

Distribution of some parasites and diseases of fishes from the
North Sea in February, 1977

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Abstract

In February/March 1977, ten fish species from 82 localities all over the North Sea have been examined. The occurrence of Vibrio disease, Lymphocystis disease, Contracaecum larvae in whiting, and of the copepods Clavella adunca, Lernaeocera branchialis, L. obtusa, Lernaeenicus sprattae, and L. encrasicoli has been noted. Information is given on the geographic distribution of parasites and on infection rates according to fish length. No significant influence of water pollution on distribution of fish diseases could be detected.

Résumé

En février/mars 1977 dix espèces de poissons de toute la mer du Nord ont été examinés. L'existence de la vibriosis, de la lymphocystis, des larves de Contracaecum chez les merlans et des copépodes Clavella adunca, Lernaeocera branchialis, L. obtusa, Lernaeenicus sprattae et L. encrasicoli a été notée. Des informations sont données sur la distribution géographique des parasites et sur la quote-part des parasites en rapport avec la longueur des poissons. Une influence significative de la pollution de l'eau sur la distribution des maladies de poissons n'a pu être constatée.

Introduction

Increasing water pollution is suspected to favour the outbreak of fish diseases. In the case of vibriosis, copper is known as initiating factor of the disease (RØDSAETHER & al., 1977). Vibriosis occurs to high extends in fish from polluted coastal waters (JENSEN & al., 1976; LAMOLET & al., 1976).

One intention of this paper is to give comparative informa-

tion on the status of diseases of offshore fishes from the North Sea and to find relationships between various degrees of water pollution and the occurrence of several fish diseases.

From 28, January to 10, March 1977, a survey of the fish stocks of the North Sea has been carried out by RV "Poseidon". The randomly chosen positions of 82 trawling stations are shown in fig.1. Distribution of the various fish species is reported by BOYSEN & al. (1977). For each station the occurrence of some of the most harmful parasites and diseases has been recorded.

The following fish species have been examined (number of specimen in brackets): Sprattus sprattus (10,390), Clupea harengus (3,746), Gadus morhua (1,238), Merlangius merlangus (12,423), Melanogrammus aeglefinus (5,647), Trisopterus esmarki (3,536), Trisopterus minutus (456), Pleuronectes platessa (520), Limanda limanda (5,051), and Hippoglossoides platessoides (286).

1. Vibrio disease

This disease is probably caused by the bacterium Vibrio anguillarum. Necrosis of the skin, sometimes affecting the upper layers of the body muscles is a typical Vibrio lesion. Wounds may occur at each part of the body, reaching up to 2 cm in diameter.

During this survey, only 14 fish out of 43,693 were found to carry a typical Vibrio lesion, among them 1 haddock, 1 long rough dab, and 12 dabs. There was a concentration of infections in the SW North Sea, 11 diseased fish were found at stations 8 to 11.

2. Lymphocystis disease

In the North Sea, flatfish species are the most probable hosts of Lymphocystis, a disease of viral origin. Fish infected by Lymphocystis carry white tumours emerging from skin cells and resembling to small cauliflowers. Just 38 out of 6,027 (0.6%) flatfish were found to be infected, all of them were dabs (fig.1).

3. Contracaecum larvae

Only the body cavity of whiting was examined. A subsample of 100 nematode larvae was determined microscopically. All these nematodes proved to be third or fourth stage larvae of the genus Contracaecum, characterized by the presence of two appendices at the end of the esophagus. Most of them were encysted on the liver or in the hind part of the body cavity. Infections with adult Contracaecum in the intestine were common. The life cycle

of Contracaecum in the North Sea is not yet known in detail. Planktonic crustacea may serve as first intermediate hosts (ROSENTHAL, 1967). It is not known, if the second intermediate host (fish) is necessary for the development of the parasite. Final hosts are fish - benthos feeders as well as fish eaters.

The number of parasites per fish decreases with increasing length of the fish (tab.1). For to study the distribution of Contracaecum larvae in the North Sea, whittings of 14-16 cm length from 36 stations were examined (fig.2). Highest infection rates were found in the central North Sea.

4. Clavella adunca

Clavella adunca from the gills of whiting was found at stations all over the North Sea. There were two regions with relative high incidences of infection: south of 55°N and north of 57°N (fig.3). Infection rates of nearly 20% were found in fish of 13-18 cm length, smaller and larger specimen being less infected (tab.1).

5. Lernaeocera spp.

According to KABATA (1957), two species of Lernaeocera are parasitizing gadoid fishes in the North Sea: L.obtusa on haddock and L.branchialis on cod and whiting. In the life cycles of Lernaeocera species, an intermediate host is involved: flounder and plaice in the case of L.branchialis and lemon sole in the case of L.obtusa.

Whiting proved to be infected from 13cm upwards (tab.1). The highest rate of infection (2.5%) was noted for whiting of 20cm length, larger as well as smaller fish being less infected. The geographic distribution of the parasite shows a preference of shallow waters of the southern North Sea (fig.4).

A similar distribution was noted for Lernaeocera from cod. Ten out of 838 or 1.2% of cod from station 1 to 42 were infected, the smallest one measuring 19cm.

The rate of infection of haddock was considerably higher: 15.7% of all fish larger than 23cm carried one or more parasites. The smallest fish infected measured 15cm. There is an increase of infection rates with increasing fish length (tab.2). Adult females, young females without egg strings and rests of dead parasites were found together on one host. A single fish carried up to 5 parasites. Maximal rates of infection were found at

stations off Scotland and northern England, not deeper than 80m (fig.5, tab.3).

6. Lernaenicus spp.

Two species of Lernaenicus are parasitizing clupeids in the North Sea: L.sprattae being anchored in the eye and L.encrasi-choli being anchored in the body muscles of the host.

During this survey, no herring was found to be infected, while 0.4% of sprat carried one L.sprattae and 0.2% one L. encrasi-choli. All infected fish were caught in the German Bight and adjacent waters (fig.6, tab.4). Both species proved to have a similar distribution.

Discussion

Although a long list of publications on parasites and diseases of North Sea fish is existing (MÖLLER, 1977), there is little information on harmful effects of diseases on fish and nothing is known on the influence of parasites and diseases on the natural mortality in North Sea fish stocks.

Loss of weight has been recorded from fish infected with the fungus Ichthyosporidium hoferi (MÖLLER, 1974), with Contra-caecum larvae (GETSEVICHYUTE, 1955) and with copepods of the genus Lernaecocera (MANN, 1952). Infections with the protozoan Glugea stephani cause death of flatfish (MÖLLER, 1972) and Vibrio disease may cause mass mortality of eel and death of single specimen of other species. Heavy tissue lesions are known from infections with nematode larvae (KAHL, 1939), copepods (LÜLING, 1953) and with Lymphocystis disease (RUSSELL, 1974).

There is little possibility of comparing results from this survey with former data, as most previous surveys on parasites mentioned here have been done in coastal waters. The rates of infection appear to be higher in inshore waters in the case of Vibrio disease and Lernaecocera (SMITH, 1969). LAMOLET & al. (1976) reported high numbers of Vibrio necrosis in cod from shallow waters off Dunkerque. JENSEN (personal communication) found up to 50% of cod from some Danish fjords to be infected. A study on the occurrence of Vibrio disease in Kiel Bight is in progress by the author.

Probably most species mentioned here will occur at higher percentages during summer, as is known from Vibrio disease.

(HAASTEIN & HOLT, 1972), adult Contracaecum (MÖLLER, 1975) and adult Lernaeocera (SUNDNES, 1970) from other regions. Therefore the survey will be repeated in summer 1977.

In the case of Lernaeocera, there is a relation between the occurrence of adult parasites on gadoids and the distribution of the first intermediate hosts of the parasites: whiting is heavily infected by L.branchialis in SE North Sea, where the highest density of flounders occurs. Maximal infection rates of haddock by L.obtusa are known from the coast off NE England and East Scotland, where lemon sole occurs in high numbers.

No clear relation was shown between water pollution, as indicated by the presence of heavy metals in sea water (DUTTON & al., 1973) and the geographic distribution of fish diseases. The concentration of Vibrio and Lymphocystis infections in SW and SE North Sea might indicate an influence of pollution, but the total rates of infection are too low to give definite informations.

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	fish length (cm)																													
	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	> 30				
n fish examined (station 3-6)	0	0	0	0	0	0	0	18	20	25	25	25	25	20	21	18	14	19	12	16	13	16	8	9	6	10				
n Contra-caecum larvae								50	77	84	62	63	43	27	29	30	31	22	34	29	26	34	12	9	6	15				
x Contracecum larvae per fish								2.8	3.8	3.4	2.5	2.5	1.7	1.3	1.4	1.7	2.2	1.2	2.8	1.8	2.0	2.1	1.5	1.0	1.0	1.5				
n fish examined (all stations)	7	9	62	141	296	396	487	541	730	814	768	703	532	547	694	616	615	440	309	303	278	167	190	173	147	403				
n infections with Clavella	0	2	6	13	29	56	68	106	145	122	139	125	103	69	98	80	66	66	39	39	36	23	20	7	13	19				
% infected with Clavella	0	22.2	9.7	9.2	9.8	14.1	14.0	19.6	19.9	15.0	18.1	17.8	19.4	12.6	14.1	13.0	10.7	15.0	12.6	12.9	12.9	13.8	10.5	4.0	8.8	4.7				
n fish examined (all stations)	7	9	62	140	298	400	508	599	825	918	868	752	557	557	724	651	685	519	370	368	329	308	207	191	163	431				
n infections with Lernaecera	0	0	0	0	0	0	0	3	5	7	5	7	12	11	18	15	12	9	5	4	2	5	3	2	2	6				
% infected with Lernaecera	0	0	0	0	0	0	0	0.5	0.6	0.8	0.6	0.9	2.2	2.0	2.5	2.3	1.8	1.7	1.4	1.1	0.6	1.6	1.4	1.0	1.2	1.4				

tab. 1:

infections of whiting with Contracecum larvae, Clavella, and Lernaecera

fish length	15	15	16	17	18	19	20	21	22	23	24	25	26	27	28
n fish examined	276	220	193	200	181	148	118	115	120	172	227	266	265	340	334
% infected by <i>Lernaeocera obtusa</i>	0.0	0.45	0.0	1.0	1.7	0.0	0.85	4.35	0.8	6.4	11.9	11.65	14.3	13.2	15.0
fish length	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
n fish examined	345	380	284	269	228	194	191	135	108	65	49	51	42	36	18
% infected by <i>Lernaeocera obtusa</i>	14.8	13.2	10.9	16.7	17.1	20.1	19.4	18.5	22.2	23.1	24.5	25.5	19.05	13.9	27.8
fish length	44	45	46	47	48	49	50	51	52	53	54	55	56	57	59
n fish examined	11	14	10	10	8	6	3	3	3	0	2	3	1	1	1
% infected by <i>Lernaeocera obtusa</i>	24.0		21.4			39.1									

tab. 2:

infection of haddock with *Lernaeocera obtusa*.

station	Contracaecum larvae		Lernaeocera		Clavella	
	n fish (14-16cm) examined	n parasites per fish	n fish (>13cm) examined	% infected	n fish (>6cm) examined	% infected
1	0		89	23.6	92	17.4
2	0		138	14.5	138	23.9
3	26	3.2	285	2.5	285	26.0
4	0		249	1.6	0	
5	20	2.9	301	0.7	330	47.9
6	25	3.3	218	5.0	259	25.4
7	23	3.3	191	2.1	195	26.2
8	0		15	6.7	20	10.0
10	21	3.6	472	1.5	484	12.4
12	20	2.25	84	20.2	142	21.8
13	26	5.2	74	0	191	9.9
14	25	4.8	720	0.1	720	5.3
15	25	6.6	477	0	477	6.5
16	25	5.5	452	0	462	9.1
17	25	3.7	550	0	562	12.1
18	10	4.5	116	1.7	132	3.8
19	16	3.3	52	19.2	47	0
20	25	5.6	107	0.9	130	18.5
21	25	5.6	299	0	503	13.7
22	25	6.4	93	0	168	10.7
24	17	5.5	58	0	155	10.3
25	25	6.4	56	0	99	9.1
27	0		21	0	59	10.2
28	25	6.0	40	0	93	14.0
29	19	6.3	99	0	282	7.1
30	0		5	0	27	3.7
32	0		15	0	26	7.7
33	25	3.8	132	0	139	7.9
34	24	5.3	77	0	90	8.9
36	0		10	70.0	29	27.6
37	21	5.7	21	0	139	15.1
38	0		15	0	20	15.0
39	25	2.6	147	2.0	176	13.6
41	0		34	0	58	5.2
43	0		3	0	18	0
44	0		9	0	34	0
45	25	3.1	70	1.4	143	21.7
47	15	3.5	26	3.8	89	9.0
48	0		23	0	27	11.1
49	25	9.6	137	0	0	
50	0		21	0	0	
52	25	9.0	132	0	0	
54	0		246	0.8	0	
55	25	6.4	257	0	0	
56	0		199	0	199	7.0
57	0		99	0	165	9.7
58	0		15	0	15	6.7
59	0		165	0	165	9.7
60	0		67	1.5	69	26.1
61	0		107	0	109	9.2
62	25	3.6	178	0.6	192	13.5
63	25	4.8	352	0.6	361	13.0
64	0		173	0	173	12.7
65	0		281	0	281	5.3
66	0		151	0	151	7.3
67	0		200	0	200	10.5
69	0		25	0	28	14.3
70	0		51	0	52	30.8
71	0		121	1.7	121	10.7
72	0		113	0	113	20.4
73	0		40	0	40	22.5
74	22	5.6	89	0	95	28.4
75	25	5.5	165	0	174	28.2
76	25	3.8	564	0.5	568	18.8
77	0		25	0	26	26.9
79	0		43	2.3	43	30.2
80	0		58	0	58	17.2
	823	4.9	10,022	1.3	10,377	14.4

tab. 3: infection of whiting by Contracaecum larvae, Lernaeocera branchialis and Clavella adurca

station	Lernaecocera in haddock		Lernaenicus in sprat		
	n fish (≥24cm) examined	% infected	n fish examined	% infected by L.spratdae	% infected by L.encrasicholi
1	0		279	1.1	0.7
2	0		127	0	0.8
3	0		414	0	0
4	0		100	0	0
5	0		1.043	0	0
6	0		851	0	0
7	0		501	0	0.2
8	8	17.5	73	0	0
9	0		386	0	0.3
10	2	0	262	0.8	0.4
11	0		406	0.5	0
12	0		260	0.4	0
13	0		14	0	0
14	52	43.6	4	0	0
15	70	37.1	34	0	0
16	10	30.0	107	0	0
17	50	42.0	74	0	0
18	159	26.4	0		
19	26	57.7	23	0	0
20	8	62.5	10	0	0
21	19	63.2	11	0	0
22	2	50.0	208	0	0
23	16	18.75	39	0	0
24	35	25.7	0		
25	29	13.8	0		
28	13	53.8	20	0	0
29	17	35.3	166	0	0
30	0		73	0	0
31	0		284	0	0
32	0		345	0	0
33	3	0	372	0	0
34	0		409	0.5	0
35	0		103	5.8	2.8
36	0		286	2.8	0.7
37	0		212	1.9	0.5
38	0		171	1.2	2.3
39	0		206	4.4	1.5
40	0		377	0.5	0
41	0		150	0.7	0
42	0		213	0	0
43	0		114	0	0
44	0		155	0	0
45	8	0	68	0	0
46	0		227	0.9	0
47	6	16.7	52	0	0
48	40	25.0	6	0	0
49	371	3.0	0		
50	47	12.8	5	0	0
51	103	13.6	2	0	0
54	21	19.0	304	0	0
55	35	42.9	131	0	0
56	173	31.2	191	0	0
57	51	45.1	74	0	0
58	33	42.4	40	0	0
59	16	50.0	81	0	0
60	69	33.3	219	0	0
61	104	11.5	21	0	0
62	127	7.1	7	0	0
63	193	12.4	4	0	0
64	275	11.6	0		
65	256	17.6	0		
66	150	15.3	0		
67	100	9.0	0		
69	10	10.0	4	0	0
70	16	6.25	3	0	0
72	137	6.6	0		
73	70	14.3	1	0	0
74	232	9.5	23	0	0
75	31	12.9	0		
76	249	14.9	5	0	0
77	27	14.8	5	0	0
78	15	20.0	3	0	0
79	143	10.5	4	0	0
80	54	13.0	2	0	0
81	98	9.2	1	0	0
	3.786	16.8	10.390	0.4	0.2

Tab. 4: Infection of haddock by Lernaecocera obtusa and infections of sprat with Lernaenicus spp.











