We compare the implications of determinate vs. indeterminate growth of a parthenogenetic iteroparous ectotherm at constant food density in the context of the dynamic energy budget theory, which specifies the tight links between life history traits, such as feeding, aging, growth and reproduction. We do a comparative analysis using, as measure of fitness, the life span reproduction, the population growth rate, and the conversion efficiency of food to biomass. When extrinsic mortality is constant, indeterminate growth cannot maximize fitness if measured by the population growth rate or the conversion efficiency, except when mortality is low, in which case both types of animals are similar. If the fitness measure is life span reproduction, indeterminate growth maximizes fitness even with constant mortality, provided it is not very high. When mortality decreases with size, indeterminate growth maximizes fitness for almost all measures of fitness. Finally, we suggest an evolutionary link between allocation strategies and expected life span. In populations of long living species, each type of animal can establish in the population of the other. In populations of short living species, determinate growers can invade, and displace, a population of indeterminate ones. However, when the mortality risk of organisms with small size is much higher than those of large size, indeterminate growers can be superior.