We investigated the nutritive values of niboshi (boiled and dried sardine) and pearl oyster as protein sources using Wistar male rats. The aim of the study was to utilize unused marine products. The nutritive values of niboshi and pearl oyster as protein sources are similar to those of casein.\textsuperscript{1,2} The body weight increment of the pearl oyster diet group, however, was higher than that of the casein diet group. In contrast, the body weight increase of the niboshi diet group was lower than that of the casein diet group. From these results, it was estimated that the amount of food intake of the niboshi diet group was lower than that of the casein diet group and, in contrast, the amount of food intake of the pearl oyster diet group was higher than that of the casein diet group. It was also estimated that the effect came from some biologically active substances in the protein sources. The aim of this study was to compare the amount of food intake of the niboshi, pearl oyster, and casein diet groups and to discuss the effects of some components in the protein sources.

Male Wistar rats purchased from Clea Japan Inc. (Osaka, Japan) were used as the experimental animals. Fifteen rats were divided into three groups for diets of casein, niboshi, and pearl oyster. The number of rats in each diet group was five. The initial body weights of the casein, niboshi, and pearl oyster groups were 101±9 g, 111±5 g, and 107±6 g, respectively. Rats were fed in metabolic cages over 3 weeks. The diets and conditions of feeding were described in our previous reports.\textsuperscript{1,2} Every rat could take food and water \textit{ad libitum}. During the feeding term, the body weight and food intake of rats were measured daily. The significant differences between the values of the three diet groups were determined using Student’s \textit{t}-test. The amino acid compositions of protein sources were measured as described in a previous paper.\textsuperscript{3}

The changes in the body weight increments of each group of rats for each week are shown in Fig. 1. Throughout the whole feeding term, the body weight increments of the pearl oyster diet group were higher than those of the other groups and showed significant differences in each week. Also during the whole feeding term, the weight increment of the casein diet group was higher than that of the niboshi diet group and showed significant differences for the first and last weeks. The amount of food intake per initial body weight of each diet group is shown in Fig. 2. During the first week, the amount of food intake of the pearl oyster group was higher than those of the other groups, followed by the casein diet group. The lowest one was the niboshi diet group. There was, however, no significant difference between the groups. For the casein and pearl oyster diet groups, the amounts of food intake increased according to the feeding term. The increase rate of food intake of the pearl oyster diet group was higher than that of the casein diet group. In contrast, for the niboshi diet group, the amount of food intake during the second week was slightly higher than that of the first week. During the third week, however, it was lower than that of the first week. The amount of food intake of the niboshi diet group was the lowest during the entire feeding term. They showed significant differences in comparison with the pearl oyster group in the second week, and showed significant differences in comparison with the pearl oyster and casein diet groups in the third week.

The nutritive values of casein, niboshi, and pearl oyster were, however, almost the same.\textsuperscript{1,2} The differences
of body weight increment were caused by a difference in the amount of food intake. It was considered that the differences in the amount of food intake stem from the different components of protein sources. On measuring the amino acid composition of these protein sources, we found that the amounts of cysteine, histidine, alanine, and aspartic acid in the niboshi protein were higher than those in the other protein sources. Among these amino acids, histidine was chosen to be studied, because histamine, a derivative of histidine, should decrease the food intake by the activation of the histamine neuron, as described in the report by Sakata et al. The total contents of histidine (histidine per 100 g total amino acids) in casein, niboshi, and pearl oyster were 2.8%, 3.4%, and 2.1%, respectively. The histidine level in niboshi was the highest among these samples. The rates of body weight gain and food intake were inversely related to the histidine content in each protein source. Histidine-rich protein sources may have an inhibitory effect on food intake. It is necessary to further investigate the inhibitory effect of histidine on food intake using the foods which contain different amounts of histidine.

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