

The evolution of phenotypic plasticity in response to anthropogenic disturbance

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ABSTRACT

Questions: Do evolutionary changes in phenotypic plasticity occur after anthropogenic disturbance? Do these changes tend to be increases or decreases in plasticity? How do these evolutionary patterns differ among taxa and trait types? Does evolution of plasticity change with time since the disturbance?

Data incorporated: Evolutionary rates for plasticity estimated from 20 studies that have compared a plastic response in two or more populations, at least one of which had experienced an anthropogenic disturbance in nature and at least one of which had not.

Method of analysis: We estimate evolutionary rates (darwins and haldanes) for plasticity for each study, which represent the amount of evolutionary change in plasticity. We then perform analyses of covariance, with the evolutionary rate numerator (amount of evolutionary change) as a response variable, taxa and trait type as predictor variables, and the amount of evolutionary time as a covariate.

Conclusions: We find that plasticity has evolved in several cases, including both increases and decreases in the levels of plasticity following anthropogenic disturbances. The typical direction of this evolutionary response depends on an interaction between taxon and trait type. For instance, invertebrates sometimes show the evolution of *increased* plasticity for life-history traits, but the evolution of *decreased* plasticity for morphological traits. Plants, on the other hand, show no trends in the direction of plasticity evolution.

Keywords: adaptation, adaptive plasticity, climate change, contemporary evolution, human impact, meta-analysis, rapid evolution, reaction norms.

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