THE CONDITION FACTOR OF OYSTER, *CRASSOSTREA BELCHERI* AT KHOA YOA BAY, RANONG PROVINCE

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ABSTRACT

A total of 450 oysters were collected from the culture rafts in Khoa Yoa Bay, Ranong Province, Thailand, from March 1996 to May 1997. The condition factor (C.F) was calculated as the ratio between the dry weight of the oyster meat and the volume of the shell cavity x 1,000. The occurrence of fat oysters (C.F $\geq$ 150) peaked from March to April and thin oysters (C.F $\leq$ 70) were mostly found from July to October. Medium fat oysters (70>C.F. >150) were found all year round. The occurrence of fat oysters was significantly related with the salinity and the amount of rainfall. The condition factor was not significantly related to the temperature or the density of diatoms or total plankton. Settlement of oyster larvae occurred after the oyster's C.F. had been higher than 150 for two months.

INTRODUCTION

Oyster is a delicious seafood product. The meat has to be fresh with a creamy white colour for the Thai consumer who prefer eating it raw. The fatness or condition factor (C.F.) is a determination of the meat content in relation to the shell volume. The appearance of the meat is an important factor for the acceptance of the consumer (Tandavanitij 1995). The meat of oyster in prime condition has a thick appearance with a moderate hard mantle, and a creamy white colour. The taste of a fat oyster is richer because the content of glycogen is high (Quayle & Newkirk 1989), which affects the price. A thin, soft, transparent oyster with a dark coloured digestive gland indicates a poor condition.

The condition factor is influenced by the spawning cycle because of the energy required. A high condition factor can indicate that the oyster has developed its reproductive system. In the post- spawning or spent stage, the body decreases in size and takes on a somewhat grey colour, with a dark digestive gland, and the mantle is thin and transparent. The factor increases again towards the next spawning season (Quayle & Newkirk 1989). These changes can also be affected by other parameters, such as the water temperature, salinity and the availability of food (Park *et al.* 1988; Wong *et al.* 1993; Wouhuyzen 1994)

This study describes the condition factor of *Crassostrea belcheri*, and the relationship with some hydrological parameters and the presence of food, which could be used to determine both the best time for harvesting and spat collection.

MATERIALS AND METHODS

Thirty oysters from the raft culture at Khoa Yoa Bay (Figure 1) were collected monthly from March 1996 to May 1997. The oysters were cleaned and the epifauna removed. Each oyster was marked with a marker pen and soaked in seawater for 30 minutes to fill up the shell cavity. The length, width and height of all oysters were measured according to Quayle and Newkirk (1989). Each oyster was placed in a water filled container with an overflow pipe (Figure 2). The volume of each oyster (shell, meat and water) was measured as displacement of water. The dry weight of the meat was measured after it had been oven-dried at 98 °C for 24 hrs. The shell volume was calculated from the difference between the

Figure 1. The study site in the mangrove channels in Ranong Province.

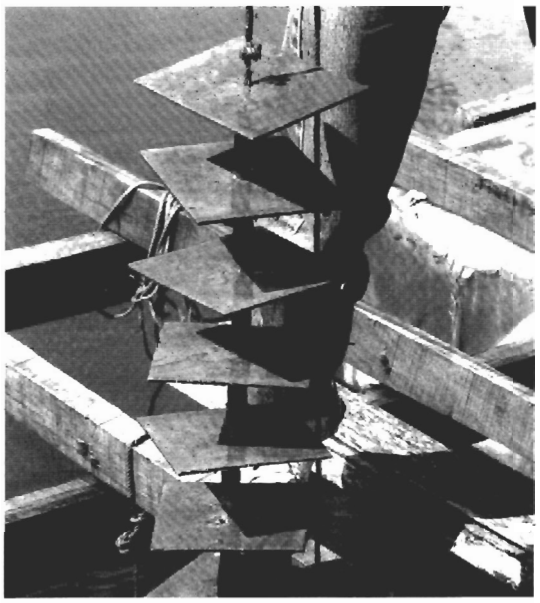

Figure 3. The spat collectors used in the experiment.

volume of water displaced by the whole animal and that of the empty shell.

The condition factor was calculated as dry weight · 1000 / shell volume (Quayle & Newkirk 1989). The condition factor was

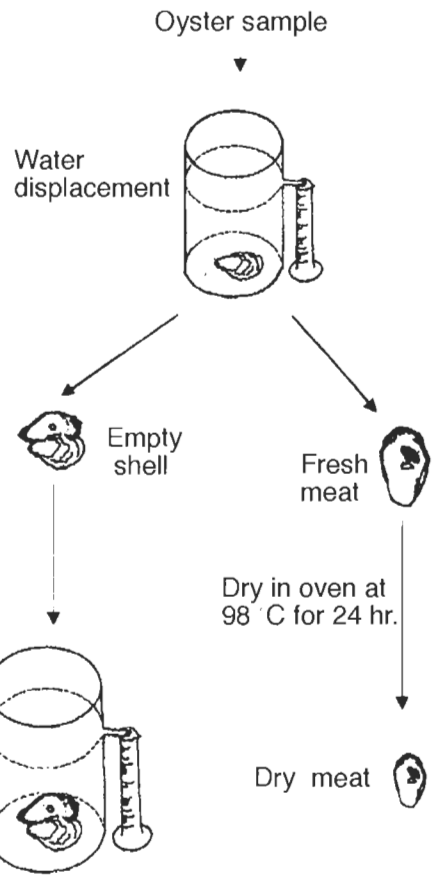

Figure 2. The experimental method used to determine the condition factor.

rated as follows:

1) Condition factor equal or over 150 indicates a fat oyster.

2) Condition factor from 71 - 149 indicates a medium fat oyster.

3) Condition factor lower than 70 indicates a thin oyster in poor condition.

The water temperature and salinity were measured at the same time as the collection of the oyster using a thermometer and a salinometer. Plankton samples were taken using a plankton net and identified to genus level after Shirota (1966), and their density were estimated using a microscope. Data of monthly rainfall was obtained from the Meteorological Office Station.

Seasonal oyster spatfall were studied in relation to the condition factor using spat

Table 1. The percentage of oyster with a condition factor above 150 in relation to hydrological factors and the amount of food.

Time	(%) oyster with a C.F > 150	Plankton (cells /l)	Diatoms (cells/l)	Rainfall (mm)	Temp. (°C)	Salinity (ppt)	Spat / collector
Jan 96		2163	2090	0			0
Feb 96		700	692	8	30	32	0
Mar 96	40	1540	1462	0	30	34	0
Apr 96	45	2056	1978	309	31	33	0
May 96	10	789	677	379	30	31	0
Jun 96	0	1193	1151	387	29	26	53
Jul 96	0	789	1184	475	29	20	29
Aug 96	3	111	59	512	29	20	10
Sep 96	3	396	341	1129	29	22	6
Oct 96	0	1669	1431	385	27	20	6
Nov 96	0	2060	2014	381	30	22	18
Dec 96	3	2096	1913	149	27	26	20
Jan 97	23	2810	2713	1	26	30	11
Feb 97	6	1457	1365	18	29	33	21
Mar 97	36	1677	1639	13	31	33	4
Apr 97	30	1093	873	97	31	34	8
May 97	3	1630	1556	360	31	30	9
Correlation		0.346	0.388	-0.52**	0.19	1.73**	0.56**

collectors made by asbestos plates. One set consisted of ten plates (15x15 cm) attached to a line at 10 cm intervals. Two sets of collectors were replaced every month and newly settled spat was counted.

The correlation between the presence of fat oysters with a condition factor above 150 and the hydrological parameters and the amount of food as plankton was analysed (Aryuthaka 1993)

RESULTS

A total of 450 oysters were examined during 15 months. The size range of the oysters during the entire study were from 6.7- 12.5 cm, average 9.69 ± 0.99 cm in length.

The condition factor of the oysters from Khoa Yoa Bay ranged from 38-354. The monthly percentage of oyster with a C.F ≥ 150 peaked from December to May and to a smaller extent from August to September. The highest peak occurred from March to April in 1996 and 1997 where 40-45 % and 30-36.7 % had a C.F. higher than 150.

Oysters with a C.F. above 150 were not found in June, July, October, and November. Most thin oysters (C.F< 70) were found from July to November and to a less extend from January to February (Table 1). The stock consisted of more than 50 % medium fat oyster (70<C.F <150) all year round. In the rainy season, the oyster meat was grey in colour and creamy white during the dry season.

The water temperature ranged from 26-31 °C, slightly lower in the rainy season (26-30 °C) than in the dry season (30-31 °C). The salinity ranged from 20-34 ‰, lower in the rainy season (20-31 ‰) compared to the dry season (30-34 ‰).

Forty nine species of plankton were found during this study: 35 species of phytoplankton, and 14 species of zooplankton. The abundant groups were diatoms with 29 species. The abundant species were *Cheatoceros* sp., *Rhizosolenia* sp, *Bacteriastrum* sp, *Thalassionema* sp., *Thalassiothrix* sp., and *Ditylium* sp. The plankton density especially of diatoms was highest 2-3 months before the period where the condition factor peaked.

The rainy period lasted from April to January and the highest rainfall was measured in September (1129 mm). The rain affected the salinity and these two factors correlated with the occurrence of oysters with a condition factor less than 70.

The number of oyster spat ranged from 4.0 to 53.5 spat per collector set.
The number of spat peaked from June to August (10.5-53.5 spat per collector) and from November to February (11.3-21.8 spat per collector). The highest spat number was found in June (53.5 spat per collector). High numbers of spat occurred 1-2 month after the condition factor peaked.

A statistical analysis showed no significant correlation between a high condition factor and the amount of food or the water temperature. But it was significantly related to the salinity the amount of rainfall (Table 1).

DISCUSSION AND RECOMMENDATION

The condition factor of the oyster at Khoa Yoa Bay was highest from March to April but several parameters seemed to be involved. The amount of rain which is closely related to the salinity in this enclosed area had a clear influence on the condition factor of the oysters as the factor peaked during the dry season.

The density of plankton and diatoms was highest 2-3 months before the condition factor peaked but the correlation was not significant. Hatati (1997) reported that the condition factor was highest when the abundance of *Cheatoceros* sp., *Rhizosolenia* sp., *Thalassiothrix* sp. and *Nitzchia* sp., was high.

The temperature did not seem to have any effect on the condition factor in the present experiment, but Wong *et al.* (1991) found that a high condition factor correlated with a stable temperature.

The spatfall season peaked two months after the peak of the condition factor. The pelagic phase of the oyster larvae was more than 17 days before settling (Nugranad. *et al.* 1987).

The best time to harvest oyster in Khoa Yoa bay was from April to May, which seemed to be related to the amount of rain and salinity. The relation between the condition factor and the density of food needs further investigation.

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