Reintroduction of Indigenous Species to Natural Ecosystems

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Animals can become extirpated from a natural area for many reasons. Excessive hunting or other forms of unnatural mortality, habitat alteration, extreme climatic events, pesticides, vegetation succession, competition from invading species, or chance population fluctuations may all lead to local extinction. Such extirpations become a matter of particular concern when they occur in areas set aside as nature reserves. A local extirpation may preexist the establishment of a reserve, or it may occur despite management efforts. Considerable thought has lately been given to the near certainty of some extirpations occurring in habitat islands, such as reserves, either because of turnover at equilibrium (Simberloff 1976), or because of system-level degradation associated with area isolation and population changes (Kushlan 1979), or through area effects alone (Abele and Connor 1979).

The management goal of many reserves is to maintain as near natural conditions as possible, including as many aboriginal organisms as possible. Inherent in reaching such a goal is the desirability of reintroducing any extirpated species. In many cases, such species are recognized as being endangered or threatened, and reintroduction becomes an important aspect of the recovery effort for that species. Since the welfare of the species is the foremost consideration, a species-oriented approach is usually taken.

Animals for reintroduction are either translocated from other areas or are from captive breeding populations. The complexities of reintroduction are well known through popular accounts (e.g., Adamson 1960). Training of some species may be necessary, particularly for predatory and social animals. Dietary change, lack of disease and parasite resistance, climate and shelter changes, and deviation of captive stock from native genotypes are all problems that need to be overcome, as are the substantial technical difficulties of the reintroduction itself. These species-specific problems are widely recognized and are usually taken into consideration in a reintroduction program.

However, this species-oriented emphasis, by its very nature, may have a serious drawback. Often, too little attention is paid to the effects of reintroduction on the receiving environment. When an organism is extirpated, the system changes with time because of both internal and external forces. The system into which an animal is reintroduced will probably be different than it was when the animal was extirpated, and the species' absence may in itself have led to such changes. As a result an animal will seldom be reinserted into its vacant niche in a completely natural environment. Several aspects of the organism–environment interaction are worth emphasizing with respect to effects of introductions.

It is clear that a basic question is whether the environment will support enough animals to ensure their continued existence. This is particularly pertinent in light of the potential for system changes since extirpation, and additional changes that may occur because of the reintroduction.

Such potential impacts of reintroductions on ecosystem components must be evaluated. Reintroduction of a predator may have substantial effects on prey populations and, through competition, on other predators. Reintroduction of a herbivore may change the plant community. Any reintroduction may alter pathways of energy flow. Furthermore, potential changes are not necessarily predictable from the species' past role in the system.

As various populations of a species usually differ, it is important to consider the genetic composition of the population to be reintroduced. Much genetic variation among populations is adaptive with respect to the local environment. Survival potential of the reintroduced population may be affected by local genetic adaptations and, as importantly, the nature of these adaptations may also determine impact of the reintroduced animal on the environment.

If a reintroduction is to augment rather than to reestablish a population, the potential effects become more complex. A surviving population in an area indicates that existing numbers of animals are capable of surviving there. The habitat may not be able to support additional animals, despite low existing population levels. New

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animals may disrupt established social hierarchies, territories, disease or parasite levels, and genetic composition of offspring, and all such disruptions may affect other ecosystem components. Augmenting existing populations is a difficult and potentially dangerous approach to species conservation.

Thus possible impacts of reintroduction on the receiving environments must be analyzed. Natural systems are usually complex, and changes are difficult to forecast. Reintroduction of a species may require trade-offs in population levels of other species or in aspects of ecosystem function. The nature of these trade-offs with respect to both the species and the receiving ecosystem should be assessed before reintroduction decisions are made. In that way, reasonable decisions are possible regarding conservation of both extirpated species and natural ecosystems.

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