

Species at the Edge: The Case for Listing of “Peripheral” Species

David F. Fraser

Wildlife Branch, British Columbia Ministry of Environment, Lands and Parks
P.O. Box 9374, STN PROV GOVT, Victoria, BC, V8W 9M4, Canada
Dave.Fraser@gems8.gov.bc.ca

ABSTRACT

Peripheral species are those that are at the edge of their range, often barely crossing the line into a political jurisdiction. Formerly, the process for listing species in British Columbia prevented peripheral species from becoming candidates for threatened and endangered status. Reasons for changing this policy include patterns of species collapse, historical importance of peripheral species in recovery planning, and genetic, evolutionary, and biodiversity considerations.

Key words: peripheral species, species collapse.

Peripheral taxa are those that are at the edge of their range, usually those that barely extend into a political jurisdiction. Since the late 1980s, British Columbia has risk-listed species of vertebrates, with Red-listed species being of the greatest conservation concern, followed by Blue-listed, and lastly by Yellow-listed species (Harcombe 2000). Before 1992, the British Columbia Wildlife Branch placed species at risk that were considered peripheral on the Blue List. Those peripheral species that were candidates for threatened or endangered status were down-listed from Red to Blue. This policy was designed to ensure that scarce resources were not spent on species that could not be recovered because they were limited by climate or habitat factors beyond human control.

This policy was changed for several reasons:

1. Many endangered species collapse to the periphery of their range. Lomolino and Channell (1995), examined 31 endangered mammal species, 23 of which had extant populations along the historic periphery of their range and had been extirpated in the core of their range. Lomolino and Perault (1998) examined 245 species that had collapsed to <25% of their historic range, most collapsed to the periphery of their range. They concluded that “sites along the periphery of a species’ historic range should no longer be dismissed as sites with little conservation value.” This trend is particularly important for British Columbia, as the most common pattern (for mammals) in the northern hemisphere is to collapse to the northern and western edges of a species’ range (Lomolino and Channell 1995).

The pattern of collapsing to the edge of a species’ range is not restricted to vertebrates. For example, the golden paintbrush (*Castilleja levisecta*) was formerly distributed

from southern Vancouver Island south through the Willamette Valley to central Oregon (Peck 1961, Douglas and Ryan 1999). Currently, this species is restricted to 7 sites in Puget Sound, Washington (Sheenan and Sprague 1984) and some small islands off southern Vancouver Island, near the northern edge of the species’ historic range (Douglas and Ryan 1999).

History has shown that peripheral populations can be important in conservation efforts. In some cases peripheral populations are the only populations that are healthy enough to provide animals for reintroduction or recolonization. Sea otters (*Enhydra lutra*) reintroduced along the Pacific Coast were taken from peripheral populations that escaped overharvesting (Watson et al. 1997). California bighorn sheep (*Ovis canadensis californiana*) taken from healthy populations at the northern edge of their range in British Columbia have been used in reintroductions in areas of the western United States (Charles and Leslie 1999). Columbia sharp-tailed grouse (*Tympanuchus phasianellus columbianus*) found at the very northern edge of this subspecies’ range provide the only healthy populations of a bird that once extended from the Cariboo to California, and are being used to repopulate sites in the United States (M. Chutter, Wildlife Branch, B.C. Ministry of Environment, Lands and Parks, pers. comm.). Within hours of the confirmation of the identification of a population of Oregon spotted frogs (*Rana pretiosa*) in British Columbia, there were requests from the United States for egg masses for genetic analysis (L. Friis, Wildlife Branch, B.C. Ministry of Environment, Lands and Parks, pers. comm.).

2. Populations at the geographic margins of their ranges may be important for the long-term survival and evolution of species, as they are major contributors to evolutionary

change (Mayr 1982, Lesica and Allendorf 1995).

Founder effects and drift due to reduced gene flow should cause peripheral populations to have different gene frequencies than central populations. This has been well documented for plants (Lesica and Allendorf 1995). Scudder (1989) stated, "Marginal populations have a high adaptive significance to the species as a whole, and marginal habitat conservation, preservation and management is one of the 'best' ways to conserve the genetic diversity...". Many consider the loss of genetically distinct populations to be as important as the loss of species (Ehrlich 1988, Ledig 1993).

Here lies an interesting conservation conundrum that has been explored by Noss (1994). Disjunct or peripheral populations of species can be expected to be more genetically impoverished than central populations—but also genetically distinct from central populations, because of reduced gene flow to these isolated or marginal populations. The pattern presents a conservation dilemma because populations with lower heterozygosity are likely to be less adaptable to future environmental change (Frankel and Soule 1981) and therefore might be seen as less important to conserve. Peripheral populations are also likely to be in suboptimal habitat, making conservation more effective when directed to the central portion of each species' range. However, disjunct or peripheral populations are likely to have diverged genetically from central populations due to either genetic drift or adaptation to local environments. Selective pressures can be expected to be intense for these populations. If we are concerned with maintaining opportunities for speciation and future biodiversity, then the conservation of peripheral and disjunct populations is critical (Noss 1994).

Presumably because of these populations adapting to selective pressures, species at the edge of their range can occur in unusual or atypical habitats; for example, flammulated owls (*Otus flammeolus*) in British Columbia use different forest types than in other parts of their range (van Woudenberg and Kirk 1999); and 1 of the northernmost Garry oak (*Quercus garryana*) stands in British Columbia has an understory comprised of wild ginger (*Asarum caudatum*)—a species usually associated with wet, coniferous forests (G. Sirk, Comox-Strathcona Regional District, pers. comm.). Certain uncommon genotypes may be well represented in peripheral populations. For example, the isolated populations of slender-footed waterleaf (*Hydrophyllum tenuipes*) in British Columbia are predominately purple-flowered (Fraser in press)—a relatively rare flower colour for this species in the core of its range in the United States (Pojar and MacKinnon 1994).

3. Some species at risk at the edge of their range are also at risk over a large portion of their range. In British

Columbia, for example, the Oregon spotted frog is at risk or extirpated throughout its historic range (literature reviewed in Haycock and Knopp in prog.); the coastal subspecies of gopher snake (*Pituophis melanoleuca catinifer*) is extirpated in Washington State (Storm and Leonard 1995); and the sage grouse (*Centrocercus urophasianus*) and sage thrasher (*Oreoscoptes montanus*) are both considered at risk in Washington State (Smith et al. 1997). The status of a species elsewhere should be considered before dismissing a peripheral population as unimportant.

4. Several high-level policy strategies call for the maintenance of all species in British Columbia (B.C. Ministry of Environment, Lands and Parks 1994, 1996) and in the Canadian Biodiversity Strategy (Biodiversity Convention Office 1995). Most recently, the National Accord for the Protection of Species at Risk committed signatories (the governments of Canada and most of the Canadian provinces and territories) to a program to protect species including "all native, wild species." These programs do not exclude species at the edge of their range.
5. The exclusion of peripheral taxa from legal protection and programs could result in a significant loss of Canada's genetic resources. Vertebrate species often take the role of umbrella species, because efforts made to protect the habitat of these species will likely help many other species. Efforts to protect species associated with 1 ecosystem type will protect many other species (some as yet unstudied) associated with that habitat type (Hunter and Hutchinson 1994). This applies to "peripheral" habitat types as well as (or perhaps better than) our "core" habitat types. In British Columbia, the small "at the edge of the range" habitats associated with the Peace River district, the Okanagan Valley, the Gulf Islands, the Lower Mainland, the southern Rocky Mountain Trench, and the Haines Triangle add much to the diversity of British Columbia. Since several of these "hot spots" for peripheral species are exactly those that have been selected for intensive human development because of their unusual climates, many of these species face a high level of threat from habitat loss.
6. Reintroductions of populations at the edge of a species' range are less likely to succeed than recovery efforts for populations at the core of a range (Griffith et al. 1989). Precautions for the conservation of peripheral populations may be more important given the poor prospect of recovery if eliminated or severely damaged.
7. Often species are more widespread than current knowledge would indicate. Spotted owls (*Strix occidentalis*), flammulated owls, spotted bats (*Euderma maculatum*), and tailed frogs (*Ascaphus truei*) in British Columbia have been found north of what was once considered their range when they were first listed. The inventories

required to document the extent of these species' ranges were not initiated until after they were "listed" and became of management concern. For tailed frogs, flammulated owls, and spotted bats this has resulted in both down-listing and changes in management practices (Cannings et al. 1999, Fraser et al. 1999). In other words, species thought to be at risk and "peripheral" may not be peripheral at all.

8. There is a high public demand for these species by people who participate in wildlife viewing as recreation. Thousands of recreational dollars are spent yearly by wildlife watchers looking for these species, particularly birds and mammals. You only need to spend 1 day of the May long weekend in the Okanagan Valley visiting "hot spots" for Okanagan "specialties" such as canyon wren (*Catherpes mexicanus*), yellow-breasted chat (*Icteria virens*), white-headed woodpecker (*Picoides albolarvatus*), and sage thrasher to realize how many recreational hours these "peripheral" species provide. After "being in the outdoors," the second most important reason British Columbian wildlife viewers give for deciding where to watch wildlife is "the variety of wildlife available" (Reid 1998).
9. Peripheral populations are likely to contain genetic stock that will make them valuable not only for conservation, but for agricultural or horticultural purposes as well. They often are populated by individuals with increased hardiness or other characteristics that make them valuable. O'Brien (1996) has noted that peripheral habitats can be an important source of new cultivars. For example, peripheral populations of giant chain fern (*Woodwardia fimbriata*) in British Columbia are regarded as having a high value for increased hardiness for this horticulturally valuable species.
10. Peripheral populations can be numerically significant. Intuitively one would expect that the number of individuals of a species would dwindle towards the edge of a species range, and that the importance of a peripheral population to the numbers of a species as a whole, would be small. This is often not the case. Barn owls (*Tyto alba*) in southwestern British Columbia are at the northern edge of the species' range, but can occur at very high densities relative to the species elsewhere (R.W. Campbell, Wildlife Branch, B.C. Ministry of Environment, Lands and Parks, pers. comm.). High densities of individuals in populations of species at the edge of their ranges have been noted for other species groups, such as warblers (e.g., Oliarnyk and Jones 1997, Bennett et al. 2000). As Lomolino and Channell (1995) point out, management practices that discount peripheral populations make the assumption that species at the edge of their range are found in small numbers, so sparsely distributed that they do not contribute significantly to a species' survival. This

may not always be the case and should be determined rather than assumed.

11. Populations at the edges of geographic ranges may also be important in surviving long-term environmental changes, such as global warming (Hunter 1991, Quinn and Karr 1992). This is of particular importance in British Columbia, which, by at least 1 estimate, is expected to lose more species than any other jurisdiction in Canada due to global warming (Kutner and Morse 1996). Peripheral species may be those most suited to establishing themselves in the new habitats created by warming temperatures.
12. Several areas of endemism (areas with unique species) straddle the British Columbia border, including: the Rocky Mountains in eastern British Columbia, western Alberta, and northeastern Montana; the Georgia Depression/Puget Lowlands, the Cascades, and the Shuswap Highland–Okanagan Valley–Columbia River Basin in southern British Columbia and northern Washington; and the Northern Mountains and Plateau area in extreme north-central British Columbia and the southern Yukon (Douglas 1996). If arbitrary rules requiring a species to occur farther than a certain distance from a border are used by each state, territory, and province, these endemic species may not receive adequate attention.

CONCLUSION

If one looks at the entry for "peripheral" in Roget's thesaurus, you'll find a rather large entry—some of the synonyms include "secondary," "nonessential," "borderline," and "tangential." Given the implications outlined above, I would suggest that these words do not describe the issues associated with the listing of so-called peripheral species. Instead, the issues related to species at the edge of their ranges are at the core of biodiversity and conservation planning. Perhaps biologists concerned with conservation planning and biodiversity management should relegate the term "peripheral species" to the same place as the terms "decadent stand," "overmature forest," and "barren lake."

Listing is often the first step in a process that leads to inventory, recovery planning, and protection. It is important that scarce resources are not squandered on species that are not able to benefit from conservation attention. Since there are ecological, economic, evolutionary, and conservation issues associated with the management of peripheral species and populations, it would seem prudent to risk-list those that are imperilled. Careful planning should then be associated with the resources that are subsequently spent on managing, conserving, recovering, and restoring these species and populations.

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