On the Manufacture of Canned Crab from *Paralithodes camtschaticus* (TILESIIUS)—II.

The Relation between Storing Temperature and Maximum Storing Time of *Paralithodes camtschaticus* Meat as Raw Material for Canned Crab

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As stated in the previous paper¹⁾, *Paralithodes camtschaticus* meat is decomposable. If unfresh raw material is employed, the canned crab of good quality is not obtainable just as in other canned marine foods. The author²⁾ have previously determined that when the amount of volatile basic nitrogen (V.B-N) produced in raw meat of *Erimacrus isenbeckii* rises to about 20 mg. %, the meat becomes unfit for canning. In previous paper¹⁾ of this series, it has also been reported that when the amount of V.B-N produced in raw meat of *Paralithodes camtschaticus* rises above 20 mg. %, the meat begins to have abnormal odor, becomes somewhat viscid and is unfit for canning. The authors have called this amount of V.B-N of 20 mg. % the "limit freshness" of fish or crab meat as raw material for canning. In the present paper a discussion is presented on the relation between storing temperature and maximum time during which *Paralithodes camtschaticus* meat can be stored and still remains suitable as raw material for canning.

Experimental method

Samples of *Paralithodes camtschaticus* meat prepared just as described in the previous paper, were stored aerobically at the respective temperatures, $12^{\circ} \pm 1^{\circ}\text{C}$. and $31^{\circ} \pm 1^{\circ}\text{C}$. Values of time, " t_{20} ", at which the amount of V.B-N produced in the stored meat came up to 20 mg. % were measured.

Results and Discussion

From the results obtained¹⁾, values of the time, " t_{20} ", are shown in Table 1.

Table 1. Relation between the value of " t_{20} " and temperature for various kinds of samples.

Sample	Temp.	
	12°C.	31°C.
Crushed crab meat	21 (hrs.)	9.5
Crab meat with the crust	44	11
Boiled crab meat	60	15.5

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In this experiment, two degrees of storing temperature were used on account of the amount of the sample. But considering from the previous paper²⁾ on the meat of *Erimacrus isenbeckii*, it has been assumed that the relation between storing temperature θ_r ($^{\circ}\text{C}.$) and the value of " t_{20} " (t_{θ_r} hrs.) can be manifested with following equation (1)

$$\log t_{\theta_r} = a - b\theta_r \dots\dots\dots (1)$$

Here, " a " and " b " are constants.

When the results shown in Table 1 are substituted in equation (1), the relation between " $\log t_{20}$ " and respective storing temperature, " θ_r , $^{\circ}\text{C}.$ ", is granted to be linear as in Fig. 1.

As to I-curve in Fig. 1 which is applicable for the raw crushed meat, the following equation is obtained: $\log t_{\theta_r} = 1.55 - 0.018\theta$

As to II-curve, for raw meat with crust, the following equation is obtained: $\log t_{\theta_r} = 2.02 - 0.03\theta$

As to III-curve for boiled meat, the following equation is obtained: $\log t_{\theta_r} = 2.15 - 0.03\theta$

After KANEKO³⁾, when the values of " Q_{10} " are calculated from equation (2), value of about 1.5 is obtained for raw crushed meat, about 2.0 for raw meat with crust and about 2.0 for boiled meat.

$$\log \frac{t_{\theta_1}}{t_{\theta_2}} = \frac{\theta_2 - \theta_1}{10} \log Q_{10} \dots\dots\dots (2)$$

Here, " t_{θ_1} ", and " t_{θ_2} " are the values of the time, " t_{20} ", at which the V.B-N produced in the stored sample attained the 20 mg. % level.

These values of " Q_{10} " resemble the results obtained in the previous experiment¹⁾. Based upon the result²⁾ obtained in the raw crushed sample of *Erimacrus isenbeckii* meat which is shown as dotted line (IV-curve) in Fig. 1, the value of " a " is 1.62 and " b " is 0.024. Comparing curve-I with curve-IV, the raw meat of *Paralithodes camtschaticus* is considered to be more decomposable than that of *Erimacrus isenbeckii*. On the boiled meat of *Paralithodes camtschaticus* and *Erimacrus isenbeckii*, the relation between the value of " t_{20} " and temperature was shown in Fig. 2 as curve-III for the former and as curve-IV for the latter.

Curve-IV is manifested by the following equation:

$$\log t_{\theta} = 1.99 - 0.029\theta_r$$

The degree of inclination of curve-IV is similar with that of curve-III, so that the two curves are par-

Fig. 1. Relation between the value of " $\log t_{20}$ " and temperature

Fig. 2. Comparative data with the values of " t_{20} " and temperature for the boiled meats of *Erimacrus isenbeckii* and *Paralithodes camtschaticus*

allel. Considering from the two cruves, the former is less decomposable than the latter. Curve-I in Fig. 2, which shows the boiled meat stored with the crust, is manifested by the following equation : $\log t_{\theta}=2.27-0.03 \theta_{\theta}$.

The value of "b", meaning the value of the degree of inclination of the straight line, is similar almost in either with curve-IV or curve-III of *Paralithodes camtschaticus*. Considering from those results, the boiled meat of *Paralithodes camtschaticus* and *Erimacrus isenbeckii* can be said to have no distinct difference. The difference of values of "a" of both samples may be due to the difference of the freshness of the meat, that is, to the number of bacteria attached to the meat.

Curve-II is the curve which was obtained by adding 10 hrs. to the storing time at 15°C. in curve-I as a safety surplus. Curve-V is the curve which was introduced by KANEKO³⁾. As a safety surplus, he added 10 hrs. to the storing time at 15°C. in the curve representing the boiled meat of *Paralithodes camtschaticus* with the crust by means of organoleptic examination.

In this experiment, no result for the boiled meat with the crust was obtained on account of the small amount of sample meat. But according to the chemical tests which were carried out by the authors, no large difference between the values of "b" of *Paralithodes camtschaticus* and *Erimacrus isenbeckii* is considered to exist, therefore the difference of "b" between those observed by KANEKO and those of the authors seems to be due to the difference of tests employed, organoleptic or chemical.

From curves in Fig. 1 and Fig. 2, the maximum storing time (hrs.) for the respective samples can be learned.

It is advisable to know the maximum storing time for the variously treated crab meat from the standpoint of the rational processing.

Summary

The authors have obtained an equation showing the relation between the value of $\log "t_{\theta}"$, the value of the time until which the amount of V.B-N attained 20 mg. %, and the storing time " $t_{\theta r}$ "; $\log t_{\theta r}=A-B\theta_{\theta}$. This equation was applied for every sample which was treated by different operations, and the following values were obtained.

As to the raw crushed meat : $\log t_{\theta}=1.55-0.018 \theta$

As to the raw meat with the crust : $\log t_{\theta}=2.02-0.03 \theta$

As to the boiled meat : $\log t_{\theta}=2.15-0.03 \theta$

The value of a constant "b", for *Paralithodes camtschaticus* is almost the same as that for *Erimacrus isenbeckii*. But there seems to be some difference between the values of constant, "a".

From those data the maximum storing time for the raw material of *Paralithodes camtschaticus* can be learned.

References

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