

A brief history of investigations on the benthic fauna of the sea around the Faroe Islands, with emphasis on the expeditions and research vessels

Introduction

Information on the benthic fauna of the Faroes is very scattered in the literature, and when extracting details, one must remember that the extent of “the Faroese area” has changed over time in accordance with the international agreements on fishery limits. A 3 nautical miles limit was agreed upon with Great Britain in 1901 and maintained until 1955, when a provisional arrangement extended it to 6 miles. In 1959 a 12 nautical miles limit was introduced, with some fishing rights for British trawlers as close to the coast as 6 miles. However, Faroese fishermen demanded new negotiations, and when these did not lead to agreement, Denmark declared the 12 miles to be in force from 1964. Finally, from 1978 a Faroese Exclusive Economic Zone (EEZ) was set at 200 nautical miles (Madsen 1990).

The aim is here to give a survey, as complete as possible, of the expeditions by research vessel and nationality during which samples of invertebrate benthos were collected within the nowadays Faroese EEZ, or very close to its borderlines. It should be noted that quite a number of other expeditions have visited Faroese waters. Their purpose was fishery research, plankton investigations or hydrographic observation, or they were just passing by on their way to other destinations.

Summaries in part covering the theme are given by Spärck (1928) and Vedel Thåning (1943).

The early period: travelers and laymen

In order to collect the material for a comprehensive description of the Faroes, the Danish government had the Faroese born economist and naturalist Jens Christian Svabo travelling all over the islands in 1781-1782. His observations are to be found in a large hand-written manuscript which, however, was not printed until

1959. It includes a list of about 20 marine invertebrate species, mostly molluscs and crustaceans (Svabo 1959).

Jørgen Landt, who was a priest in the Faroes 1791-1799, also worked out a description of the Islands, published in 1800. He gave a list of close to 60 marine invertebrate species, about half of them molluscs, the rest being sponges, cnidarians, polychaetes, crustaceans, bryozoans and echinoderms (Landt 1800). Some specimens were sent to Copenhagen to be included in what later became the collections of the Zoological Museum (Fabricius 1797).

The later professor of zoology at the University of Copenhagen, Japetus Steenstrup, was the first trained zoologist sampling Faroese marine fauna. In 1844 he was appointed part of the company attending the crown prince, the later King Frederik VII, during travel to Scotland and the Faroes. This gave Steenstrup the opportunity to dredge from rowing boats around some of the Islands, and also to establish useful contacts to officials and private persons (Steenstrup 1914). Strange enough, Steenstrup never published any results from his sampling efforts, but it seems from the comments in a list accompanying the collection that it comprised mostly molluscs of which 43 species were recorded (Mörch 1868).

Oscar Schmidt, professor of zoology in Jena, lived for several months in the Faroes in the spring of 1848. He collected turbellarians around Tórshavn (Schmidt 1848a,b).

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ing a telephone cable from Europe to America via the Faroes and Iceland, the British 'Fox' took a few bottom samples east and west of the Faroes in 1860 (Zeilau 1861). The Same year and for the same purpose another British ship 'Bulldog' visited the Faroes, and some few samples were taken in Vestmanna Sound (Willich 1862)

In 1872 the Danish government supported an expedition to the Faroes in order to explore the possibilities of mining the coal-layers. The German zoologist Rudolph von Willemoes-Suhm took part in order to describe the fauna. He seems mostly to have been interested in the vertebrates, but also collected annelids around Tórshavn (Kortum 1996, Willemoes-Suhm 1872a,b, 1873).

At this time the tradition had developed that interested officials, priests, officers and doctors collected specimens and sent them to the Zoological Museum in Copenhagen. These collections were not systematically made, rather they comprised specimens which somehow seemed remarkable. A fine example of this is chief administrator Müller, who most years between 1847 and 1892 sent mainly crustaceans and fishes, but also a few hydroids, "Worms" and bryozoans.

Thus, until the last part of the 1800-years there were only scattered efforts to provide surveys of the Faroese benthic fauna, with exception of the molluscs, which at the time attracted the interest of many educated persons. A detailed account of collectors and collections of molluscs from this period is given by Mörch (1868).

The era of British expeditions: topography, hydrography and fauna of the Scottish-Faroese deep-sea area

During the 1860'ies it became, on the basis of work of Norwegian, British and French colleagues, increasingly clear to the British marine zoologists W.B. Carter and C. Wyville Thomson, that the deep-sea probably housed a rich, undescribed fauna. They succeeded in 1868 in getting at their disposal the paddle steamer 'Lightning' for cruises between Scotland and the Faroes,

also visiting Tórshavn in August 1868 (Carpenter 1868, Rice 1986). The 'Lightning' was old, almost falling apart and poorly suitable for the purpose, but nevertheless these two months of sounding, dredging and hydrographic observation were breaking the ground for the immense efforts that during the next 100 years were to be displayed all over the world by many nations on numerous ships, whose names are now the milestones in the history of exploration of the deep oceans.

The demonstration by 'Lightning' of the existence of a diverse life at great depths and of unexpected strong temperature variations from south to north in the area led, in the following decades, to the British expeditions with 'Porcupine', 'Knight Errant', 'Triton', 'Goldseeker', and 'Silver Belle' (Carpenter *et al.* 1870, Deacon 1977, Wyville Thomson 1880, Tizard 1883, Tizard & Murray 1882, Wolfenden 1909, Rice 1986, Damkaer 2000). The results were, in brief, that along what is today the southern border area of the Faroese EEZ, the Wyville Thomson Ridge was discovered and mapped, the hydrographic pattern of the area was explained and a new and rich fauna described. Some of the data have been published in separate papers, but the main part was included in the large material collected and worked up from the Challenger Expedition, and appears in some of the volumes in this large series.

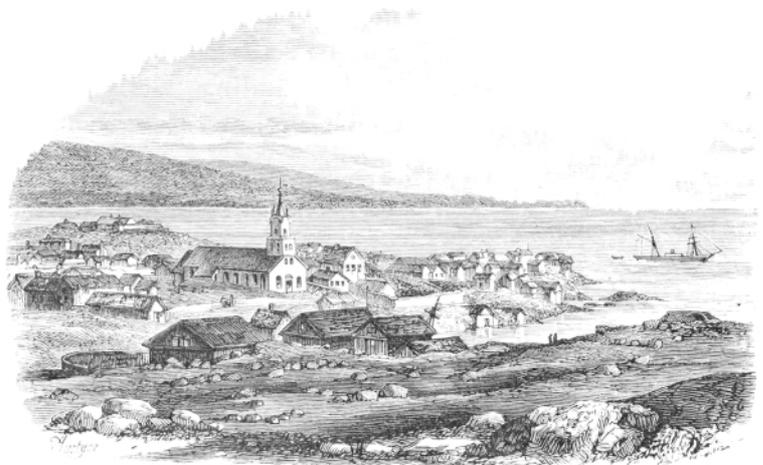


Figure 1. Drawing by Madame Holten, wife of the Faroese Governor M. Holten, probably of the paddle steamer 'Lightning' with Tórshavn in the foreground (Wyville Thomson 1873).

It should be mentioned here that in 1898 a few samples were taken in the Wyville Thomson Ridge area by the German steamer 'Valdivia' while this deep-sea expedition was on its way to the main working area around Africa and in the Indian Ocean (Schulze 1904).

International efforts: the fauna of the eastern, northern and western deep-sea areas of the Faroese EEZ

On the basis of a well-argued recommendation from the professors H. Mohn and G.O. Sars, it was decided by the Norwegian government to hire and fit out the steamer 'Vøringen' for deep-sea investigations in the Norwegian Sea during the summers of 1876-1878 (Wille 1882). The expedition visited the Faroes in July 1876 and took a number of samples east and north of the islands, thereby delivering the first insight into the fauna of that area (Hansen 1885).

In 1900, 1902, 1904, 1905 and 1910 the Norwegian fishery research vessel 'Michael Sars' during cruises led by professor J. Hjort in the Norwegian sea and the North Atlantic visited the Faroes and took some samples at depths larger than 1000 m (Friele 1902, Grieg 1927, Murray & Hjort 1910, Wollebæk 1909). In the expeditions in 1900 and 1902 Danish scientists were onboard the 'Michael Sars' and sampled in a number of places, mostly on the Faroe plateau. Another Norwegian research vessel, 'Armauer Hansen', worked near the Faroes in 1914 (Helland Hansen 1913, 1914).

The French oceanographic vessel 'Pourquoi pas?' took a few samples when having short stays in the Faroes in 1913 and 1930.

The next research vessel from which work was done at large depths seems to have been the German fisheries research ship 'Anton Dohrn' on a cruise led by professor H. Thiel in 1966; numerous samples were taken in the area of the Faroe-Iceland Ridge, mainly for the purpose of meiofauna investigations (Reinke-Kunze 1986, Thiel 1971).

The German fishery research ship 'Walther

Herwig" worked briefly in 1974 and 1981 on the banks west of the Faroes (Reinke-Kunze 1986).

A joined French-Swedish project, NORBI, carried out onboard the French oceanographic research vessel 'Jean Charcot' successfully investigated the deep basins of the Norwegian and Greenland Seas in 1975 and came close to the north-east corner of the Faroese EEZ (Dahl *et al.* 1977).

Since 1981 the Norwegian research vessel 'Håkon Mosby' from the University in Bergen has, under the leadership of the marine zoologist T. Brattegard, made numerous benthos investigations all over the Norwegian sea, especially in deep water. During cruises in 1983, 1986 and 1987 samples were taken inside the Faroese EEZ (Brattegard & Rømer 1998). These samples were later included in the station list of the BIOFAR programme (Nørrevang *et al.* 1994).

The Dutch research vessel 'Pelagia' worked in the Faroe-Shetland Channel in 1997 securing a small number of benthos samples (Raaphorst 1997).

Danish investigations around the Faroes and on the outer shelf

The role of naval ships.

There is a long tradition for the Danish Navy to support marine research with sampling opportunities and logistics. While commander of the mail-ship to Iceland and the Faroese, C.F. Wandel did some dredging in 1878 (Steenstrup 1880). At the Faroes, the ship's doctor Halberg dredged bottom animals from the surveying schooner 'Diana' under Commander C. Irminger in 1884, and one of the ship officers, lieutenant commander Jensen, did the same in 1886 (Steenstrup 1887, Levinsen 1889). Some samples were provided by commander C.F. Wandel on the cruiser 'Fylla' in 1890, 1891 and 1892 (Levinsen 1893, 1894). In 1895 and 1896 the cruiser 'Ingolf', under commander Wandel, carried through comprehensive investigations west of the Faroes (Wandel 1899, Wolff 1967, 1997).

On numerous occasions fishery inspection and surveying vessels working in the Faroese, Icelandic and Greenland waters have given space and time for scientists' work for periods up to several months. In some cases young biologists being onboard as conscripts got a special permission to take samples. The opportunity was used for the first time in the Faroes in 1898, when the zoologist R. Hørring collected with the 'Diana' (Vedel Thåning 1943/44). This vessel was used again in 1899 and 1901, and in 1902, the last year of her function (Larsen 1932). In 1899 the most comprehensive sampling hitherto carried through in the Faroes was done by the zoologist T. Mortensen from the inspection vessel 'Guldborgsund'. The survey and fishery inspection ship 'Beskytteren' was used for investigations during the summers of 1902, 1904, 1905, 1907 and 1909, and again 1926, 1927 and 1933. In 1931 'Hvidbjørnen' gave time for sampling as did 'Thetis' in 1946 and next generation fishery inspection ships, also called 'Hvidbjørnen' and 'Thesis', in 1979 and 1991 respectively (Olsen & Storgaard 1998).

Fishery research vessels.

Bought in 1902, the steam trawler 'Thor' started work in the Faroes and Iceland the following year. Simultaneously with fishery and plankton research, samples of bottom invertebrates were provided in the years 1903 through 1906, and again in 1913 (Schmidt 1909).

During the onset of a plankton investigation expedition across the Atlantic, the hired, privately owned schooner 'Margrethe' in 1913 spent some time on the Faroes, and quite a number of benthic samples were collected by the fishery biologist P. Jespersen (Vedel Thåning 1952).

In 1920 the Danish government bought a British steam trawler, somewhat larger than 'Thor', and equipped it for fishery investigation work. It was named 'Dana' and was, until it sunk in 1935 after a collision, used both for longer expeditions and local work. Bottom invertebrate samples were taken in the Faroes in 1925, 1926 and 1927. A replacement, also named 'Dana'



Figure 2.

The Danish fishery inspection ship 'Beskytteren' in Tórshavn on King Christian X's birthday, September 1926 (Photo by P.L. Kramp, archive of the Zoological Museum, Copenhagen).

was not built and ready until 1938; meanwhile other ships were chartered to carry through the fishery investigations (Vedel Thåning 1943). The new 'Dana' took some samples in 1938 and 1939, when the 2nd World War broke the communication between Denmark and the Faroes. After the war, 'Dana' provided scattered bottom invertebrate samples in 1946, 1954 and 1961.

In 1964 the Faroese government bought the trawler 'Jens Christian Svabo' for local fishery investigation, thereby providing a year-round basis for scientific marine work. With a major rebuilding in 1967, it functioned until 1980, when it was replaced by the larger 'Magnus Heinasson'. The last-mentioned was used for intensive bottom invertebrate sampling in 1987 through 1991 and again in 1998.

Major benthic investigations in the Faroese EEZ

"The Ingolf Expedition"

In 1880 a plan for a Danish deep-sea expedition west and north of the Faroes and around Iceland and southern Greenland was developed by the zoologist C. Lütken and the naval officer C.F. Wandel. Various preparations were made, among them that



Figure 3.
The Faroese research vessel 'Magnus Heinason'
(Photo, G. Bruntse)

Wandel in 1880 was sent to USA to take part in a cruise, led by professor A. Agassiz and commander J.R. Bartlett onboard the survey-vessel 'Blake' (Wandel 1881). It was, however, not until 1895-1896 that the naval cruiser 'Ingolf' could set out and carry through its investigations, comprising 24 stations west of the Faroes (Wandel

1899, Wolff 1967, 1997). The results are published in the series "The Danish Ingolf Expedition" at the Zoological Museum, Copenhagen.

"The Zoology of the Faroes"

In the beginning of the 1920'ties Danish zoologists realized that while the vertebrate fauna of the Faroes was fairly well investigated, the knowledge of the invertebrates was very scattered and insufficient. An organizing committee was appointed and a generous grant was obtained from The Carlsberg Foundation for a zoological investigation of the islands (Spärck 1928). Intensive collection efforts were displayed during 5 years, beginning in 1924, both at sea and on land. The marine sampling was carried out from the inspection vessel 'Beskytteren' in 1926, and the fishery research vessel 'Dana' in 1925, 1926 and 1927. The largest part of the samples were from between the islands and inside the 3 nautical miles fishery limit; accordingly, very few samples came from depths larger than 200 m. The results are to be found in the series "The Zoology of the Faroes", 1928 through 1971, in which 59 of the 68 chapters were published before 1940.

"The BIOFAR Program"

With the erection of the EEZ in 1977, the Faroes got the scientific responsibility for a much larger area than before. At the same time there was among marine biologists in the Nordic countries a growing anxiety over the decreasing marine taxonomic expertise. As it was, no single country was any more able to handle its own fauna, not even all the largest groups to full extent. It was felt that the Nordic traditions for cowork in marine sciences should be reinforced, and moreover, it seemed that the resources for a larger project were available. The result was the creation of the Internordic BIOFAR Program in 1987, with the aim of investigating the Faroese marine bottom fauna between 100 m and 1000 m depth. The limits were chosen, because it was felt that "The Zoology of the Faroes" had covered the shallower parts sufficiently, and the larger depths were to a great extent already worked over by previous expeditions. Also, local fishery interests, who were going to

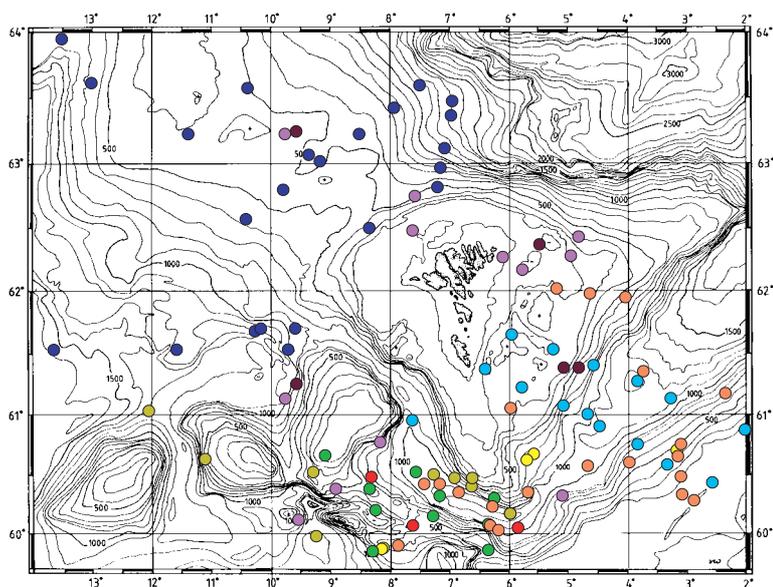


Figure 4.
Sampling stations of the older expeditions compiled from various sources. The Danish Ingolf expedition: ●, The Michael Sars 1910 expedition: ●, The Michael Sars 1902 expedition: ●, Deutsche Tiefsee Expedition: ●, Triton: ●, Lightning: ●, Porcupine: ●, Knight Errant: ●, 2 stations by Fylla, 1 by the Norwegian North Atlantic Sea Expedition and a few other single stations ●.

support the project with an appreciable amount of ship-time, did not reach beyond about 1000 m.

During the years from 1987 to 1991 a large number of Nordic scientists, students and technicians took part in 9 cruises onboard the Faroese 'Magnus Heinason' and the Norwegian 'Håkon Mosby'. Besides, visiting cruises were carried through onboard the British 'Challenger' and the German 'Valdivia'. An important local support came from the Faroese Coastguard, who put their ships at disposal for a number of shorter cruises with the purpose of special investigations. After sorting at the locally erected Kaldbak Laboratory, the material was sent out internationally to a large number of specialists for identification and further work. Publications are now appearing in English in the Faroese journal "Fróðskaparrit" and in various international journals, among which especially the Norwegian "Sarsia" should be mentioned.

Because the older shallow-water investigations turned out nevertheless to be somewhat insufficient, a shallow-water BIOFAR 2 was run from 1995 through 1998, including also the flora.

Maps of benthos sampling sites

When the First World War broke out, and for a number of years stopped all seagoing research, a large part of the Faroese area had been sampled. The sampling activity had been rather high on and around the Wyville Thomson Ridge, lower in the other parts (Figure 4). Quite accidentally, most samples were taken in deep water, and relatively few lower than 500 m (they are not all shown in the map). The material was scattered in the collections of many institutions in different countries, and the results were to be found in numerous publications in a large number of journals and series. As it was, the effort to gather all this information was, in a way, already done for a number of groups treated in the monographs of the comprehensive 'Ingolf' report. Since there had been no need for a fauna survey of that particular area, it was, however, even in those reports troublesome to extract the information from the multitude of

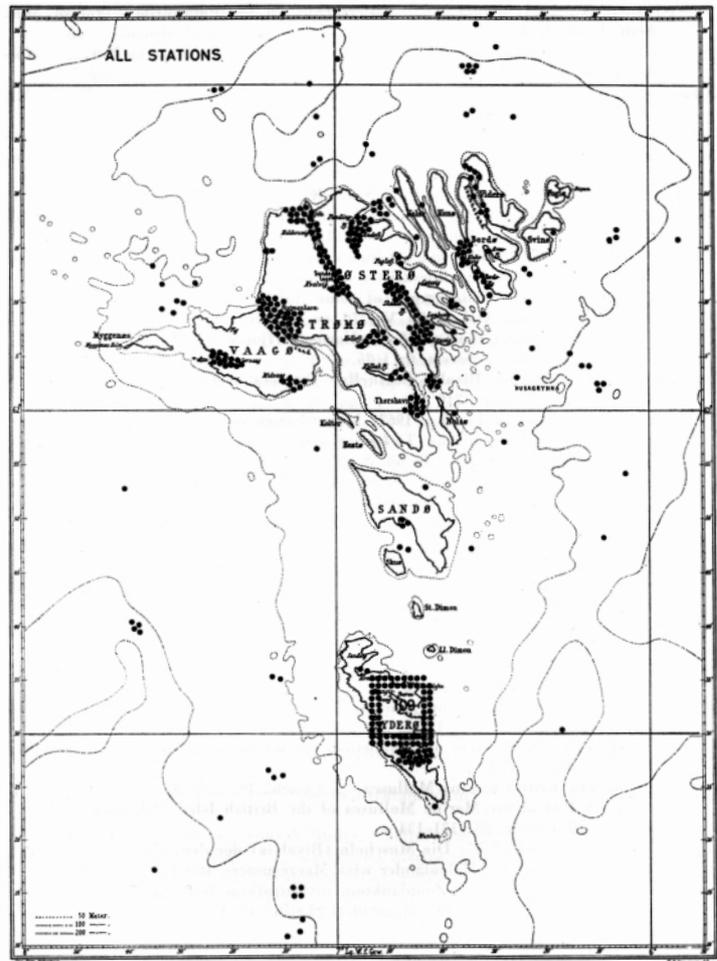


Figure 5. The sampling stations of "The Zoology of the Faroes" program. After G. Høpner Petersen 1968.

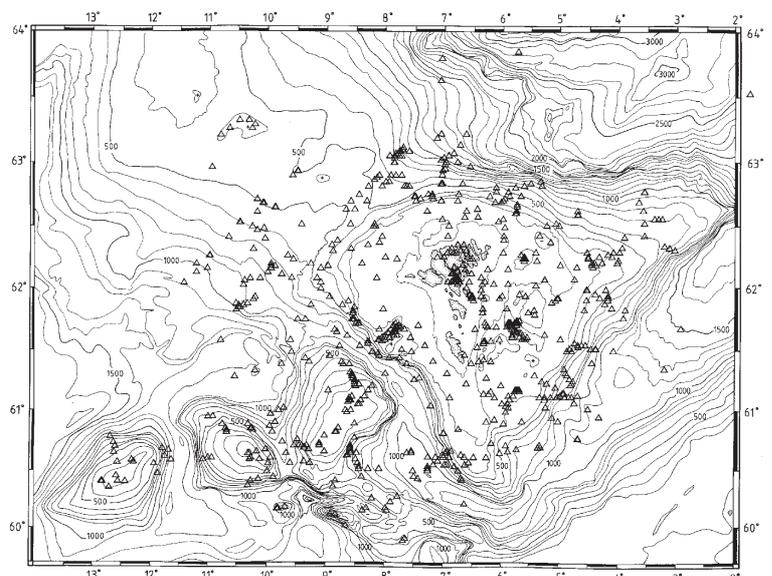


Figure 6. The sampling sites of the BIOFAR program. Based on Nørrevang *et al.* 1994.

results from many parts of the Northeast Atlantic.

The obvious lack of knowledge about the shallow water fauna was realized by zoologists from the Zoological Museum of the University of Copenhagen, who managed to create a program "The Zoology of the Faroes" during which sampling was done in the later part of the 20'ties. Sampling efforts were restricted to between the islands and parts of the plateau largely within the 3-miles fishery limit (Figure 5); about 400 localities were sampled (Høpner Petersen 1968). The outer shelf and upper slope were still left unsampled.

During the BIOFAR program the effort was directed towards closing the gaps between 100 and 1000 m depth (Figure 6). Because new kinds of gear (Smith-McIntyre grab, Sneli detritus sledge (Sneli 1998), Rothlisberg-Pearcy hyperbenthic sledge (Buhl-Jensen 1986, Brattegard & Fosså 1991), and photography) were used it was decided as far as possible to cover the area without too much consideration of earlier sampling. Close to 600 localities were sampled with about 800 deployments of gear (Nørrevang *et al.* 1994).

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