



Recovering Native Culture in a World of Nonnative Species

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Historical Use and Value of Introduced Species

Traditionally, native species have been the main source of food and shelter for humans. However, this drastically changed from the eras of colonization onwards (Crosby 2004). Diasporic people took familiar species with them as a resource and to maintain their culture in the colonized environments (Pfeiffer & Voeks 2008). This practice produced a shift toward the continuous use of nonnative species, which increased their cultural value and led them to be considered local resources (Lambertucci & Speziale 2011; Nuñez et al. 2012; Speziale et al. 2012). Currently, the increasing demand for products by highly consumptive societies exacerbates the production and use of nonnative species (Myers & Kent 2004).

Human consumption of invasive species is commonly advised for controlling them (e.g., Collier et al. 2011). Thus, nonnative invasive species control can become a profitable activity (Collier et al. 2011), increasing their social value and even triggering their protection (Carruthers et al. 2011; Speziale et al. 2012). So harvesting nonnative species can lead to a problem: whether to eradicate or maintain populations of this economic resource (Lambertucci & Speziale 2011). We considered the problems of valuing nonnative species and propose that increasing the cultural and economic value of native species through their sustainable use could reduce these problems.

Trade-offs between economic development and conservation arise when dealing with commercially valuable species (Pascual et al. 2002). This is of particular concern to conservation organizations because they may get trapped by their own decisions. For example, since

1950, the National Park Administration and Provincial Governments of Argentina introduced nonnative species including trout (e.g., *Salvelinus* sp.), red deer (*Cervus elaphus*), and pine (*Pinus* spp.) for fishing, hunting, and timber production, respectively. Although these are nonnative species, they represent economic resources. Governments tend to protect them (i.e., sustain healthy populations) by designating hunting and fishing seasons or limiting the number of individuals that can be fished or hunted per day. People value nonnative species, sometimes over local ones (Carruthers et al. 2011; Speziale et al. 2012).

Revaluing Native Species

We propose that appreciation of some native species be enhanced so as to reduce the value of nonnative species. Well managed harvesting or plantations of native species preserve sustainable environments for native fauna and ecological services and provide ecotourism opportunities (Engelbrecht & Van der Walt 1993; Lamb et al. 2005). Native species may not always be as profitable as nonnative species, but their use avoids land use change and expenditures on invasive species control (Strauss 2001; Lamb et al. 2005). Incomes from native species use may reduce their persecution and enhance their value if harvest is conducted in a sustainable way (Mainka & Trivedi 2002; Bradshaw 2011).

Several examples exist of successful use of native species both from harvesting wild populations and cultivation. A few of them include a shift in use from nonnative to native species (e.g., Carruthers et al. 2011). As for many

species, unregulated harvest of African crocodilians led to their near extinction. Nowadays the managed harvest of wild crocodile eggs for ranching purposes helps in their recovery and conservation (Thorbjarnarson 1999). Also, the Australian saltwater crocodile (*Caiman porosus*), formerly close to extinction, has recovered due to its sustainable use (Bradshaw 2011). The commercial use of crocodiles' eggs and skins favors the protection of crocodile habitat to sustain egg availability (Altman & Whitehead 2003). For decades Australia neglected the use of native tree species and instead grew plantations of nonnative trees; by 1997 more than 700,000 hectares were planted with exotic softwood (e.g., *Pinus radiata*; Strauss 2001). Meanwhile, all over the world, Australia's native *Acacia* and *Eucalyptus* species were being successfully and profitably cultivated (Carruthers et al. 2011). A decade ago, Australia embraced a shift toward replacing *P. radiata* with native species. By 2000, 34,000 new hectares were planted with eucalypt species, and there is a plan to increase this to 1,200,000 hectares by 2020 (Strauss 2001).

Avoiding Undesired Effects

Domestication and intensive harvesting of natives may produce undesired side-effects, such as overexploitation, habitat transformation, and genetic pollution (Strauss 2001; Mainka & Trivedi 2002). Increases in market demands and technological improvements often lead to domestication (Pérez 1996). But, domestication might produce some drawbacks such as native ecosystem transformation and genetic contamination due to gene flow between domesticated and wild populations (Strauss 2001). Most hybridization problems arise when domesticated species are seminative because they are grown outside their natural range (Strauss 2001). As long as they are maintained within their native range and no genetic manipulation is conducted, genetic contamination risk is low. Furthermore, domestication of natives has several benefits because it reduces nonnatives invasion risks and insects outbreaks, provides shelter and food for native animals, and improves ecological services in contrast to productive systems based on nonnative species (Strauss 2001; Lamb et al. 2005). For example, the agroforestry system of cacao (*Theobroma cacao*) and native timber trees in Amazonia provides forest fragment connections and habitat for the endangered maned sloth (*Bradypus torquatus*; Cassano et al. 2011). To avoid native environment transformation, the change to agroforestry with native species is highly recommended for application in already cleared agricultural land (Strauss 2001). Risks associated with domestication can be overcome with the sustainable harvest of native species and ecotourism. Ecotourism may provide more economic and social benefits for local communities than the agricultural use of the land

(Engelbrecht & Van der Walt 1993). Wild harvesting has been attempted, but many efforts have not been sustainable in the long run (Plotkin et al. 1992; Pérez 1996).

Not every native species may be harvested because rare or endangered species could become threatened. Yet, several natives could tolerate sustainable extraction, domestication, or ecotourism (Thorbjarnarson 1999). Economic and social factors, particularly market preferences, guide the selection of native species for consumption (Pérez 1996; Lilieholm & Weatherly 2010). From an ecological point of view, the overall potential of a species selection for sustainable use will be determined by its demography, disturbance tolerance, range size, and habit (Pérez 1996). This is the case for crocodiles in Africa and for native plants in Australia used for arts and crafts, an activity that can even expand without seriously threatening sustainability (Thorbjarnarson 1999; Altman & Whitehead 2003). Also, species that supply multiple products or are suitable for diversified production systems could buffer the vagaries of economic markets and might be better candidates for human consumption (Plotkin et al. 1992).

Looking for a Native Strategy

Several factors are crucial to assure the success of projects fostering the use of native species: research, education, monitoring, and funding. Research, building up on locals' knowledge, is essential to provide land managers information on sustainable harvest rates or domestication viability of native species (Pérez 1996; Altman & Whitehead 2003). Research was highly important in designing the successful use of crocodiles in Africa because it allowed the setting of sustainable extraction quotas (Thorbjarnarson 1999). Education should highlight the feasibility of native species sustainable use and the importance of protecting native biological diversity (Speziale et al. 2012). In Argentina university experts favor the shift toward native species agroforestry by providing tree seedlings of native species, advice, and training (Montagnini et al. 2005). Monitoring should be clearly delineated to assess the sustainability of the native resources (Pérez 1996; Lilieholm & Weatherly 2010) and avoid consumption drawbacks. Funding provided by governmental and private sectors should support researchers and institutions working on native species sustainable use. Governments should also establish policies, pass legislation, and apply strict controls. For instance, a special law regulating fishing to ensure biological diversity conservation for the Galapagos archipelago (law no. 278, 1998) was the result of and the solution for a long socioeconomic conflict in Galapagos National Park. Reserves and national parks can be also seen as sources of native food and goods instead of as a source of undesired species as many local neighbors consider them. Particularly important is the

development of a trading structure and marketing strategies to gain market acceptance (Liliehalm & Weatherly 2010). Under strict conditions, local land managers should be encouraged to shift the use of exotic species to use of native species. National resources spent to overcome problems derived from the utilization of exotic species could be used instead to encourage the shift toward native species.

The positive feedback between biotic homogenization and its close relatives, cultural and culinary homogenization, is evident and favors the economic use of nonnative species (Olden et al. 2005). The overvaluation of nonnative species has not been thoroughly considered in conservation practices. There are few examples of a shifting strategy from producing exotic species to the productive use of native ones, and this change should be encouraged. However, several examples of sustainable use of native species exist. Here we call attention to more conscientious practices that gradually realign local needs with native natural resources. The revaluing of local diversity so that it is appreciated as in former times over a small number of globally used (nonnative) species can be a key step in efforts to preserve native natural and cultural resources.

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