A double blessing: selection favours heavier seal pups through improved survival and earlier recruitment

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Conditions experienced during early development may contribute significantly to individual heterogeneity of both phenotypic traits and fitness components, ultimately affecting population dynamics. We estimated phenotypic selection on weaning mass, a highly variable trait closely linked with maternal investment, within a population of female southern elephant seals (*Mirounga leonina*). We used capture-recapture methods to estimate how survival and recruitment probabilities change in relation to weaning mass, and matrix projection models to estimate the sensitivity of the asymptotic population growth rate, a measure of mean absolute fitness, to changes in weaning mass. Heavier female offspring had improved odds of survival early in life and a higher probability to recruit at an early age. The positive link between weaning mass and age at first reproduction is noteworthy, considering that pre-recruitment mortality already imposed a strong selective filter on the population, leaving only the most 'robust' individuals to reproduce. Standardized selection gradients, which measured the change in relative fitness per standard deviation unit of weaning mass, suggested weaker selection on mean fitness (the asymptotic growth rate) compared to selection on certain individual fitness components (first-year survival and recruitment probabilities). Weaker selection on mean fitness occurs because weaning mass have little impact on adult survival, the fitness component with the largest potential impact on population growth in elephant seals. In contrast, the fitness components that vary with weaning mass are characterised by low elasticities. Our results highlight the importance of interpreting individual variation in phenotypic traits in a context that considers the demographic pathways between the trait and an inclusive proxy of mean individual fitness, such as the asymptotic growth rate. Although only a weak evolutionary response to selection on weaning mass is expected, the selection forces operating thereon may play a fundamental role in parent-offspring conflict and the optimization of energy investment in individual offspring.