Advective movement of organisms determined by resource availability is incorporated into a structured fish population model coupled with a dynamic model or the resource. In particular, we consider movement behaviors in which individuals move continuously into areas with higher resource densities. The novelty of the approach is that existing spatial models ignore individual variability while structured population models ignore spatial heterogeneity. While this paper focuses on the spatial aspects of population dynamics, effects of lipophilic chemicals on populations in a spatially heterogeneous environment is the ultimate goal; thus it is necessary to formulate the model so that toxic exposure and effects can be addressed. This paper addresses modeling issues such as the physiologically-based individual model, the representation of spatial movement, and the incorporation of temporal-spatial processes and physiological processes of individuals into a population model. Numerical studies show that the particular movement behavior results in the formation of groups of individuals of similar size. Due to the continuous movement of all individuals, there is no great variation in resource density. A characteristic behavior of the unstressed model is that the fish and resource biomass as well as the age, lipid and structural distributions, are asymptotically periodic with a period of a year, the same as the reproductive period of the fish.