Studies on the Inorganic Chemical Constituents of Marine Fishes—IX

On the Methods to Indicate the Relative Quantities of Alkaline Elements and Alkaline-Earth Elements in Marine Fishes.

Noboru Imanishi

Abstract: Ca, Mg, Na and K are the main inorganic chemical constituents of marine fishes. If there is found a method by which the relative quantities of these elements are simply indicated, it will be useful to discriminate parts of fishes' bodies. The author investigated several methods and found the better one. The results are shown as follows:

1. \( \text{Ca} + \text{Mg} + \text{Na} + \text{K} \)

This ratio was calculated using four units; i.e. gram of oxide, gram of atom, gram atom and gram equivalent of these elements.

These ratios of most parts of fishes' bodies close together and accordingly these are useless to discriminate each part of fishes (see Table 1.).

2. A. \( \frac{\text{total weight of four elements in gram equivalent (Ca} + \text{Mg} + \text{Na} + \text{K})}{\text{ashes in gram}} \)

B. \( \frac{\text{total weight of four elements in gram equivalent (Ca} + \text{Mg} + \text{Na} + \text{K})}{\text{total oxide in gram (CaO} + \text{MgO} + \text{Na}_{2}O + \text{K}_{2}O)} \)

The method A uses the total quantity of these elements in gram equivalent per 1 g of ashes, and called specific gram equivalent of ash by the author. The method B uses the total quantity of these elements in gram equivalent per 1 g of oxide of these elements.

The values of ratios by the methods A and B distinguish part from part of fishes and these ratios are useful to make discrimination between part and part, but the method B is more exact than A because the total gram of oxide in 1 g of ash is different in each part of fishes. (see Table 2.).

The results obtained by applying the method B to parts of several marine fishes are shown in Table 4.

According to the values of ratios by the method B, parts of marine fishes are grouped to three regions as follows:

<table>
<thead>
<tr>
<th>Region</th>
<th>Specific gram equivalent by the method B</th>
<th>Parts of fishes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bone and head</td>
<td>36–34</td>
<td>bone, gills, scale, fin, head</td>
</tr>
<tr>
<td>Pyloric coeca and stomach</td>
<td>33–30</td>
<td>pyloric coeca, stomach</td>
</tr>
<tr>
<td>Liver and flesh</td>
<td>29–25</td>
<td>liver, flesh, heart, ovary, spleen, etc.</td>
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</tbody>
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In most cases the following seems to be true. If the ratios of any two parts of a fish P

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** Chemical Laboratory, Faculty of Literature and Science, Kochi University.
and Q by the method B are the same, these two parts have similar constitutions of these four elements: Ca, Ma, Na and K.

If the ratio of P is larger than that of Q, the quantities of Ca and Mg in ashes of P are larger than those of Q and accordingly the quantities of Na and K in the former become smaller than those of the latter.