



FAROE SEAFOOD
NEWS

The North Atlantic Exporter

Structure and health of nature



Dr. Torleiv Brattegard
Institute of Marine Biology
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using a grab around the Faroes carried out under the BIOFAR programme have revealed diversity values which are higher than what is usually found in Skagerrak and Norwegian fjords with the same type of sea bed and depth. This is a good indication that there is little or no pollution of any significance, and

that stress is insignificant in the western part of the Faroe area. Investigations with other instruments support these findings. Faroese benthic fauna is much richer than what was previously thought, and it is especially abundant in species which are preferred as food by fish which live at the bottom of the sea.

Fig. 2. On the basis of results from a number of fjords with different levels of pollution, a classification system has been established which shows the relationship between the number of individuals and the number of species with different levels of diversity. Moderate, low and extremely low diversity indicate effects of pollution. F = Faroes, N = Norwegian fjord, n = normal, s = stressed, p = Heavily polluted, S = Skagerrak.

The degree of health of an area is not only determined by the number of its species, nor the number of individuals present.

An area in the tropics which is polluted can have many more species than unpolluted areas in Arctic regions.

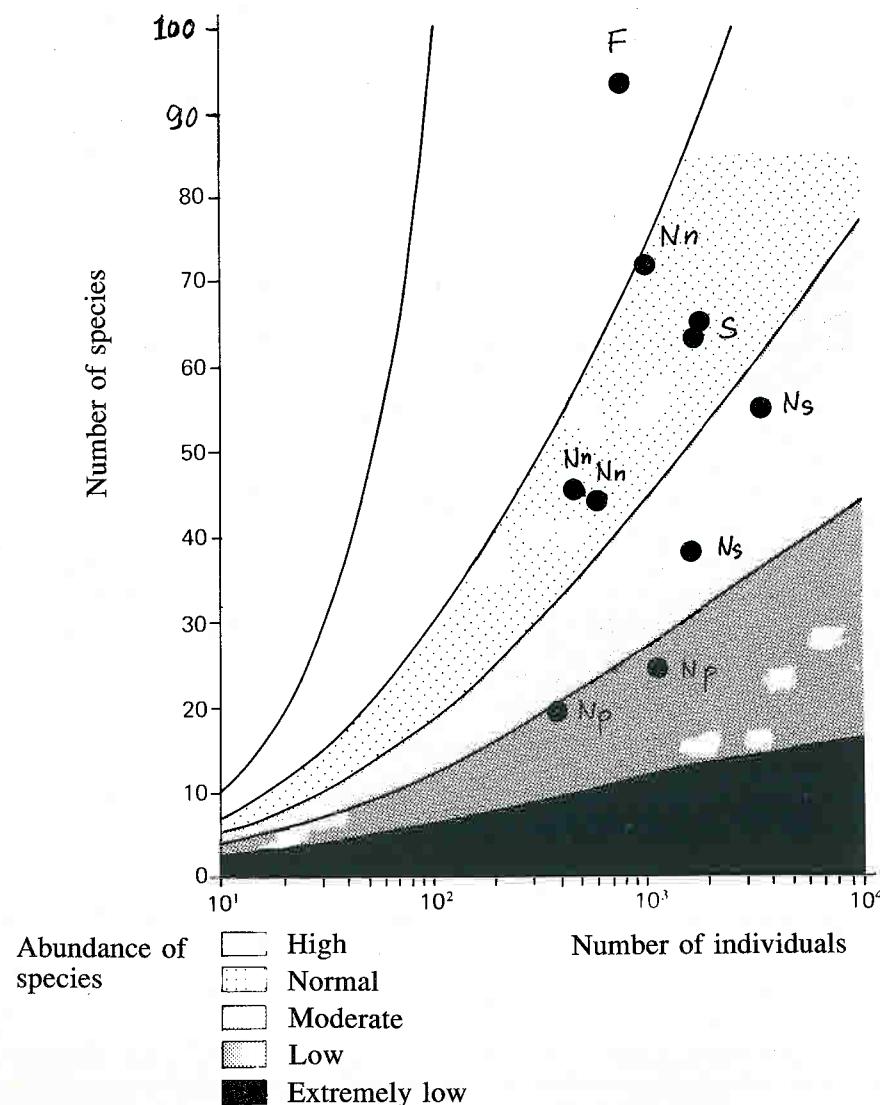
If one combines information about the number of species and the number of individuals and studies how all the individuals in an area are distributed among the species occurring there, one will find a pattern in the proportion of individuals to species which corresponds to levels of pollution.

Ecologists have mathematical formulas with which they can express such patterns in numbers. In their terminology these are known as indices of abundance or diversity.

A high or large diversity figure is a sign that nature is unstressed, or, as they say, fit and healthy. A low or small diversity figure is often a sign of sickness - nature is polluted or stressed.

Fig. 2 demonstrates all this in a simple way. On the basis of results of the examinations of benthic fauna in Norwegian fjords with different pollution levels. Rygg (1985) has established a classification which shows the relationship between diversity on the one hand, and the level of pollution on the other. Moderate, low and extremely low diversity has a clear relationship with light, medium or heavy pollution. Examinations of benthic fauna

Figure 2.



Seas around the Faroes unpolluted

The polycyclic aromatic hydrocarbons - PAH - are natural constituents of oil. When oil and other fossil fuels are burned, PAH compounds are formed and escape to the environment - atmosphere and water. Hence, a global distribution exists and some traces are to be expected even in Faroese waters.

Polychlorinated biphenyls (some 200 different compounds) are byproducts from the industrial use of petroleum hydrocarbons and are also used extensively in modern technology. They are all known as pollutants.

Analyses of the levels of PCB's and PAH's give indications of the level of global and regional pollution.

L/F Føroya Fiskasøla asked Prof. Karsten Palmork at the Marine Research Institute, Bergen, Norway, to analyse two large samples of cod from one of the most used Faroese trawling grounds.

The analyses followed standard procedures and were performed on a

selection of "congeners" of PCB's and PAH's (naphtalen, phenanthren, dibenzothiophen and some of their substituted components).

PCB

The level of PCB's was low. The lowest values compare with minimum values found in fish from the Barents Sea. The highest values from the Barents Sea are about six times

higher than the highest values from the Faroes. This indicates that the general level of PCB's is lower in Faroese waters than in the Barents Sea.

PAH

The level of PAH's in cod-liver from Faroese waters are slightly lower than those in fish from the northern North Sea.

PCB's in cod-liver (ng/g) from the Faroes and the Barents Sea

| Area | 28 | 52 | 101 | 118 | 153 | 138 | 180 | sum |
|-------------|------|-------|--------|---------|---------|---------|--------|----------|
| Faroes | 7-11 | 21-29 | 57-87 | 60-89 | 133-191 | 96-134 | 40-56 | 421-593 |
| Barents Sea | - | 56-78 | 94-395 | 130-897 | 133-783 | 108-771 | 60-294 | 581-3218 |

Selected PAH's from cod-liver (ng/g fat) from the Faroes and the northern North Sea.

| | Faroes | | Northern North Sea |
|--------------------|--------|------|--------------------|
| | min. | max. | mean |
| Naphthalen | 5 | 14 | 10 |
| C ₁ -"- | 14 | 25 | 26 |
| C ₂ -"- | 14 | 22 | 43 |
| C ₃ -"- | 9 | 12 | 24 |
| Phenantren | 4 | 6 | 4 |
| Anthracen | 2 | 4 | ? |
| Fluoranthren | | 1 | 2 |
| Pyren | | 1 | 2 |
| SUM | 34 | 86 | 112 |

As quoted by the Press:

Researchers have found completely clean waters

Seas around the Faroes unpolluted

by Ole Røssell
Whilst there are almost daily reports of new environmental problems, an inter-Nordic research team now reports the discovery of a large expanse of water in the Nordic region without the slightest trace of marine pollution. The area in question, the sea around the Faroes, is therefore expected to function as a reference area for environmental research in other marine areas in the North and elsewhere in the world.

The sea in question is situated in an area of upheaval between the Atlantic and the Norwegian Sea, and receives an influx of waters from both these seas. This makes it even more surprising that no apparent man-made environmental problems have been found, the Nordic research team, which also includes Danes, concludes.

The researchers have, however, found 173 animal species which have never before been registered in the area. Five of these species are, moreover, completely new to science. These are shellfish and worms, a member of the research team, the Norwegian marine biologist Torgeir Bakke, tells Politiken.

The research project, which goes by the

name of Biofar, was begun in 1988 and will be completed in 1990. It is financed by funds from a number of Nordic research institutions and by national research funds...

Biofar is a purely scientific project, the

object of which is to investigate animal and plant life in depths between 100 and 1,000 metres in the area concerned.

The project has already attracted a great deal of international interest.



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that stress is insignificant in the western part of the Faroe area.

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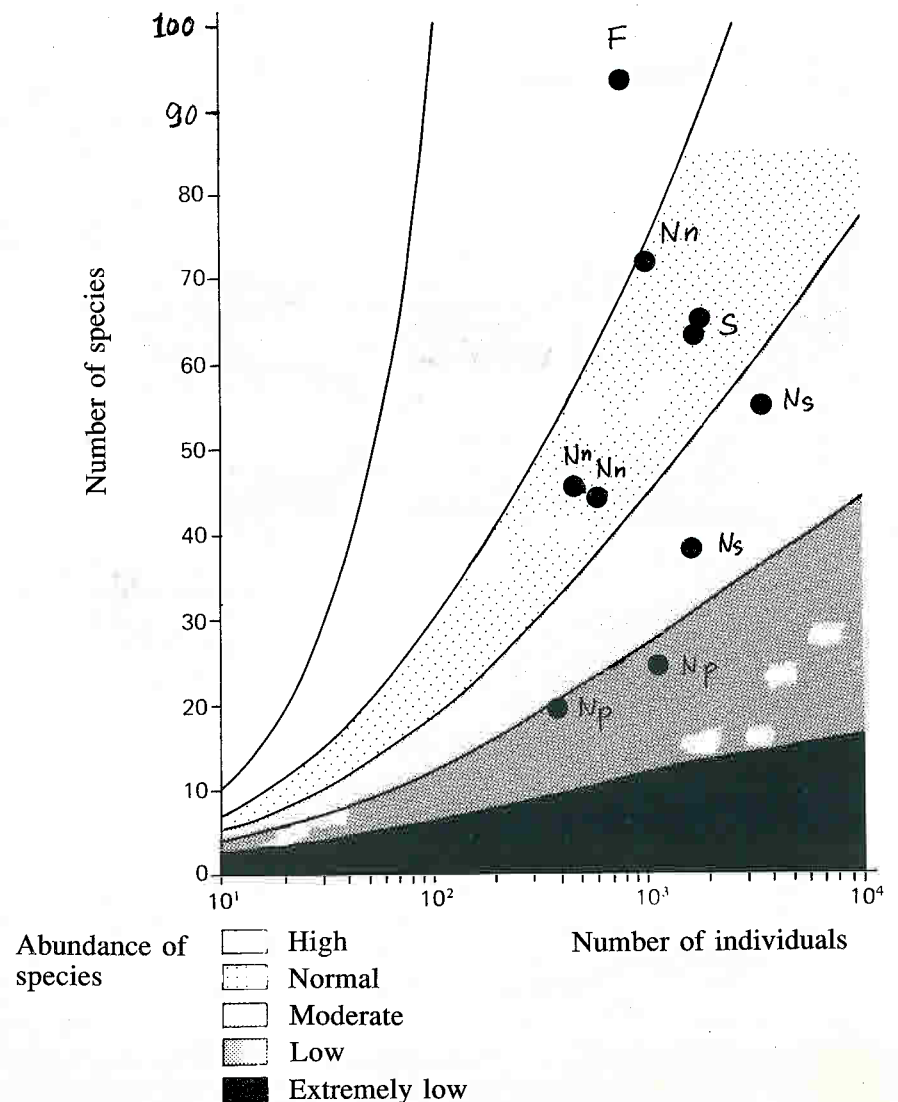
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Studies of life on the ocean floor

Starting at the bottom

In connection with the growing interest in exploitation of marine resources, and in pollution of sea water which is having an ever increasing impact, world-wide investigations have begun which involve studies of animal life, and the registration and analysis of any changes.

For many years marine scientists have been interested in ecology - in nature's house-keeping - and the many new discoveries in this field have somewhat overshadowed research on individual species.

In 1986 the desire was expressed by the Nordic Council for Marine Biology to remedy this and to give young researchers the possibility of studying different groups of animals and the many species which together make up the ecosystem.

The suggestion to start a thorough investigation of the benthic fauna around the Faroes was met with enthusiasm which led to a pilot study in 1987, and the beginning of the BIOFAR project in 1988.

The aims of BIOFAR are:

1. to strengthen the Faroes' knowledge of their own marine fauna and to establish local possibilities and an inter-Nordic network of contacts for its further investigation;
2. to increase knowledge of the fauna on hard and soft sea beds in an area which is of interest for research as regards its biogeography, the natural base of important fisheries, and for examinations related to the influence of human activity;
3. to utilize a common nordic fauna research project to co-ordinate Nordic taxonomic expertise, which may later be of value to other scientific projects.

BIOFAR can thus be seen as a basic science project, but as results presented here show, such studies also have practical significance.

Today BIOFAR is located in the Kaldbak laboratory which has been set up and equipped by the Faroese Parliament. Financing has been secured for the three years 1988 to 1990 with grants from the Nordic Council of Ministers (750,000), the Carlsberg Foundation (250,000), Faroese financial institutions (160,000), and subsidies for running costs from the Faroese Parliament (288,000 for 1989).



Dr. Arne Nørrevang, Biofar Kaldbak Laboratory - Faroe Islands

Mariculture

One important requirement for the breeding of fish in the sea is clean water. Many difficulties with mariculture, for example salmon and trout breeding, are the fault of poor water quality.

Technical developments in connection with the mariculture are aimed at activities on the open sea, but this offers great problems.

The Faroes are surrounded by one of the cleanest marine environments in the world.

The Faroes have many fjords and sounds where the water is renewed daily with water from the open sea, while the surrounding islands provide shelter from storms and swell.

There is one fjord, however, which has poor water circulation because the fjord is deep with a shallow sill at its mouth. Three scientific institutions in the Faroes cooperate on an ongoing investigation of water quality in the most important sounds and fjords.

The so-called "killer algae" are only dangerous when they occur in very high concentrations. Growth, leading to high concentrations, seems to take place only where the amount of nutrient salts in the sea is abnormally high, and in the Faroes there have only been limited incidences of this phenomenon in certain fjords.

The Faroes are well on their way to becoming self-sufficient in the production of food for mariculture. Various fish species caught in the clean waters around the islands are used in this production, and prawn shells from the prawn factories at Oyri give the salmon meat its appetizing colour.



Dr. Alf Josefson Kristineberg's Marine Biology Station, Sweden

The composition of benthic fauna (fauna of the ocean floor) can reflect the condition of the water and sediment environment, and for this reason it is often used as an indicator of the quality of that environment.

In disturbed environments, for example where there is a high degree of pollution, a few tolerant opportunistic species will dominate. In undisturbed environments, on the other hand, a variety of species is able to co-exist, each in its own ecological niche.

The variety can be shown in the form

of a diversity curve, where one calculates from a large sample how many species can be expected in a smaller sample.

The end of the curve gives the number of species in the large sample, and the slope of the curve reflects how evenly the number of individuals is distributed according to species.

Figure 1 shows combined diversity curves for polychaete worms, molluscs and echinoderms from the Faroe shelf at a depth of 300m. For comparison, corresponding curves from eastern Skagerrak are shown, based on material from the 1970's, from areas where the fauna still does not appear to be influenced by pollution.

The Faroe samples clearly contain more species than the Skagerrak samples, and the slopes of the curves are steeper. This latter is a result of the fact that each species only occurs with few individuals. Measurements of organic material in the sediment, as well as the relatively low number of individuals and biomasses to be found on the Faroe shelf also suggest that the sea bed is not significantly loaded with organic material.

The results gained so far from sediment floors on the Faroe shelf agree with the conclusion that the fauna there has not been noticeably affected by pollution.

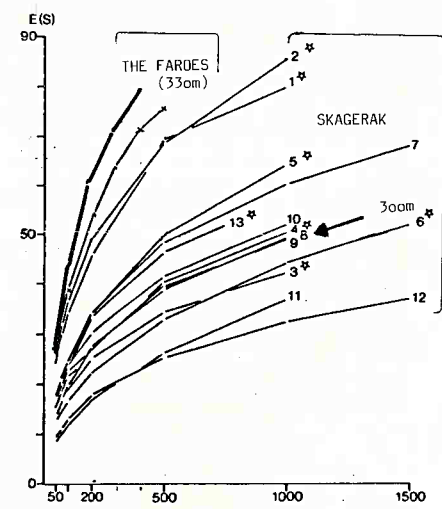
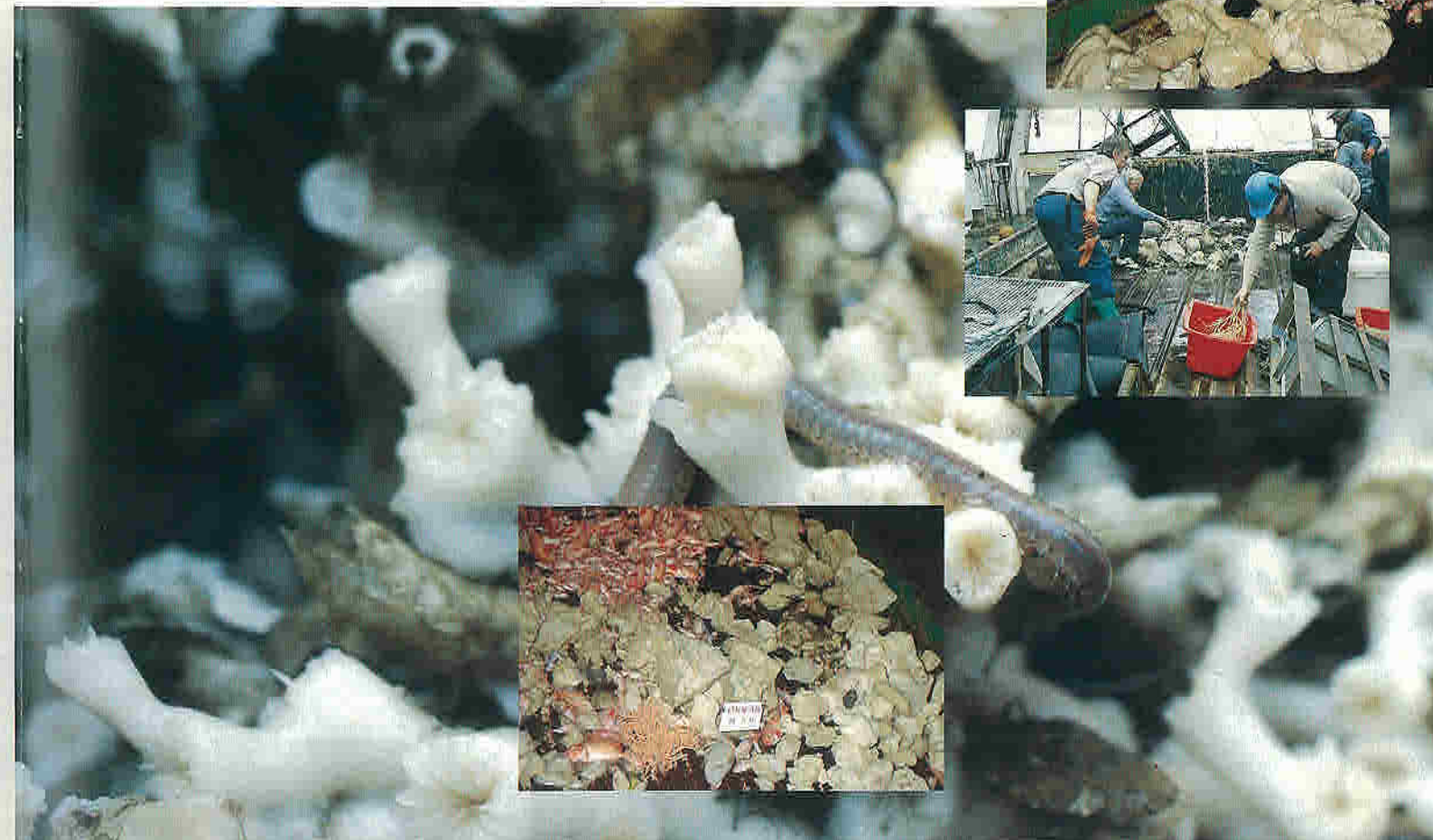
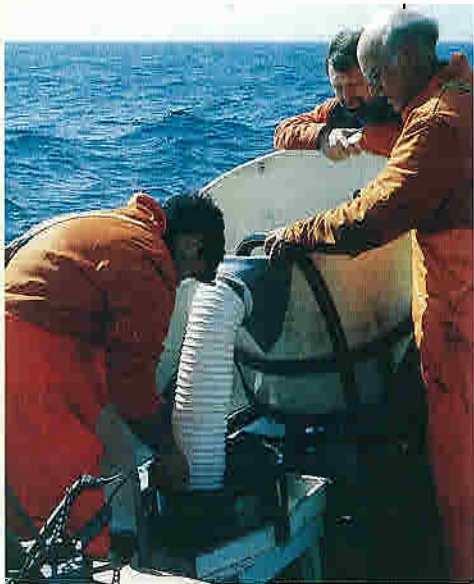


Figure 1. The diversity measured according to Hurlbert's "Expected number of species", (E(S)) for different sized samples (number of individuals x - axel) from 13 stations in Skagerrak (Josefson 1985), and the area west of Suðuroy, Faroes (Fa). The arrow shows stations around the 300m. level Skagerrak. Dominance is lower and the abundance of species is higher around the Faroes.



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What is a clean sea?

Until recently most people believed that the sea - the ocean - was almost unaffected by activities of man.

Unfortunately, we have a situation today where it is necessary to ask: what is a clean sea?

An unpolluted sea can be defined as marine areas where the negative effects of human activity in the form of pollution have not yet had an impact.

Pollution consists of those substances which do not belong to the natural environment. We are particularly interested in those substances which are harmful.

1. Actual poisons which kill or cause sicknesses. Amongst these are heavy metals such as lead and cadmium, and organic substances such as DDT, PCB and many others. Many of these substances accumulate in the food chain because animals and plants do not recognize them as harmful and

hence do not emit them in urine and excrement.

2. "Natural" emissions in the form of sewage outflows, and organic waste from industries such as paper factories, fish processing factories etc. These substances are not in themselves poisonous, but they must undergo decomposition. That requires oxygen which is taken from the sea water, thus leaving less for other organisms. As a consequence their resistance towards diseases may become lowered. In the worst situation they can die from lack of oxygen or from poisonous gases, such as hydrogen sulphide, which are created during the decomposition process.
3. "Overfertilization" of marine areas with nutrients such as nitrogen

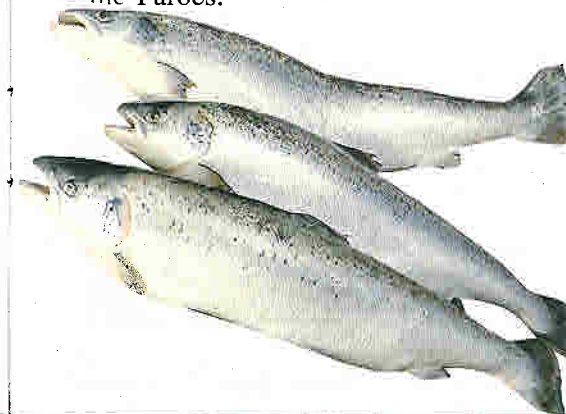
and phosphorus. This may cause high primary production of "poisonous" algae may become so abundant that large numbers of higher organisms die. Their decomposition can also create lack of oxygen.

Many animals which live in and on the ocean floor cannot escape such conditions, and the composition of benthic fauna is therefore a good indication of pollution impact. The results of the BIOFAR project can be used directly in this connection and can determine how conditions in the sea around the Faroes compare with those of other marine regions.

Ideal conditions for fish and fishing

Food chains in the sea begin with the plants - the algae attached to the bottom and the microscopic plankton algae. This is called primary production. The two main requirements for the growth of plants are sunlight for photosynthesis and nutrient salts from the sea water.

The conditions for a large primary production exist in the seas around the Faroes.



Seasonal patterns in the amount of light reaching down into the sea mean that primary production in Faroese waters is confined to the spring and summer season of the year, and is at its greatest in mid-summer, if the nutrient salts have not been used up. In the Faroes, the summer season is blessed with up to 20 hours of daylight at midsummer due to the location at c. 62 degrees N.

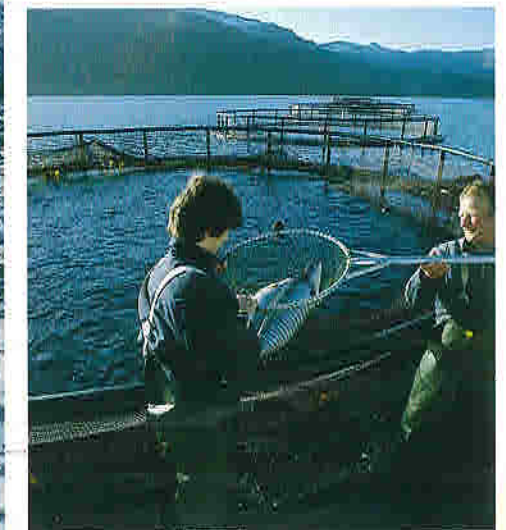
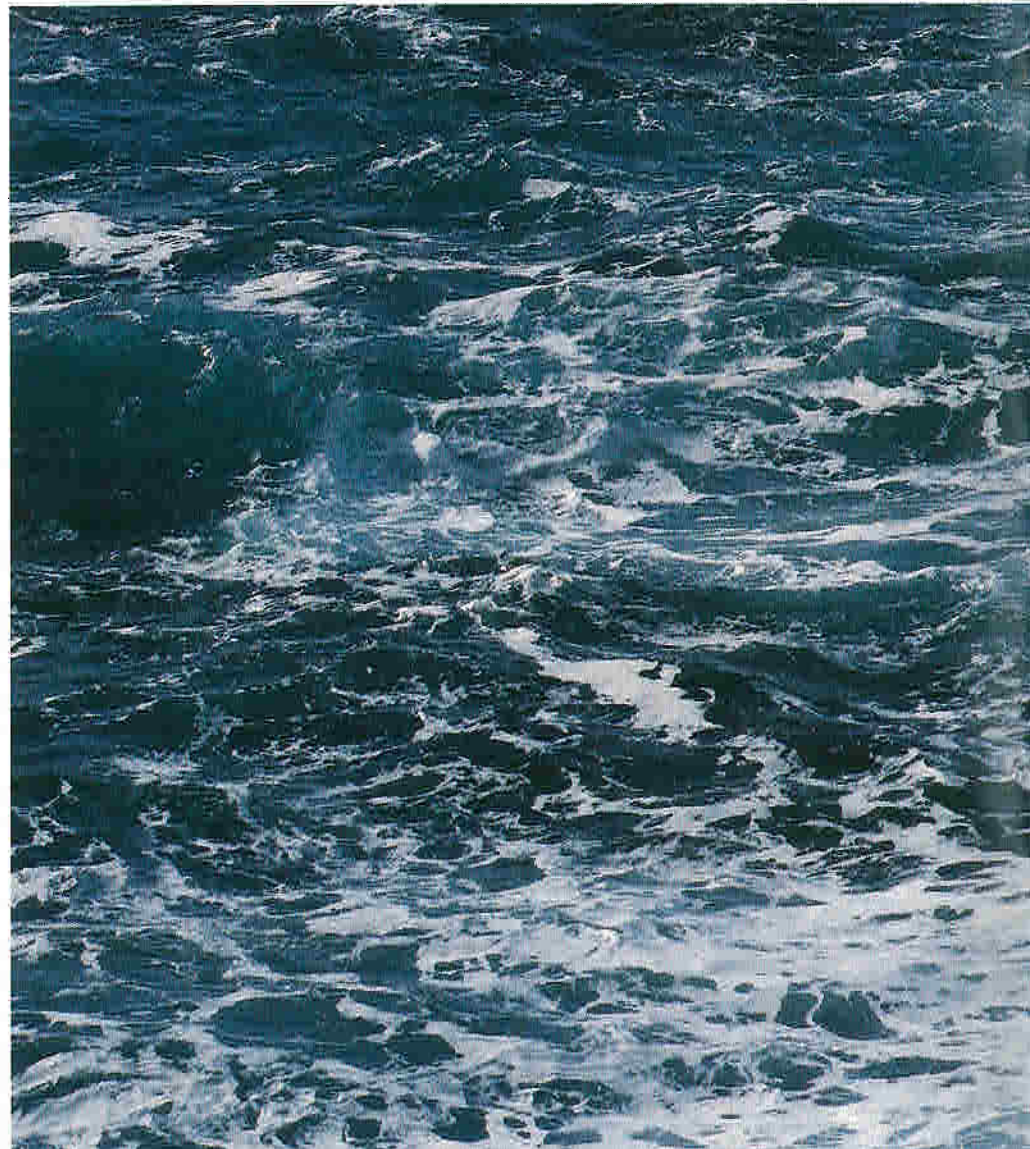
Nutrient salts are found everywhere in the sea. But the productions of plant plankton can use up all the nutrient salt and it is therefore important that there is sufficient turbulence in the sea for nutrient-rich water to be able to rise from the depths to the surface where primary production takes place. The sea around the Faroes

is characterised by strong sea currents, and the Gulf stream's meeting with the cold northern sea creates strong turbulence.

Nutrient deficiency for plankton around the Faroes is virtually unknown.

The rate of biological processes in the sea are dependent on temperature - plants and animals grow slowly in cold water and more rapidly in warmer water. The Gulf stream which surrounds the Faroes ensures that the temperature in the sea around the islands is c. 5 C in the winter and c. 11 C in the summer.

This gives ideal conditions for fish and their food sources.



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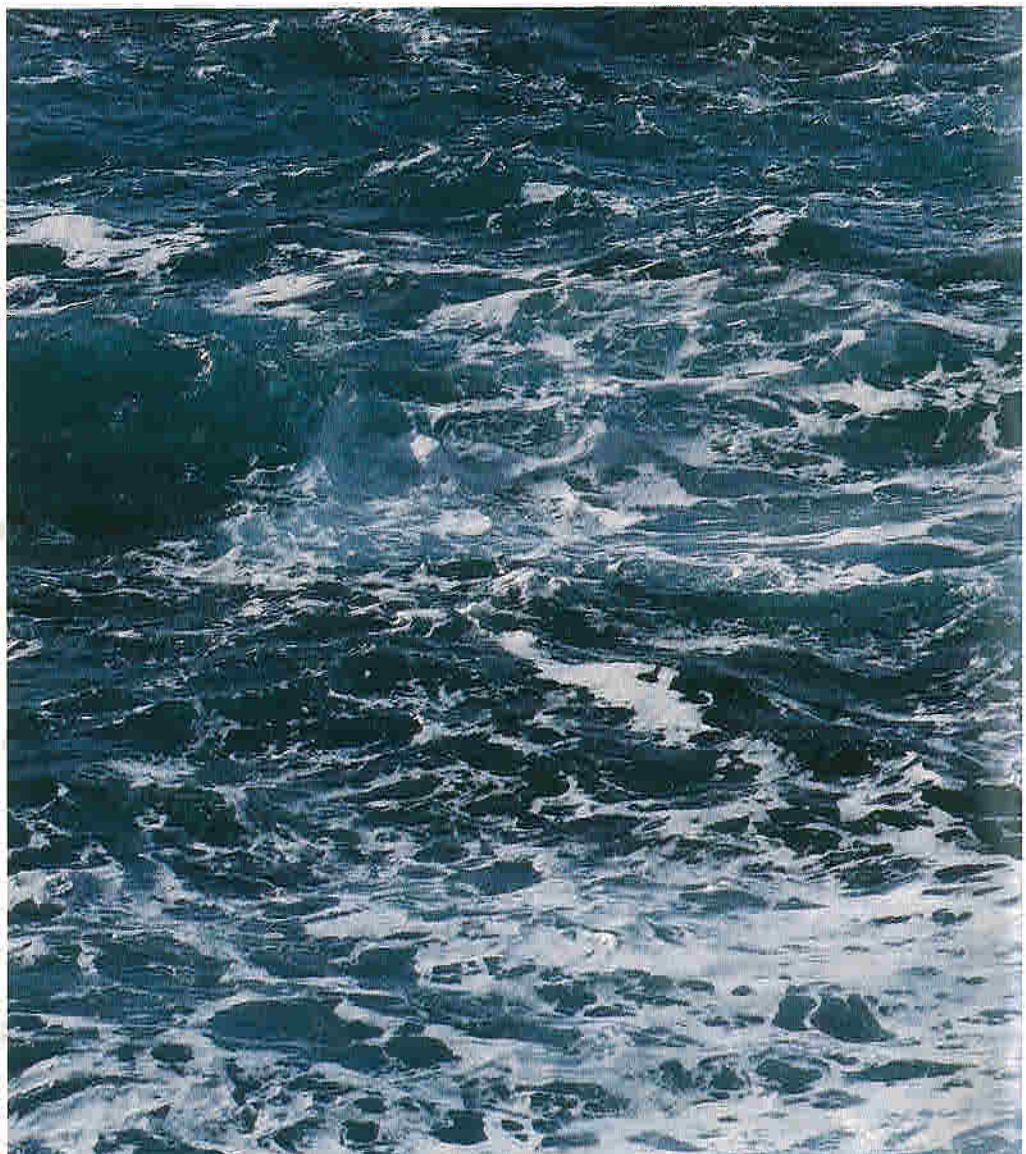
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The Faroese chain dance



Among the most characteristic traits of traditional Faroese culture is the chain dance - one of the oldest living dancing traditions of Europe.

Dancing is the same all over the Faroe Islands, but the individual villages and areas have given the dancing a local touch - this applies both to the way of dancing, the repertoire of texts and the music material. The dance is the rhythmical, physical accompaniment to the story told in the song. Its basic pattern is simple, the steps consist of two steps to the left and one to the right, distributed over six quarters in the melody. The dance expression differs in relation to the story the song is telling; a gay and amusing song is danced differently from a sad one. The dance gives expression to the texts, it illustrates the contents and mood of the stories.

The texts which accompany the dance are very varied both as regards origin, age, contents and length. They consist of

older or younger Faroese or Danish folk songs and ballads, various types of songs, broadsheet ballads and songs from revues, and other songs from the popular tradition. The oldest ones date back to the Middle Ages, the newest ones are from the 20th century. Some are short - 20 or 30 verses - others are of several hundred.

The music which gives colour and mood to the song, may, to those who are not familiar with the tradition, seem rather alien and monotonous. The melodies are sung continuously, i.e., with no interval between verse and chorus and the next verse. They are sung mostly in unison, but some sort of harmony can still be heard in a few places. In the dancing there is a choir-leader whose job it is to make the dancing go smoothly - rhythmical and inspiring. The good choir-leader is also capable of entering into the spirit of the action of the text and convey it to the other dancers.

The dancing usually starts with a choir-leader together with one or more entering the dance floor. They join hands and start to sing a chant or a song. Soon more are joining the chain, which is then

closed into a ring, and gradually as the ring becomes too large for the room, the choir-leader breaks the ring towards the middle. More and more are joining in, and finally the chain consists solely of windings and twists. In this way, the dance floor is used optimally, but in addition there is the advantage that the dancers, besides having contact with those whom they are dancing next to, are also in contact with the other dancers in the chain. At short intervals, all are in contact with each other, all are dancing closely past each other face to face. Everyone may participate in the dancing, regardless of sex or age. One enters the chain largely where one wants to.

The fact that this medieval dance is used as much as it is even today, is due not least to the many dancing societies which during the last 20 or 30 years have made great efforts to preserve the dance in a time when its social fundament, the feudal farmer's community has long since disappeared.

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