Saving the Keystone is the Key to Saving Them All

The interactions between species within any given ecosystem are highly complex, which entails that any introduction of a new species, the influence of human presence, or even the loss of a species means that system is forever changed. One species may become dominant that was not before and one species may die off. However, once an ecosystem is altered, complete restoration to the previous ecological homogeny is highly improbable, and what is most possible is a close replica of what the ecosystem once was. The US Endangered Species Act, adopted in 1973, does nothing more than rely primarily on regulation imposing the costs of protecting biodiversity on the private sector (Illical, 2007), obtaining the closest restoration of an ecosystem can be most effectively conducted by the focus of conservation efforts on significant keystone species of that ecosystem.

The first issue that must be dealt with is that there is no single accepted definition of a 'species' in the natural sciences, nor does the Endangered Species Act offer one (George, 2005). With a concrete definition of a species, restoration couldn't be manipulated to include parts of the ecosystem that are known to being insignificant or irrelevant to obtain ecosystem restoration. Conservations efforts would be wasted if they were focused equally on all animal and plant populations in an ecosystem instead of the important keystone species; this is because the greatest influence on the ecosystem is done by the keystone species. Instead, prolonged debate over species concepts has allowed various stakeholders to embrace and defend particular definitions based upon personal agendas that may be at odds with the objectives of the ESA (George, 2005). These politics could be eliminated if keystone species just received all the focus from conservation efforts, because not only is focusing on just the keystone species more effective to ecosystem restoration it is more efficient as well. This is because the more concentrated the efforts are, the more cost effective (cheaper) efforts are (George, 2005). Therefore, the definition should be the one most commonly accepted one, which is the Biological Species concept, species are groups of actually or potentially interbreeding natural populations which are reproductively isolated from other such groups (Ernst Mayr, 1940). This definition is very specific and provides little to no wiggle room for wasteful manipulation of conservation efforts to being blanketed over an ecosystem to include just one large population of organisms within an ecosystem.

It is important to understanding the issue of whether focusing on the keystone species is better than simply allocating conservation efforts equally over the entire ecosystem, by knowing how to identify a keystone species within an ecosystem and what the keystone species really does. Essentially, the species that exerts the greatest influence on an ecosystem is the keystone species, a species whose abundance dramatically alters the structure and dynamics of ecological systems (Brown and Heske, 1990). Its nonsense to fritter away valuable resources on species that don't hold strong baring over the structure and dynamics of an ecosystem, yet that is exactly what happens when conservation efforts are dispersed over the entire ecosystem equally. However all species serve some purpose one way or another no matter how small but when looking for the most effective course of action to achieving ecosystem restoration, the keystone species holds the key and their influence can take several forms and could be representative of many different species within a single ecosystem.

So in order to understand how to restore an ecosystem we must fully understand how that ecosystem is structured through the complex web of interactions between the keystone and other species, the keystone species and its environment, and etc.

The first indicator of a keystone species is that a keystone predator may prevent a particular prey species from overrunning an ecosystem. Some sea stars may perform this function by preying on mussels and other shellfish that have no other natural predators. If the sea star is removed from the ecosystem, the mussel population explodes uncontrollably, driving out most other species (Paine, 1966). In this case, it is understood how it is such a waste of conservation efforts to focus on both the sea stars and mussels and every other organism within the ecosystem equally when studying an ecosystem's web of interactions. In fact it can be seen that by focusing on more than just the keystone species the result become counter intuitive or counter effective in the efforts of obtaining ecological restoration. Predators have been employed in conservation as keystone species. Top predators have been described as highly interactive keystone species. Their decline has been linked to secondary extinctions and their increase has been linked to ecological restoration (Wallach, 2009). The top predator seems to set significant direction of an ecosystem web of ecological interactions and has a deeper impact on the environment. Evidence suggests that top predators promote species richness. Therefore, predator-centered conservation may deliver certain biodiversity goals (Sergio, 2008).

The beaver and elephant are also keystone species, not as predators but in a different capacity known as being an ecosystem engineer. The beaver builds dams which transforms its territory from a stream to a pond or swamp (Wright, 2002). Without their presence the ecosystem would not be the same. In the African savanna, larger herbivores, particularly the elephants, shape their environment in a similar fashion. The elephant's traveling destroys trees, making room for the grass species. Without these animals, much of the savanna would turn into woodland (Leakey, 1999). If focus was turned on all species equally, then we could see not just disruptions in the food web but the entire biome as a whole would be disrupted. It is a bad idea to equally distribute conservation efforts across an ecosystem because it's unnatural and conservational biology's purpose is to preserve the natural order, not produce and support an artificial one (George, 2005). However, regardless of what type of keystone species a creature happens to be a part of, their removal from an ecosystem is always disruptive and without conservational focus undividedly placed on the keystone, restoration is nearly impossible to obtain.

The necessity of a keystone species in the restoration of an ecosystem has been best observed in the case of the Yellowstone wolves. A 'trophic cascade' is the term biologists' use for the ecological chain of events set off by extermination of wolves and other top predators. Starting in Yellowstone more than a decade ago, Beschta and Ripple documented in Zion National Park the linked the absence of cougars to an upswing of mule deer and a crash in cottonwoods, which was followed by stream-bank erosion and declines in butterflies, frogs and native fish. Similar patterns of vegetation and habitat destruction emerged in Yosemite and Jasper national parks, the latter in Canada (Doughton, 2009). Because settlers and trappers have killed all the wolves in the Hoh Rain Forest over the past three decades, direct documentation has shown correlation with ecological homogeny and the wolves' population presence.

Observational evidence has pointed to the loss to having a rippling effect throughout what is now Olympic National Park. The loss has lead to a boom in elk populations, over browsing of shrubs and trees, and erosion so severe it has altered the very nature of the rivers according to Oregon State University biologists. In fact, growing evidence shows that key predators do more than simply keep prey species in check. Most famously, Ripple and his OSU colleague Robert Beschta showed that within three years after wolves were reintroduced to Yellowstone National Park and elk populations fell, pockets of trees and shrubs began rebounding. Beavers returned, coyote numbers dropped and habitat flourished for fish and birds. The whole ecosystem re-sorted itself after those wolf populations got large enough claimed David Graber the regional chief scientist for the National Park Service (Doughton, 2009), which shows a concrete example of the insurmountable value the keystone species holds to its ecosystem and how wasteful and unnecessary conservational recourses would be if used on the other species populations of the ecosystem.

In another case, when focus was placed solely on the salmon in the efforts to save the Pacific Rim coastal ecosystem within the past decade or so, Guido Rahr the President of The Wild Salmon Center noted it was because their population's health offered the highest probability of protecting the coastal ecosystems. Within the Pacific Rim coastal ecosystem, salmon themselves are also the best species indicator of the coastal ecosystem's health because salmon are the biological foundation, or keystone species, of coastal ecosystems and human economies. According to Rahr, since coastal human communities depend on salmon for protein as well as income, it's obvious that focusing solely on the keystone species is just as important for the particular ecosystem just as it is for local and sometimes nation and worldwide human societies. In 1992, Pacific salmonids including trout, steelhead, salmon and char supported commercial and recreational fishing industries that produced over $1 billion in personal income and more than 60,000 jobs in the region. Alaskan salmon exports generate over $700 million each year, and 80% of Kamchatka, Russia's economy is dependent on salmon and other seafood. Native people of the Pacific Rim not only depend on salmon for food, but also as a critical component of their traditional culture and economy (Rahr, 2009). By focusing conservation efforts on the keystone species, its restoration and restoration of the species which rely on them provides more jobs and greater income for the people who live and are associated with the keystone population’s health. If conservation efforts were not focused directly on the suffering keystone species, then their decline could be seen to have severe consequences on the markets revolve around them as well.

If you lose the keystone species, you lose the entire ecosystem support base. With no natural equilibrium, an ecosystem will not have the means to keep a natural balance. Another aspect of the argument is that to best accomplish this, there must be public support, without it there are not conservation resources to allocate to begin with. But it is difficult to capture public sympathy for something as amorphous as an “ecosystem” (Rahr, 2009). When gaining public support, it’s honestly just too inconceivable to the public to believe something as vague as to focusing finite conservation resources across an entire ecosystem in order to restore it. However it is more believable, plausible and affordable in gaining public support for the restoration of just one species to save an ecosystem, because it seems more obtainable and observable. Yet using a single species without a constituency as a flagship is also risky, based on Rahr's studying of lessons learned from the spotted owl and Klamath large-scale sucker conflicts. Many native people of the Pacific Rim revere salmon as a source of life and a cultural centerpiece. As a tool to rally support for forest and water conservation, it is difficult to find a species that has more charisma and broad cultural support than salmon (Rahr, 2009). By focusing on just the keystone species which many industries and cultures rely on gain more support than species that serve no industrially or culturally dependant purposes which therefore people have a hard time striking up the inclination to allocate money to their conservation and support.

All ecosystems go through some sort of state of flux at some point in time. However, when an ecosystem loses its equilibrium and begins to free fall into peril, an ecosystem can bounce back when all of their original pieces are restored. The evidence exemplifies this as observed by the reintroduction of the wolves in Yellowstone for example, since it has been demonstrated that focusing resources on the preservation of a keystone species is highly effective, there is little argument for the unnecessary squandering of funds to be allocated to other species. The fact is that the significance of the keystone species and there imperative role in the efforts of restoration and future self-stability of an ecosystem are undeniably crucial. When it comes to such a costly and sensitive issue as to ecosystem restoration and its allocation of efforts, there is no money that can be misused on such inefficient and ineffective measures as to distributing conservation efforts equally across an ecosystem. So being as it is the keystone species that drives the ecosystem and it is the answer to saving the ecosystem, it must receive all focus of conservation efforts.

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