

## S1 Supplementary Information

### S1.1 A glossary of common facilitative phenomena

Recognizing the generality and ubiquity of facilitation as an interaction outcome requires we use a common definition. Facilitative interactions have been given many names depending on the details and context in which they occur, and some terms mean different things depending on the subfield of ecology. Contributing to the confusion of this concept are the nonparsimonious origins of the study of positive interactions; the literature concerning cross-trophic positive interactions and within-trophic guild positive interactions have distinct histories and domain-specific terms. While the literature concerning cross-trophic interactions has distinct terms for symmetric versus asymmetric facilitation research on plant-plant interactions (within-trophic guild interactions) typically ignores this distinction and often assumes symmetrical outcomes of interactions. This glossary details a range of terms emerging from this history.

**Allee effects:** Positive density dependence, usually referred to as the situation in which there is an increase in population growth as density increases in sexually-reproducing organisms.

**Apparent facilitation:** Beneficial interactions mediated by interactions with other species, often these interactions are negative (involving shared competitors) resulting in a net positive outcome (Sauve et al. 2016)

**Black Queen hypothesis:** Proposed evolutionary process by which organisms become dependent on others through the loss of gene function, which is compensated for by other organisms which still retain that function (Morris et al. 2012).

**Beneficence:** Term previously used to denote facilitation among plants (e.g. Hunter and Aarssen 1988, “Plants helping plants”).

**Commensalism:** A type of facilitation where one participant benefits without harming or benefiting the other (+/0).

**Complementarity effect:** The result of ecological interactions in high-diversity systems that do not occur in low-diversity systems. Thought to be a mechanism by which the biodiversity-ecosystem functioning relationship occurs. When positive it indicates that the majority of species produce a higher relative yield in mixture than in a monoculture (Loreau and Hector 2001).

**Depensation:** Often used in the fisheries sciences as an analogue to Allee effects, whereby a decrease in the breeding population leads to reduced production and survival of eggs or offspring.

**Ecosystem engineering:** Occurs when certain organisms significantly create, modify, maintain or destroy a habitat by creating physical changes in the biotic or abiotic environment. Can be facilitative to certain species and harmful to others.

**Facilitation:** An outcome of an interactions that increases performance of one interaction partner in the presence or increased density of interaction partners, relative to conditions where those partners are absent or at lower densities.

**Facilitation model of ecological succession:** A proposed pathway for ecological succession, whereby early coloniser species modify the environment and make it more hospitable to

later-successional species, often to the detriment of the early colonisers (Connell and Slatyer 1977).

**Facilitative shift:** When interactions shift from competitive to facilitative as a result of increased biotic or abiotic stress (He et al. 2013).

**Holobiont:** An assemblage of closely associated species that have complex interactions often involving forms of symbiosis, for example reef-building corals or humans and their microbiome (Margulis and Fester 1991)

**Indirect facilitation:** Beneficial effects of a species on a focal species in the presence of at least one other intermediate species (Wootton 1994). First coined by Davidson (1980) to describe the beneficial end result of competitive interaction chains between ant species, in a special case of diffuse competition.

**Invasion meltdown:** Promotion of non-native species by other non-native species, often with harmful consequences to natives; the mechanism being  $+/0$  or  $+/-$  interaction outcomes (Simberloff and Von Holle 1999; Richardson et al. 2000; Simberloff 2006).

**Metabolic cross-feeding:** An interaction between bacteria whereby the metabolic byproducts of one bacteria strain is further metabolised by another strain, often occurring concurrently with resource competition (Smith et al. 2019).

**Mutualism:** A type of facilitation where both participants benefit from interacting with one another ( $+/+$ ).

**Mixed crop benefits:** A system of growing multiple crops together on the same land to increase overall productivity (also known as polyculture, inter-cropping, co-cultivation).

**Niche construction:** Whereby an organism actively modifies its environment, often in a beneficial way e.g. fire-adapted trees increasing fire intensity by retaining dead branches (Schwilk 2003).

**Symbiosis:** Obligate mutualism.

**Priority effects:** In community assembly, when the establishment of one species benefits the later establishment of another species (Fukami 2015; Halliday et al. 2020).