net is weighted with wooden rollers and steel bobbins, which help to avoid obstructions in towing it along the sea-bed. Fish swim into the mouth of the trawl

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and are held in the narrow end, known as the cod end, which also collects sand, rock, and seaweed (Fig. 3). The trawl continues for about three hours and is then winched on board; with the catch it may weigh up to 3 tons (3,048 kg.). Once the cod end has been swung aboard, a rope that closes the end is released and the catch falls into compartments on the deck called "pounds." The net, unless it requires mending, is reshot; the fish are then sorted into baskets, gutted, washed, and stored in ice in the fish-holds. This very active work normally takes 35 to 40 minutes; the cycle is repeated every three hours throughout the day and night.

The Lowestoft trawlers vary in length from 80 to 110 ft. (24.4 to 33.5 m.); the tonnage from 150 to 210 (152 to 213 metric tonnes); they all have diesel engines. They normally carry a crew of nine—skipper, mate, third hand, three deck-

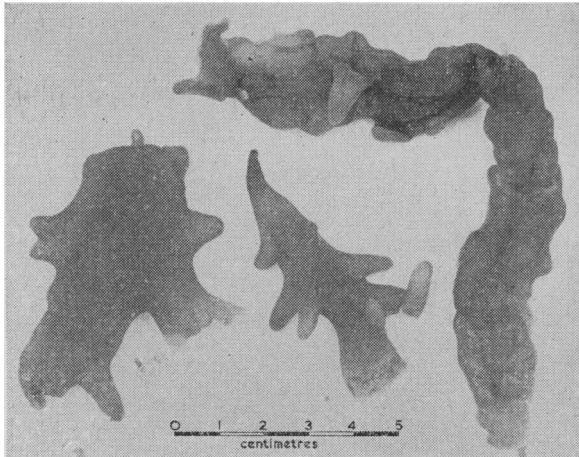


FIG. 1.—*Alcyonidium hirsutum*.

hands, a chief and second engineer, and cook. A deckie learner—that is, a youth of 16 who has recently passed through the navigational school—may also be included. The skipper is chiefly occupied with navigation and spends much of his time in the wheel-house. The mate has the most onerous duties

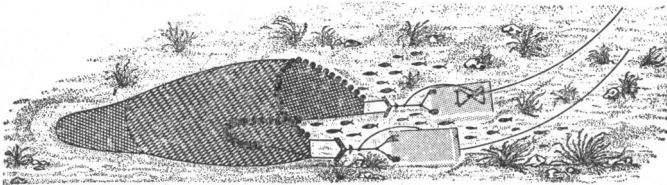


FIG. 3.—The trawl.

on board: he operates the winch, and helps with hand hauling of the nets and gutting the fish; he stores it in the fish-holds and is responsible for net mending. The third hand has the particular duty of releasing the rope securing the cod end. Deck-hands have watch-keeping duties while sailing to and from the fishing grounds, but while fishing they are occupied with shooting the trawl, hauling it in, and gutting and cleaning fish. The engineers have no obligation to help with the fishing but often work voluntarily on deck; only the cook remains in his galley, preparing the meals and serving endless cups of tea.

The Survey

Two of the largest trawler companies in Lowestoft maintain 60 ships, which make up about half the Lowestoft fleet. It was decided to interview the crews of these companies' ships which docked at Lowestoft during the month of May. This month was chosen for the survey because the number of fishermen in the port receiving disablement benefit for industrial

dermatitis had shown a sharp rise in May 1964. The two companies made accommodation available in their quayside offices, and after each crew member reported to the cashier for his pay he was directed to the survey office. If he failed to attend on docking there was a further opportunity to interview him before he sailed on his next voyage.

A special form was completed for each man, giving his age, history of allergy, his present job, and his occupational history. It also recorded the presence or absence of skin disease in relation to exposure to the sea-chervil and his job at the time of onset. A specimen of the alcyonidium was kept on the desk for reference, as there are many types of seaweed in the North Sea, and the sea-chervil is known by several names, often as the curly weed or amber weed. Only the hands, forearms, face, and neck were inspected as a routine.

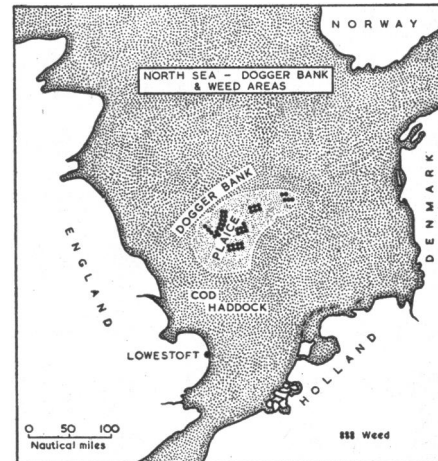


FIG. 2.—Fishing chart of North Sea.

From 55 ships 451 (94.4%) members of the crews were interviewed; of the 27 men who failed to attend one was in hospital with an injured hand and most of the others lived some distance from the port. None was reported to be suffering from skin disease.

At the time of the survey the sea-chervil was very abundant. Thirty of the skippers reported that in their last voyage they had been fishing in areas where it was brought on board in every haul, nine had found it in a few hauls only, and 16 had no contact with it at all. Some of these latter were fishing for cod and haddock in the nearer waters off the East Coast.

Clinical Features

The clinical appearance soon became clear and was striking. As described by Bonnevie, the area first affected was often the antecubital fossa, but a rash was also often found on the flexor aspects of the forearms, the wrists, the extensor surface of the hands, the fingers, and the palms of the hands. Papules and blisters up to 3 to 4 mm. were often present in acute cases. In about half of the patients the face was affected, with a papular macular rash of the forehead and cheeks, and periorbital oedema with scaling and desquamation of the eyelids.

In the first 18 days of the survey only the alcyonidium itself was available for patch testing, but for the remaining 10 days a homogenate, either whole or in serial dilutions in saline, had been prepared (Meir, Newhouse, and Turk, 1966). Patch tests were performed only if the fisherman was to be in port for 48 hours or longer, and were read at 48 hours. As two of the earlier tests with alcyonidium produced extremely severe reactions, very acute cases seen later were not tested. In all, tests were done on 18 of the affected men—8 with alcyonidium alone and 10 with either the alcyonidium and dilutions of the

homogenate or with the homogenate alone. A positive result was obtained on each of the 18 affected men.

Six men without skin disease were tested both with the alcyonidium itself and with the homogenate; six other men with eczematous skin disease were also tested with either alcyonidium or the homogenate. All tests on these 12 men were negative.

Prevalence

Of the men interviewed 32 (7.1%) were considered to be suffering from this condition. In all there had been contact with the alcyonidium immediately prior to or at the time of onset of the rash. Dogger Bank itch was more prevalent among the crews of trawlers with the greatest exposure. Two trawlers which had made repeated voyages to alcyonidium-infested areas each had three affected men.

Dogger Bank itch was found among the skippers, mates, deck-hands, and engineers but not among the cooks (Table I). Its prevalence was significantly higher among the mates than

TABLE I.—*Distribution of 32 Cases of Dogger Bank Itch Among 404 Exposed Crew Members**

	Number	Cases of Dogger Bank Itch
Skippers	55	3 (5.5%)
Mates	55	10 (18.2%)
Third hands	55	3 (5.5%)
Deck	139	12 (8.6%)
Engineers	100	4 (4.0%)

$\chi^2 = 11.05$, d.f. $P < 0.05$. *47 cooks omitted.

among the men in other jobs. This is probably because of the multiple activities of the mate, who is more often in contact with the alcyonidium than other members of the crew, particularly when net mending with his bare hands.

The fishing population was young, 44% being under the age of 30; the oldest group were the cooks. Just over half (54%) of the men had had less than 15 years' experience as trawlermen. There was no statistical relationship either between age or possible duration of exposure, as judged by the length of time spent trawling in the North Sea, and onset of the disease.

Among those affected only one man had had the disease for more than four years; 10 had suffered for less than four and more than three years. The remainder had all been first affected during the previous two years. Five of these men had first had the rash either on the voyage preceding the examination or during the spring of 1965.

That long exposure is not necessary is shown by a young fisherman from Hull. Between October and December of 1964 he sailed six times from Lowestoft, and on his fourth trip he developed a rash on the arms. On the two subsequent trips his trawler fished different areas and he had no recurrence. At the end of April 1965 he returned to Lowestoft and joined the crew of a trawler sailing to the Dogger Bank: on the second day at sea his arms were affected, and on the next day his face became red and swollen. He was so severely affected that the skipper broke off the voyage and returned to port. When seen on the quayside 24 hours after leaving the Dogger Bank he was already improving, but his face and eyelids were swollen and erythematous; there was a discrete maculopapular rash over the flexor aspects of both forearms spreading on to the extensor surface. The following day he had improved, and returned to Hull with advice not to fish again in Lowestoft trawlers.

Other Occupational Skin Diseases

Skin lesions around the wrists of the men were common (Table II). In the mildest cases there was some erythema and scaling, but patches of chronic eczema were often seen. These lesions appeared to be caused by friction from the cuff of the polyvinyl chloride waterproof jacket called the "oily" or

oilskin by the fishermen, which after some wear becomes frayed and razor-sharp. Single or multiple sea-water boils were also common. There were 16 cases of oil folliculitis showing characteristic comedones and pustules on the upper part of the

TABLE II.—*Prevalence of Occupational Skin Diseases Among 451 Trawlermen*

	No. of Cases
Dogger Bank itch	32 (7.1%)
Friction dermatitis of wrist	21 (4.7%)
Seawater boils	16 (3.5%)
Folliculitis	16 (3.5%)
"Haddock" rash	4 (0.8%)
Total	89 (19.7%)

forearm; all but three of these men were engineers working with diesel oil. The mate and three deck-hands from one of the trawlers had a severe dermatitis of the sides and webs of the fingers. They had had an active voyage with a very large catch of codling, and had spent about 20 hours a day for six to seven days gutting the fish. This condition had a quite different appearance from the Dogger Bank itch and was locally known as "haddock" rash; it is probably due to an irritant in the fish entrails.

Non-occupational Skin Disease

There were 17 men (Table III) with non-occupational eczemas, three of whom had hand eczemas, two diagnosed as due to detergents. Varicose or gravitational eczemas were seen

TABLE III.—*Prevalence of Non-occupational Skin Diseases Among 451 Trawlermen*

	No. of Cases
Contact dermatitis (detergents, etc.)	3 (0.6%)
Non-occupational eczemas	14 (3.1%)
Other non-eczematous skin diseases	15 (3.3%)
Total	32 (7.1%)

in three patients; another patient was a youth with atopic eczema which had improved since he had gone to sea. Others had various manifestations of seborrhoeic eczema or patches of neurodermatitis of the forearm or leg. Among those with non-eczematous skin disease were five with psoriasis, three with urticaria, three with severe acne vulgaris, and three others suffering respectively from warts, impetigo, and pityriasis rosea.

Causes of the Present Epidemic

Well-authenticated cases of Dogger Bank itch occurred among Lowestoft fishermen 15 to 20 years ago (Seville, 1957), but undoubtedly there has been an increase in the number of cases during the past few years. The reasons for the present outbreak are not entirely clear. The fishermen hold that the weed is spreading in the Dogger Bank area and that it is particularly luxuriant after a mild winter when the sea remains warm, but the increase in the number of cases appears to date from the summer of 1962, after a very severe winter. On the other hand, there does seem to have been a change in the fishing habits of the Lowestoft fleet. Since the war the entire fleet has been converted from steam to diesel engines; this change was completed by 1955. These more powerful engines enable the trawlers to reach fishing-grounds in the north-east of the North Sea which previously were not worked very much by this fleet. Also during the past five years most of the trawlers have acquired synthetic nets, which are stronger than the old manilla net and facilitate fishing in adverse conditions, making it possible to trawl in weed-infested areas.

TABLE IV.—*Change of Fishing-grounds in the North Sea*

Years (May-July)	Hours Fished in North Sea, All Areas	Hours Fished in Areas Infested by Alcyonidium
1937-8	1,000,930	18,588 (1.9%)
1951-2	523,008	4,401 (0.8%)
1961-3	619,006	62,867 (10.2%)

The Fisheries Laboratory at Lowestoft prepares charts each month showing the hours fished in all areas of the North Sea. These charts are divided for statistical purposes into rectangles, each 1° of longitude by 30' of latitude. Information was collected from reliable skippers about the areas infested by the alcyonidium and plotted on the same type of chart. It was found that the proportion of total fishing-time spent in these areas has increased more than tenfold since 1952 (Table IV).

Curative and Preventive Action

Treatment in the early stages is simple, since relief starts as soon as exposure ceases, and often after the man has been 48 hours in port the rash has subsided. It is only after repeated attacks that the skin becomes chronically eczematized and so highly sensitized that it breaks down when in contact with any fish or gear that may carry traces of the alcyonidium. All trawlermen agree that some of the best fishing-grounds are where the alcyonidium is most luxuriant, and as the fisherman is paid a percentage of the value of the catch the temptation to return to the areas is great.

As an immediate measure cremor fluocinolone and chlorpheniramine maleate (8 mg.) (Piriton duolets), with instructions for their use, were placed in the first-aid kits of all trawlers. All men who had ever been affected by the rash were advised to wear gauntlet gloves at all times when on deck and to wash their hands, forearms, and face regularly whether the rash was present or not.

The Fishing Vessels Owners' Association at Lowestoft has appointed a part-time industrial medical officer to supervise the treatment of this condition; he will be able to continue the study of methods of prevention.

Improved protective clothing has been designed to replace the polyvinyl chloride jacket now commonly worn. This consists of a polyurethane-coated nylon jacket and trousers. The sleeve has an inner storm cuff with an elasticized band which fits snugly around the wrist. A neoprene-coated glove with a brushed fabric lining is worn with the gauntlet between the two layers of the cuff. This material is lighter and warmer than the older type of "oily," and it is hoped that friction around the wrist will be eliminated and the hand and arms kept dry. Six suits are now under trial.

Discussion

The prevalence of this allergic dermatitis among the trawlermen interviewed may not be regarded as high as might be expected in the presence of a powerful antigen, but only about 60% of the trawlermen had been exposed in the voyage previous to the examination. As there is considerable mobility of the crews within the fleet it was not possible to estimate the individual exposure over a period of months. The sample is also self-selected, since it contains only those who had recently acquired the condition or who felt able to continue this type of work. An unknown number of fishermen who have contracted this complaint have left the Lowestoft trawler fleet. Several who had changed their occupation were interviewed. They had histories extremely suggestive of Dogger Bank itch, and in the two men tested patch tests were positive to alcyonidium. Among them was a skipper, now an innkeeper in a Suffolk village; another man was employed on ships serving the oil-drilling rigs in the North Sea; and a third was based on Milford Haven, fishing in the Irish Sea.

Skin diseases of fishermen have aroused interest for many years. Prosser White (1934) wrote: "A complete list of the dermatoses affecting the fisherman still awaits a chronicler . . . they largely depend on special risks in different parts of the world."

Among British fishermen the erysipeloid of Rosenbach (Proctor and Richardson, 1954) and sea-water boils (Schwartz,

Tulipan, and Birmingham, 1957) are well-recognized syndromes. Primary irritant rashes are less well defined; they are often due to contact with fish entrails. Fraser and Lyell (1963) described an interesting contact dermatitis in salmon fishermen, due to a diatom.

The incidence of skin disease is high. The inception rate per 1,000 men for spells of incapacity from eczema and dermatitis is 5.7 among fishermen, compared with 2.3 among men in all occupations, and for infections of skin and subcutaneous tissue 18.2, compared with 10.4 for men in all occupations (Ministry of Pensions and National Insurance, 1966). In the present survey the prevalence of occupational skin diseases among fishing-vessel crews was more than twice as high as the prevalence among automobile workers in England (Newhouse, 1964).

Improved protective clothing probably offers the most immediate and effective method of controlling this high incidence of skin disease.

R. S. F. Schilling (personal communication, 1965) has shown that the accident fatality rate in fishermen is also exceedingly high, and he suspects that the mortality from other diseases may be excessive. It is hoped that the present investigation may lead to a more thorough appraisal of the specific risks of this relatively small but important industry and to the study of methods to improve the health, safety, and welfare of fishermen.

Summary

Dogger Bank itch, an allergic dermatitis due to contact with a seaweed-like organism, the *Alcyonidium gelatinosum*, has recently become prevalent among Lowestoft trawlermen. Contact occurs when the alcyonidium is hauled aboard the vessel with other contents of the trawl.

A survey of 451 trawlermen at the port showed 32 (7.1%) to be affected. The prevalence among mates at 18.2% was particularly high. Patch tests with the alcyonidium were positive in the 18 men tested.

Skin lesions of the wrist and forearms caused by friction from worn oilskins were common; these garments are poorly designed and the hands and arms of the fishermen are often wet and cold.

A part-time industrial medical officer has been appointed to supervise the prevention and treatment of Dogger Bank itch. Improved protective clothing is under trial, and immediate treatment is now available in the first-aid kits of trawlers.

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