International Council for
the Exploration of the Sea

C.M. 1980 / F 12
Mariculture Committee
Ref.: Shellfish Cttee

The Performance of the Condition Index of Oysters (Crassostrea gigas) during Spring 1980 at two Selected Sites of the German Coast.

by

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Abstract

Oysters from the North Sea as well as from the Western Baltic have been taken for the determination of Condition Index in the first part of 1980.
The data show a faster rise of C.I. values in the North Sea than in the Western Baltic, indicating better growing conditions in the Wadden Sea area of the North Sea in spring.

Introduction

Since oysters (C.gigas) have been imported as cultchless seed from Scotland they were on-grown at sites of the North Sea as well as the Western Baltic. Experience showed that spat grows differently in the two sea areas. This was obvious in shell characteristics, but seemed to occur also in meat content.
In spring 1979 the meat content of one-year old oysters became so low at the Western Baltic research field that almost 100% mortality occured while good survival was reported from one North Sea private on-growing area where ice had not taken away the oyster-container. Therefore samples of oysters were taken during spring months of 1980 to find out about the differences of Condition Index in the two areas of the sea.

Materials and Methods

Oyster samples were from the yearclass 1977, 1978 and 1979, the older ones were survivors of the extreme winter and spring 1979, the one-year-old oysters were 1979 imported spat from Scotland. The North Sea oysters were obtained from a private on-growing area at the Wadden Sea island Nordstrand, while the Baltic Sea oysters came from the research field of the Institute for Coastal and Inland Fisheries.

On Nordstrand the oysters were on-grown in containers developed by the Institute in the previous years.
At the research site off the Western Baltic coast they were overwintered in the same type of container. With rising temperatures in spring though most of the oysters were transferred into stacks of plastic-trays, suspended from rafts. The samples from the Baltic are therefore from both, bottom standing containers (6 to 15 m) and rafts (1 m below surface).
The mean weight of the oyster samples as well as maximum and minimum values are given in Table 1 and 2 together with sampling date and number of specimens per sample.
From the graphs presented in a previous paper (Neudecker, 1979) pooling of samples from different yearclasses for Condition Index seems to be justified as the data for Condition Index values of young oysters are more or less in the same range for one sampling date. The method used for determining the C.I. was the same as described by Neudecker (1979).
Temperature data were available from regular measurements at the research station Langballigau, Western Baltic. At the North Sea site however no temperature measurements could be made. Therefore data were obtained from List Harbour, where regular measurements are made in an comparable environment of the Wadden Sea.

Results

The February-values for the Condition Index of oysters from the North Sea site ranged from 24,06 to 45,63 with a mean of 34,43 and are rather low in comparison to the data gained from samples out of the Western Baltic, where the mean of Condition Index values was 68,22, with a minimum of 38,84 and a maximum of 122,45.
For the next comparable sampling dates in mid of April the difference is much less, because there was a slight decrease in Condition Index in the Western Baltic. In the North Sea site however, the Condition Index values were already increasing (Tab.3 and 4).
The equilibrium of Condition Index obviously must have been somewhere at the end of April (Fig.1).

From April to May the C.I. values rose much faster at the North Sea than in the Western Baltic, reaching a mean of 108,99 at the beginning of May while this level was reached in the Western Baltic one month later.

Discussion

The number of specimens obtained from the North Sea site had to be kept relatively small as the total number of oysters available from this site was limited due to private interests. At the Baltic Sea site however commercial aspects play a minor role as this oyster population mainly serves scientific purposes. On the other hand the sample size of only 4 to 6 specimens from the North Sea seemed to be fully sufficient. The standard deviations of the mean values of the Condition Index have very much the same range for comparable sampling dates.
Earlier random tests (Neudecker, 1977) have shown very similar results concerning the relatively low Condition Index values during winter from North Sea sites. During that part of the year Condition Index values in the Western Baltic ranged much higher. It is suggested that good autumn phytoplancton blooms together with a slower drop in temperature in the comparatively stable environment of the Western Baltic favour a high level of Condition Index until the beginning of the hibernating period. Due to the shallow waters in the Wadden Sea and the tides, the cooling off effect is much stronger there in autumn. It is suggested that before hibernating time the oysters lose energy because of a temperature range which keeps them active while there is not sufficient food available.
The same effect in the opposite direction seems to occure in spring. Due to a faster rise in temperature (Fig.2 and table 5) the oysters become able to start their activity earlier in the North Sea area than in the Western Baltic. This enables them to utilize the spring phytoplancton bloom in addition to the nutrients of the highly turbid tidal waters resulting in a fast rise of Condition Index values and an earlier start of the growing season. Therefore Condition Index values rise slowly from February until April.

In the Western Baltic on the other hand the temperature dependant feeding activity of the oysters seems to start much later (compare Fig.1). Moreover the oysters in spring loose energy for probably the same reasons as the North Sea population during autumn. They cannot utilize the phytoplancton when available due to low temperatures (Fig.2). An increase of C.I. values was detectable only when the temperatures had passed the 5 °C line in the 17th week. At that time, when Baltic Sea oysters still did not show shell growth, North Sea oysters had in several cases already produced new shell material.

The fairly low temperatures in 1979 (Neudecker, 1980) favoured a relatively high mean Condition Index at the beginning of the winter 1979/1980. In addition to that the spring 1980 seemed to have been very good for oysters, as the temperature-curve climbed slowly while a rich phytoplancton bloom was visible. This may not be a regular phenomenon.

The data given by Neudecker (1979) for Condition Index of oysters from the Western Baltic in 1977 show a dramatic drop from February to March especially for very young oysters. Still, in that year mortality of oysters was low.

In 1979 however, a Condition Index of 45,98 (s=15,24) for one year old oysters on 23rd of March suggested a normal situation. In fact the situation was quite serious as the next check some weeks later showed. On 12th of April it was already to late for a Condition Index investigation as most of the oysters gapped. The meat content was almost nil and a nearly 100%-mortality had to be faced within only three weeks. In that year the phytoplancton bloom was abnormally late (Helm, 1979) and obviously the oysters starved to death.

Conclusions

The finding of a rather different performance of the Condition Index at the two coasts might be utilized commercially in Germany, where the overwintering of oysters is one of the most hazardous factors for the development of a new oyster-growing industry.

If oysters would be transfered from the North Sea to the Baltic Sea in autumn at the time of equilibrium of Condition Index values of oysters from both Seas a further dropping of the Condition Index of these oysters could probably be prevented.

The overwintering of them in containers on the sea bed of the Flensburg Fjord at a depth of about 5-7 meters (Meixner, 1974) lowers the risk of losses caused by ice in the Wadden Sea to almost zero.
Later in spring attention should be paid to the water temperatures of the Wadden Sea and the oysters should be returned at that time when ice-hazards are over and the water temperature approaches the 5 ^{o}C line. This procedure of transfer from one Sea to the other and back again might solve not only the problem of overwintering oysters in the Wadden Sea but also help them to have a better start into the growing season.
A further investigation has to prove,whether the efforts made for this rewards not only in higher survivals during winter and especially spring but also in reaching oysters of market size some weeks earlier than usually.

Acknowledgements

This study was financed by the German Federal Ministry of Research and Technology. Thanks are due to the laboratory staff Mrs. S. Gehendges and Mr. U. Walter who have been involved in the technical work. The temperature data from List Harbour have kindly been given to us by the meteorological station of List while the oysters from the North Sea have been ceded to us by Mr. L. Ketelsen from Nordstrand.

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Table 1: Sampling date, yearclass, number, mean-, maximum- and minimum life weight of oysters from Nordstrand, North Sea, used for the determination of Condition Index in spring 1980

Sampling date	Year-class	N	mean life weight g	maximum life weight g	minimum life weight g
20.2.	1977	5	95,60	117,00	64,00
17.4.	1978	4	33,27	41,06	20,53
9.5.	1978	6	46,28	54,80	40,70
21.5.	1978	5	48,26	57,19	34,49
6.6.	1978	5	48,05	65,59	38,70

Table 2: Sampling date, yearclass, number, mean-, maximum- and minimum weight of oysters from Langballigau, Western Baltic, used for the determination of Condition Index in spring 1980.

Sampling date	Year-class	N	mean life weight g	maximum life weight g	minimum life weight g
10.1.	1979	5	7,93	9,91	6,81
18.2.	1979	10	6,24	8,83	4,24
16.4.	1978+79	30	5,67	9,28	2,24
29.4.	1978+79	34	8.48	18,67	3,54
23.5.	1978+79	30	9,93	18,88	4,59
5.6.	1978+79	33	7,87	20,88	2,53

Table 3: Condition Index of oysters from Nordstrand, North Sea, in spring 1980:

Sampling date	Condition Index $\bar{x}$	s	N	x max.	x min.
20.2.	34,43	8,6001	5	45,63	24,06
17.4.	52,45	21,8065	4	83,82	33,52
9.5.	108,99	19,6950	6	132,88	85,06
21.5.	108,85	20.3886	5	131,98	77,86
6.6.	124,59	35,2869	5	174,63	90,07

Table 4: Condition Index of oysters from Langballigau, Western Baltic, in spring 1980:

Sampling date	Condition Index $\bar{x}$	s	N	x max	x min.
10.1.	75,67	5,6381	5	84,63	69,75
18.2.	68,22	29,7989	10	122,45	38,84
16.4.	60,43	17.2494	30	97,73	40,04
29.4.	74,12	17,0553	34	126,42	30,78
23.5.	89,18	20,3382	30	132,53	49,76
5.6.	108,47	31,4290	33	188,33	53,45

Table 5: Weekly average watertemperatures (°C) at List Harbour, North Sea, and Langballigau, Western Baltic from Janurary until June 1980:

Week	List	Langballigau	△
1.	0,9	3,3	- 2,4
2.	0,4	1,4	- 1,0
3.	-0,2	1,4	- 1,6
4.	-0,7	0,0	- 0,7
5.	0,0	-	-
6.	-0,7	-	-
7.	0,6	1,0	- 0,4
8.	0,8	0,6	+ 0,2
9.	0,6	0,4	+ 0,2
10.	1,8	0,8	+ 1,0
11.	2,3	1,1	+ 1,2
12.	0,5	0,3	+ 0,2
13.	1,6	1,0	+ 0,6
14.	3,5	2,4	+ 1,1
15.	2,4	4,0	- 1,6
16.	7,2	4,8	+ 2,4
17.	7,2	5,6	+ 1,6
18.	8,6	5,0	+ 3,6
19.	10,9	7,9	+ 3,0
20.	10,0	9,4	+ 0,6
21.	13,6	10,3	+ 3,3
22.	13,4	12,7	+ 0,7
23.	14,9	13,2	+ 1,7
24.	17,3	16,9	+ 0,4
25.	17,2	16,9	+ 0,3
26.	16,0	13,9	+ 2,1

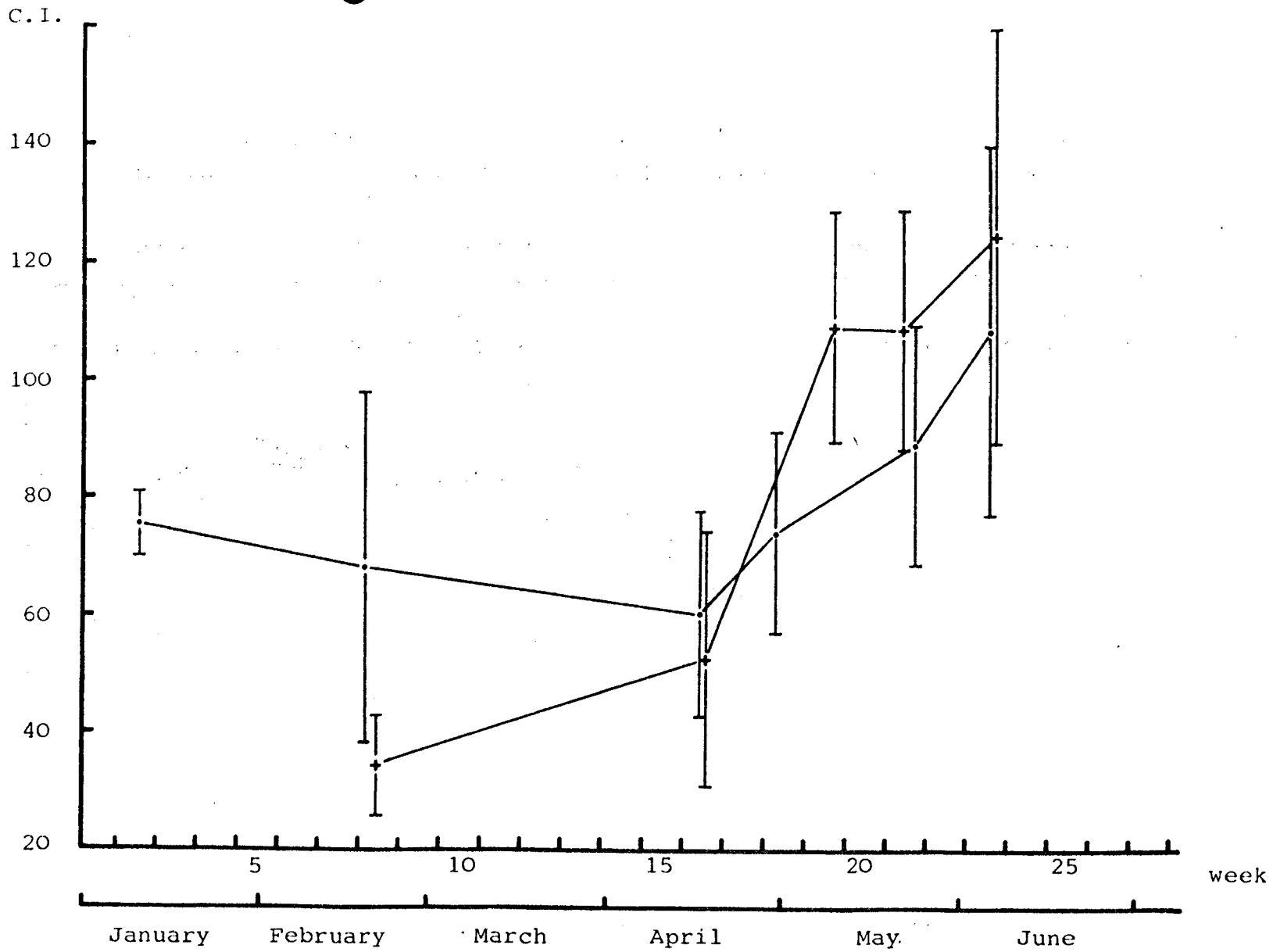

Figure 1: Condition Index values of oysters (Crassostrea gigas) from Nordstrand, North Sea (-+-) and Langballigau, Western Baltic (-·-) from January to June 1980.

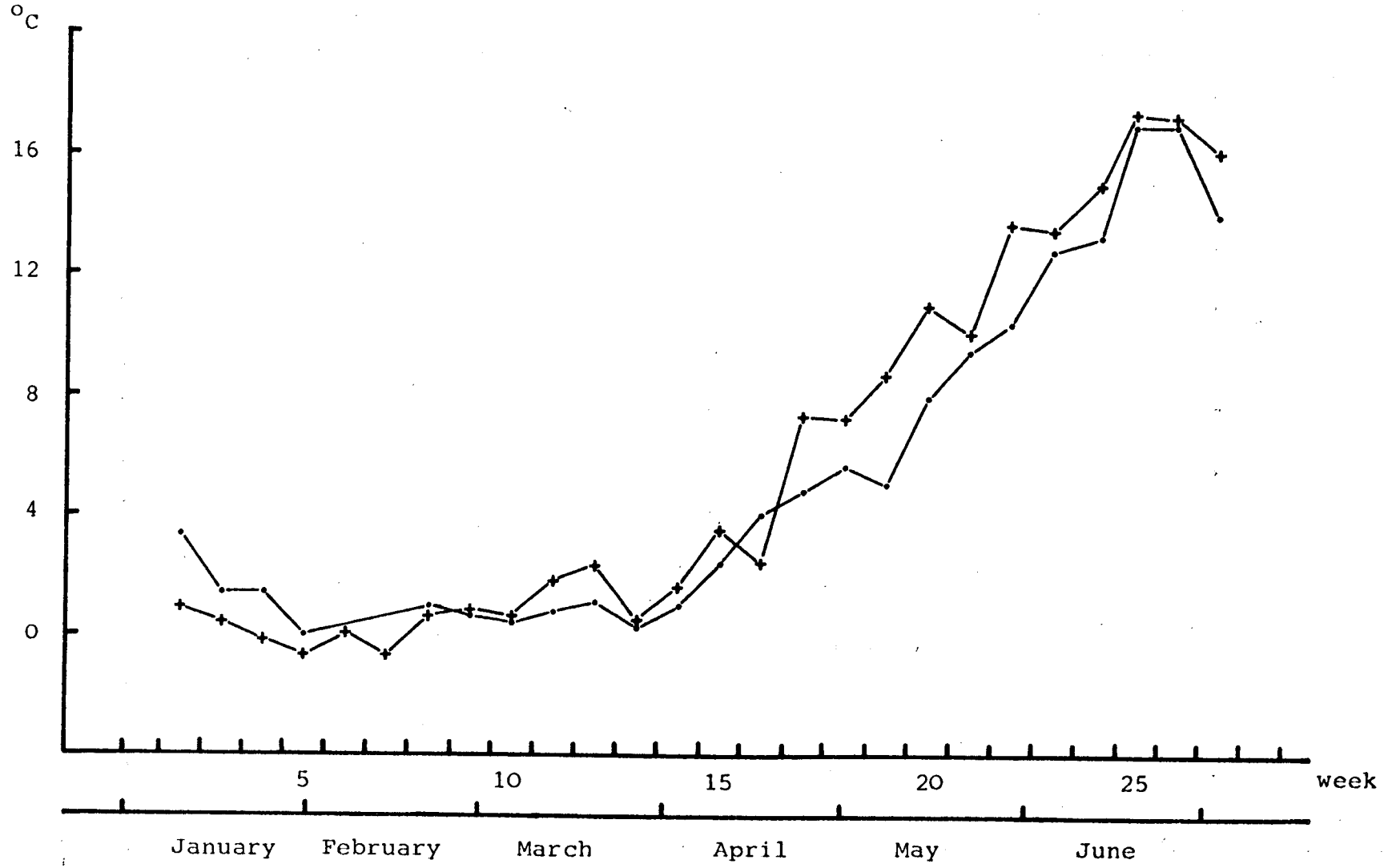

Figure 2: Average weekly temperatures at List Harbour, North Sea (-+-), and Langballigau, Western Baltic (-·-) from January to June 1980.