

Nativism and Nature: Rethinking biological invasion

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Abstract: The study of biological invasions raises troubling scientific, political and moral issues that merit discussion and debate on a broad scale. Nativist trends in Conservation Biology have made environmentalists biased against alien species. This bias is scientifically questionable, and may have roots in xenophobic and racist attitudes. Rethinking conservationists' conceptions of biological invasion is essential to the development of a progressive environmental science, politics, and philosophy.

Keywords: Conservation, biological invasion, native, alien.

Introduction

Environmentalism is a heterogeneous mix of science, politics, ecology and culture. Environmental values are inextricably linked to these diverse influences and vitalise what is perhaps the most exciting movement in our time. This paper begins at the messy interface of conservation biology and environmental ideology, and attempts to illuminate the social and political implications of environmental science. Resisting the temptation to accept science as value-free, this analysis highlights the political and ethical dimensions of conservation biologists' efforts to conserve nature and protect biodiversity. The central contention of this essay is that nativism in the biological sciences raises troubling, scientific, political and moral issues that merit discussion and debate on a broad scale.

The problem of biological invasion

Ecologists and especially conservation biologists have become keenly aware of the ecological damage that can result when alien species invade new territories (Soulé 1990, Drake et al. 1988, Groves and Burdon 1989, Macdonald et al. 1986, Mooney and Drake 1986). The protection and restoration of native species is one of the major foci of conservationists' attempts to protect biodiversity. Biological nativism pervades the environmental movement. Native plant societies have sprung up across the United States, encouraging the exclusive use of indigenous plants in urban gardens (Pollan 1994). Since 1963, the United States national parks have attempted to follow the Leopold Report's directive to re-create original ecological conditions - including the restoration and protection of native species (Wilson, 1992, Chase 1987). The popular press dramatises biological invasions, frightening and entertaining the public with African 'killer' bees, voracious cane toads, and other nefarious species (*Science* 1990, Edwards 1990).

Despite the considerable attention given to the problems of biological invasion, ecologists and wildlife managers have not developed satisfactory methods for dealing with the onslaught of alien species. Eliminating them has proved impossible in the overwhelming majority of cases (Brown 1989, Chase 1987). I will identify some issues and problems that thwart conservationists' attempts to manage biological invasions. These obstacles suggest not only that ecologists and conservationists will have to adapt and update their methods of managing biological invasion, but also that they question the political and ethical supposition implicit in their approach. Current trends in ecological theory (Hengeveld 1989, Fox and Morrow 1981), the increasing spread of alien species (Soulé 1990, Drake 1989), and current debates and ambiguities around defining what is natural (Soulé and Lease 1995,

Bennett and Chaloupka 1993, Cronon 1995), all indicate a period of turmoil for ecological science and politics. This turmoil is often focused on the status and definition of alien species. Innovative, cross-disciplinary work on biological invasion is central to the further development of ecological theory and practice.

Identifying natural native species

The words 'native' and 'natural' are closely linked. The Latin 'nascor' is the original root for several English words including native, natural, nation, and natality (OLD, OED). When ecologists use the word native, the term retains the flavour of the Latin root. Protecting nat-ure is usually equated with protecting nat-ive flora and fauna. This is done in the interests of preserving life (nat-ality), and often occurs within nat-ional parks. Nature, natives, natality, and nation have been important, interconnected concepts for environmentalists and ecologists. The association of native species with what is natural has fuelled conservationists' interest in biological invasion. The task of identifying, protecting, and restoring native species, and the corollary task of identifying and eliminating alien species, has become a major branch of conservation biology.

How do scientists distinguish between the native and the alien, the natural and the artificial? They are usually forced to rely on partial natural history records. In South Africa, for example, there are 984 documented alien species (Well et al. 1986). This figure is misleading, however, because in 104 of these cases, the origin of the alien species is in doubt. That is to day, in more than 10% of these cases, the 'alien' species might actually be a native. If the natural history record is incomplete, there is no reliable ecological or biological method that can distinguish between aliens and natives. Furthermore, it is unclear how long a species needs to be established in a location before it is considered native. Is a species 'naturalised' in 100 years, 1,000 years, or 10,000 years? The distinctions are arbitrary and unscientific. These factors suggest that the study of biological invasion does not rest on a rigorous scientific foundation.

Although most ecologists agree that alien species can have damaging effects, there is little agreement on what constitutes an alien or how aliens can be identified. Ecologists and managers usually focus on aliens that become 'especially prominent in an economic or nuisance sense' (Groves and Burdon 1986). This draws attention to particularly damaging, and usually atypical, invaders (Hengeveld 1989). This bias limits the possibility for a broader understanding of species migration and biological invasion. Attempting to keep nature 'pure', 'wild', and alien-free, may be impractical, impossible, or even undesirable.

In the interests of promoting debate, I juxtapose that nativism of conservation biology with the ecological theory that is currently in vogue in that discipline. Paradoxically, many conservation biologists emphasise the importance and pervasiveness of species migration while maintaining a nativist ideology. By exploring this contradiction, I hope to promote dialogue that will encourage environmentalists to develop an ecological framework that includes sensitivity to the cultural, moral, and political dimensions of ecological science.

Humans and native nature

Anthropogenic changes to natural areas further complicate the determination of what is natural and native. The introduction of alien species is usually associated with anthropogenic disturbance and human migration (Heywood 1989). European colonial expansion, for example, distributed flora and

fauna at an unprecedented rate (Crosby 1986). The colonial Europeans are often blamed for the degradation of the ecology of the Americas, Africa, and Asia. This attitude is reflected in U.S. National Park Policy. The 1963 Leopold Committee decreed that:

The goal of managing the National parks ... should be to preserve, or where necessary to recreate, the ecologic scene as viewed by the first European visitors. As part of this scene, native species of wild animals should be present in maximum variety and reasonable abundance (quoted in Wilson 1992).

It is assumed that Europeans found the Americas in a pristine, natural state. The goal of management is to protect and recreate native nature, before it was altered, invaded, and degraded by European culture and European biota.

This perspective often relies on an idealised and patronising attitude toward native Americans (Hecht and Cockburn 1990, Chase 1987). Many anthropologists and archaeologists challenge the view that Native Americans lived in perfect harmony with nature. Rather, they assert that Native American hunters were responsible for the extinction of the bulk of the Pleistocene megafauna (Chase 1987). By the time Europeans arrived, most of these native species had already gone extinct. Native Americans also altered their environment in beneficial ways. In Yellowstone, Native Americans set fires that interrupted serial succession. This promoted 'more varied vegetation' and supported 'more diverse wildlife' (ibid.). Native Americans are neither saints nor villains. Like colonial Europeans, native people and aboriginal people alter and influence the natural environments they inhabit.

The influence of native people on nature makes it difficult to maintain the thesis that European colonialists are the sole reason that native nature is threatened. One scientist has remarked that:

[t]he botanical traveller soon becomes aware that there is scarcely a region in the world where the vegetation has not been disturbed to some degree by man's activities, usually leading to the introduction of alien species ... Ellenburg (1979) observed that the reason he travelled to Peru and other tropical countries was to study 'real nature' but after several months of field work he could not fail to discover traces of man's impact there too, even in the Amazonian rain forest area (Heywood 1989).

Humans have existed with nature for tens of thousands of years. If 'real nature' is human-free, it becomes questionable if 'real nature' even exists. People have been moving biota for thousands of years on five continents. This biological mixing has intensified in recent years due to the globalisation of cultures. In this milieu, it becomes extremely difficult to identify the natural, native, or original conditions of an ecosystem. These factors, combined with current trends in ecological theory, have complicated conservation biology's stated task of protecting biodiversity.

Population and conservation biologists reject the balance-of-nature perspective

In the 1970s papers began to appear that challenged community and ecosystem balance-of-nature paradigms. This new scholarship asserted that '[c]hange is without any determinable direction and goes on forever, never reaching a point of stability' (Worster 1993). Population biologists and more recently conservation biologists, highlighted data suggesting that 'species move freely on all geographical scales' (Hengeveld 1989). This theory 'posits that the collection of species that exists in a particular place is a matter of historical accident and species-specific, autecological requirements'

(Soulé 1990). Specialisation has been shown to occur haphazardly, and in the absence of co-evolution (Fox and Morrow 1981, Knight and Macdonald 1991). Nature is seen as a chaotic, random, and structurally open system. Conservation and population biologists tend to view species migration as natural and normal. Conservation biologists emphasise the importance of biodiversity and have identified free species migration as a central element in preventing species extinctions.

The theoretical shift in certain biological disciplines challenges most of the previous work on biological invasion. Biological invasion has traditionally been conceptualised in terms of 'outside' invaders, that infiltrate 'closed,' 'co-evolved,' and 'interdependent' ecosystems. Aliens are damaging because they disturb the balance of an ecosystem. For traditional ecology, species spend centuries passing through serial succession as they evolve to form highly mutualistic climax communities. A hypothetical example of such mutualism is easy to imagine. A species of bird evolves together with a plant to create an efficient seed dispersal system. An alien bird migrates to this ecosystem and out competes the native bird. The alien bird has not evolved with the native plant so its digestive system does not facilitate the germination of the native plant's seeds. The dispersal system is destroyed and the native plant faces extinction.

Recent conservation biology has de-emphasised these types of stories and tends to focus on counter-examples that foreground the importance of species migration. These theorists suggest that frequent invasions are a natural, normal process. Hengeveld (1989) uses the Holocene tree invasion in Europe as an example. The migration began approximately 13,000 BP (before present) and the trees had spread to over half of Europe by 1000 BP. These rapidly migrating trees significantly altered the biological systems that they encountered. Hengeveld concludes that in 'such ecologically unstable conditions selection can only act against the formation of species-specific co-adaptations'. According to Hengeveld, species evolve in unstable conditions that promote tolerance to biological invasions and changing species compositions.

Does this mean that wildlife managers should let menaces such as feral pig and invasive goat populations skyrocket? Certainly not. No one doubts that there are dramatic examples of alien species doing grave environmental damage to an ecosystem. But if we take recent developments in conservation and population biology seriously, we must call into question whether all invader species should be eliminated or controlled. The study of biological invasion needs more effective ways to determine which invader species are ecologically damaging, and which are neutral or beneficial. Indeed, managers may even attempt to facilitate migration in some cases. As species migration is limited by human development, it becomes increasingly difficult for species to migrate naturally. The Wildlands Project's long term goal of connecting wild areas with wildlife corridors is one example of an emerging style of management (Foreman 1993). I will discuss other approaches that encourage migration and mixing in the conclusion of this paper.

The disturbing historical legacy of purist biological nativism

Compelling reasons to challenge biological nativism originate not only from within the biological sciences. Although it is impossible to prove an essential link between particular forms of scientific knowledge and the societal context from which they emerged, the purism of biological nativism has historically been associated with fascist and apartheid cultures and governments. Pre-World War II Germany, for example, saw the rise of a natural gardening movement 'founded on nationalistic, and racist ideas' (Pollan 1994). Indeed,

under National socialism, the mania for natural gardening and native plants became government policy. A team working under Heinrich Himmler set forth 'Rules of the Design of the Landscape,' which stipulated a 'close-to-nature' style and the exclusive use of native plants (ibid.).

Garden architect Willy Lange was the first German to popularise the nature garden. 'Lange's concept was a mixture of science-oriented design ideas and nationalistic, volkish thinking' (Groening and Wolschke-Bulmahn 1989). During this period, 'the subordination of the garden to the landscape by the use of native shrubs and trees became an ideological doctrine' (Groening and Wolschke-Bulmahn 1992). Strict biological nativism was compatible with the Nazi's anti-cosmopolitanism. Ideologically, politically, and ecologically, the Nazis sought to prevent mixing and to purify categories. They attempted to purify nation and nature, by eliminating people and biota that were supposedly not native.

A more recent and subtle example of this can be found in South Africa in the 1980s. This is where the initial proposal for the Scientific Committee on problems of the Environment's (SCOPE) invasive species project was proposed. 'South African scientists were instrumental in preparing the project proposal that was put to SCOPE for approval in 1982' (Macdonald et al. 1986). Since the early 1980s, SCOPE has been influential in shaping how biological invasion is studied. South African scientists have had a great deal of influence over the SCOPE project. They have been over-represented at international SCOPE conferences on biological invasion and have published a disproportionate number of articles on the subject (Drake et al. 1989). Why are scientists from South Africa especially concerned with biological invasion? The answer may be similar to the Nazi proclivity for the nature garden. Like Nazism, apartheid thinking is concerned with separating the pure from the impure. Even anti-racist scientists living in an apartheid culture may be influenced by this sort of purist, xenophobic, and racist way of thinking. It is not surprising that SCOPE's hard-line biological nativism has roots in South Africa.

The Nazi nature garden and apartheid South Africa are cautionary historical examples for the would-be nativist zealot. As xenophobic anti-immigration laws such as California's proposition 187 (1994) spread across the United States and Western Europe, environmentalists must be careful not to reinforce a politically conservative nativist agenda. Although environmental purism is not inherently racist, there are compelling arguments that nativist purism is undesirable in all spheres - politically, culturally and ecologically. Nature and society are both complex and damaged systems. To protect biological life and create a better society we must move beyond simplistic, purist responses to ecological and social crises.

The beginnings of "mixoecology" or "recombinant ecology"

Ecologists are faced with increasingly complex assemblages of native and non-native species. Soulé has predicted that a 'new ecological discipline will develop to deal with the interactions within these new, biogeographically complex assemblages. The field might be called 'recombinant ecology' or 'mixoecology' and it will offer manifold opportunities for research' (Soulé 1990). This field will not begin with the premise that alien species are bad. Instead, it will assume that communities are biogeographically diverse and attempt to determine why some species mix better than others. Completely 'eradicating' alien species is impossible in the majority of cases and bio-control campaigns are always a costly drain on resources. To avoid these problems, mixoecology will not strive to eliminate mixing, but rather to use limited economic resources to help mixed ecosystems

thrive. This may require the elimination of certain invasive species, as well as the possible introduction of species into empty niches (ibid.).

Threats to nature should not be underestimated. The environmental crisis often provokes a feeling of hopelessness and a longing to 'turn back the clock'. Although understandable, hopelessness and nostalgia do little to mitigate the continuing degradation of nature. Ecologist James H. Brown provides us with useful advice:

It has become imperative that [as] ecologists, evolutionary biologists, and biogeographers ... we use our expertise as scientists not for the futile effort to hold back the clock and preserve some romantic idealised version of a pristine natural world, but for a rational attempt to understand the disturbed ecosystems that we have created and to manage them to support both humans and wildlife" (Brown 1989).

Brown is not advocating putting human interests before environmental interests. Instead, he is asking us to recognise the complex interactions that humans have with a natural world that is almost universally characterised by anthropogenic disturbance and cosmopolitan species composition. It will require creativity and ingenuity to protect nature in this troubling milieu.

Fortunately, nature often exhibits surprising resiliency. Diverse assemblages often exist in the most unlikely places and include native and alien species. The native korthaan bird in South Africa effectively disperses the seeds of the alien *A. cyclops* in a highly efficient, and ecologically beneficial dispersal system (Knight and Macdonald 1991). The Hutchenson Forest in New Jersey is a biodiverse collection of new and old world species (Botkin 1990). In the San Luis Valley in southern Colorado, Chicano farmers have developed agricultural techniques that produce food for humans and create wetlands and habitat for hundreds of native and non-native species (Pena and Gallegos 1993). These are just a few of the many locations where native and alien species coexist with some degree of harmony. Why do these assemblages work? Investigating this question could potentially lead to the development of new paradigms in ecological theory and wildlife management. Such paradigms could help us understand and manage the damaged, cosmopolitan nature that our global, cosmopolitan society has helped produce.

Conclusion

This paper is meant to provoke the following question: If peaceful coexistence in a multicultural society is a good goal for humans, why not for other species? The idea of purity is central to current debates in environmental science, politics, and values. What sort of nature should environmentalists admire, protect, and value? The way that nature is represented by biologists is of tremendous philosophical importance to environmentalists. Do biologists think nature is 'red in tooth and claw,' or do they describe a harmoniously mutualistic community of species? Do they characterise nature as a system with frequent migration and cosmopolitan species composition, or is nature better described as being composed of closed, co-evolved communities of native species? These questions are germane to more than just the scientific understanding of flora and fauna. They are at the heart of environmentalist conceptions of humans' interactions with each other and the natural world.

It is unclear whether the majority of ecologists will embrace a version of mixoecology. Although there is some movement in that direction, many environmental scientists are committed to the idea of pure, 'native' nature. Both nativist and mixoecologist camps are composed of progressive individuals

determined to protect the earth from further degradation. This paper seeks to expand this scientific debate by inviting social scientists and philosophers to critically engage nativist discourse in the biological sciences. Questioning purist pieties may protect modern environmentalists from reproducing the xenophobic and racist attitudes that have plagued nativist biology in the past. It will require a broader and more inclusive debate to establish the scientific, political and moral implications of nativist biology.

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