A Method of Seasonality Estimation Based on Seasonal Cycle of Refuse Deposition Observed in the Shell Middens: A Case Study on the Seasonal Schedule of Fishing Activities at a Jomon Shell Midden Site, Central Japan.

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This paper focuses on the seasonal aspect of the food-procurement system. The two subjects, which are the methodology of restoring it from archaeological records and interpretation of the restored seasonal schedule, will be examined with regard to the relationship which exists between each other. Firstly, previous methods of seasonality studies will be reassessed in terms of methodological problems and, towards this solution, an alternative method utilizing seasonal cycles of refuse deposition in the shell middens will be presented and a general statement as to the basic thinking will be given. Next, in terms of a specific analysis, we will attempt to reconstruct the seasonal schedule of fishing activities from a Jomon shell midden site. The ecological significance of the reconstructed seasonal schedule will be appraised and the validity of the method will be examined.

There exist two previously used methods of seasonality estimation; one based on evidence from seasonal pattern of migration or maturation of edible materials of food resource species, and the other based on seasonal growth cycle recorded in the incremental structure or relationships between seasonality and stages in growth shown by such as body size or dentition. The first method is not applicable to species in which a seasonal cycle is not evident, and gives only the environmental background in which the species are potentially available, therefore it cannot provide a concrete acquisition pattern. The second method, in addition to being applicable only to certain species, necessitates the separate examination of individual species, as makes it difficult to grasp an inclusive seasonal schedule. Thus they are both limited in terms of their applicability to archaeological data.

A method of seasonality estimation using seasonal deposition of shell middens may provide a solution for these shortcomings. In general terms, well preserved shell deposits are often finely stratified by the differences in contents which are considered to reflect the units of disposal. The season of deposition of each stratum can be estimated by
such means as growth line analysis of clam shells contained within it. Therefore, by comparing the composition of the food debris contained within each stratum with the estimated season of deposition for every stratum, it should be possible to estimate the season in which they were disposed of. Based on this premise, an attempt was made to reconstruct a seasonal schedule, using as the instance, fishing activities as seen in the Ikawazu shell midden site in Aichi prefecture, central Japan.

The Ikawazu shell midden site is located on the coast of Mikawa bay on Atsumi peninsula and dated mainly early to middle part of the latest stage of the Jomon period. The material for analysis was taken from a shell layer approximately 50 cm thick in the from of a 50 x 50 cm column. The shell layer in the column was stratified and sampled according to differences in content. Each sample was sieved by means of wet screening through 4.0 mm to 1.0 mm meshes.

For growth line analysis, the clam *Tapes philippinarum* was used and the Koike's method (Koike 1980) was followed.

As a result, in the greater part of the strata, one or two seasonal clusters were recognised. The units of disposal in the shell layer were assumed to be relatively well preserved.

The result of comparing the assemblage of fish remains within each stratum with the season of deposition, as inferred from growth line analysis, was classification of the following fish types based on the mutual relationship:

group I: predominant in the strata in summer.

black sea bream (*Acanthopagrus* sp.), sea bass (*Lateolabrax* sp.) mullet (Mugilidae sp.), puffer (*Tetraodontidae* sp.) etc.

group II: predominant in the strata during summer but concentratedly added in fall to spring.

freshwater eel (*Anguilla* sp.)

group III: which appears to have been added in fall to spring.

sardine (*Clupeidae* sp.)

From this it can be assumed that the fishing activities at the Ikawazu site were consisted of three groups in terms of a seasonal schedule.