

CORRESPONDENCE

The Preble's meadow jumping mouse: subjective subspecies, advocacy and management

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I read with concern the letters to the editor regarding the Preble's meadow jumping mouse *Zapus hudsonius preblei* in which Martin (2006) criticized Ramey *et al.* (2005) for questioning the subspecies designation and the editor for a failed peer review, and Crandall (2006) defended his editorship.

However, the debate over the subspecies status of the Preble's meadow jumping mouse does not properly acknowledge the subjectivity of the subspecies category. Designation of subspecies status is inherently subjective and this should be openly admitted by both sides of the debate. Accusations of advocacy in this issue are spurious because applied fields such as wildlife conservation or agriculture have inherent advocacy for management objectives. As discussed below, I suggest management units of intraspecific groups should be based on geography, not subjective judgments of subspecies status or genetic differentiation.

The subspecies status of this mouse has been discussed extensively (Ramey *et al.*, 2005, 2006; Crandall, 2006; Martin, 2006; Vignieri *et al.*, 2006) because it has been listed as threatened under the Endangered Species Act (ESA). Briefly, the Preble's mouse was designated a subspecies with limited descriptive morphological data. There are no diagnostic characters that unequivocally distinguish it from conspecifics. It does not have monophyletic mitochondrial DNA. It may be geographically isolated from, and have different allele frequencies than, con-specific populations. Sample sizes and locations studied are probably small relative to population numbers. The allele frequency differences are for DNA loci that are usually considered selectively neutral. There are no data documenting local adaptation, but it is possible. Given the lack of quantitative criteria for naming subspecies the Preble's mouse could be considered a legitimate subspecies, or not a legitimate subspecies. My concerns center on the lack of appreciation of the subjectivity of subspecies and on misunderstanding of the nature of advocacy and management in the context of the Preble's mouse.

It is well established that the subspecies category is subjective (reviewed by Cronin, 1993, 2006; Geist, O'Gara & Hoffmann, 2000; Zink, 2004). This includes other cases involving the ESA (e.g. Cronin, 1997; Zink *et al.*, 2000) and recognition of this could have avoided much of the debate over the Preble's mouse. The following quotes are telling:

'Most of the prominent commentators on the theory of speciation have been careful to emphasize the inherently subjective and even arbitrary nature of racial limits.' '... we are convinced that the subspecies concept is the most critical and disorderly area of modern systematic theory ...' (Wilson & Brown, 1953). Wilson and Brown note the synonymy of the terms subspecies and geographical race. It is noteworthy that Krutzsch (1954) named the Preble's subspecies in the year following Wilson & Brown's (1953) classic critique of subspecies. Krutzsch's analysis was typical of many at the time, with few specimens and a qualitative subspecies designation.

'... because so many characters show independent patterns of geographic variation, and because so many loci are polymorphic and vary in allele frequency from one population to another, some combination of characters will distinguish every population from all others so there is no clear limit to the number of subspecies that can be recognized.' (Futuyma, 1986, pp. 108–109).

'... present applications of the subspecies concept are uneven, frequently undocumented and lead to no improvement of either evolutionary theory or practical taxonomy.' (Vanzolini, 1992, p. 189).

'Widespread species thus can be divided into any number of different sets of 'subspecies' simply by selecting different characteristics on which to base them.' 'As ... with other species, geographic variation ... does not allow *Homo sapiens* to be divided into natural evolutionary units. That basic point ... has subsequently been demonstrated in a variety of organisms ... and use of the subspecies (or race) concept has essentially disappeared from the mainstream evolutionary literature.' (Ehrlich, 2000: 49, 291).

The subjectivity of subspecies designation is exemplified by the Preble's mouse. Ramey *et al.* (2005) used a hypothesis-testing approach for genetic, ecological and morphological data and concluded that the subspecies designation was not warranted. Vignieri *et al.* (2006) presented criteria (no or significantly reduced gene flow), acknowledged subspecies are not well defined, and then concluded the Preble's mouse is a legitimate subspecies. The ensuing critiques (Crandall, 2006; Martin, 2006; Ramey *et al.*, 2006; Vignieri *et al.*, 2006) demonstrate neither was an absolute result. It is important to recognize that other intra-specific groups that can be listed under the ESA, distinct population segments-DPS and evolutionarily significant units-ESU, are also subjectively defined (Cronin, 2006).

Despite these problems, subspecies can still be used in scientific discourse. For example, a subspecies has been defined as an aggregate of populations in a geographic subdivision of the species' range that differs taxonomically from other populations (Mayr, 1963) or groups phylogenetically distinguishable from, but reproductively compatible with, other groups (Avise & Ball, 1990). Wilson (1994) notes that his criticism of subspecies (Wilson & Brown, 1953) was overstated and traits may vary concordantly over geography. However, what constitutes enough differentiation to warrant subspecies status remains subjective.

The subjectivity of subspecies should result in scientists agreeing to disagree on designations. However, discussion of the Preble's mouse subspecies status has degenerated to accusations of 'advocacy dressed up as science' (Martin, 2006). Crandall (2006) pointed out that Martin himself was practicing advocacy while accusing Ramey *et al.* (2005) of practicing advocacy. It is important to note the applicable definition of advocacy: defending or maintaining a cause or proposal (Webster's Ninth New Collegiate Dictionary). I hope the reader recognizes that conservation biology, conservation genetics, animal conservation and related fields can be construed as advocacy. After all, conservation is a specific cause (or management objective), not a science. One may use science to achieve wildlife conservation, as one would use science to achieve a management objective of agricultural crop production. It is important to recognize that The Wildlife Society and Society for Conservation Biology are composed primarily of scientists, but openly practice advocacy for conservation. Indeed, an issue of *The Wildlife Society Bulletin* featured policy and advocacy (The Wildlife Society, 1995). To avoid unproductive accusations, we need to recognize that advocating for different management objectives is inherent in applied fields such as in conservation, agriculture, forestry and medicine.

It is also important to recognize the distinction between science and management. Science can be considered as knowledge obtained from observations, measurements and data analyses of the physical world. In the case of the Preble's mouse, this includes analyses of morphology, range and genetics. Management is what one does to achieve objectives. In this case, some people have management objectives to maximize conservation of the mouse. Others may have objectives that include agriculture, building or other land uses. In either case, science may be used to achieve management objectives. Conservationists may use

science to enhance habitat, control predators or implement other measures to manage the mouse population. Others may use science to enhance crop or livestock production. The point is that science is value-neutral and does not necessarily support either conservation or development.

The Preble's mouse exemplifies what I perceive as a state of confusion in resource management because of redundant terminology, artificial classifications and a shift of focus from practical applications to vague discussions of conservation of biological diversity (Cronin, 2006). For example, Vignieri *et al.* (2006) stated '... in our efforts to preserve biodiversity ...', and that *distinct evolutionary lineages* are the units of concern, while they support designation of the Preble's mouse as a *subspecies* (my italics). It seems that intra-specific classification is becoming typological, and variable groups are being put into artificial classes rather than being acknowledged as variable populations (Mayr, 2001; Cronin, 2006). This phenomenon is also recognized by Dawkins (2004) who coined the term 'tyranny of the discontinuous mind' for the tendency to force discrete names and classifications on organisms rather than acknowledge the inherent temporal and spatial variation within and among populations and species.

It is my contention that we should continue the rigorous sciences of systematics, phylogenetics and population genetics, but we should focus management on geography (i.e. management units based on geography; Cronin, 1993, 1997, 2003). That is, for most practical fish and wildlife management applications, the geographic area and the species on it are the primary issue. If *Z. hudsonius* is desired in a geographic area, then manage for it regardless of its subspecies or genetic status. Although native populations may be favored if they are adapted to local conditions, mixing stocks of different geographic origins may also be advantageous because this can enhance genetic variation (Paabo, 2000), and use of non-native stock may be successful if they are 'ecologically exchangeable' (Crandall *et al.*, 2000). In the case of *Z. hudsonius*, there is no indication that populations from different areas are not ecologically exchangeable (Ramey *et al.*, 2005). Consider three other prominent examples. The lynx *Lynx lynx* (Federal Register, 2000) and wolf *Canis lupus* (Fritts *et al.*, 1997) in the US Rocky Mountain States have been reintroduced or augmented with Canadian sources of animals. In Florida, the panther *Felis concolor* (Pimm, Dollar & Bass, 2006) has been successfully augmented with the introduction of animals from Texas. The primary management objective was to have these species in specific geographic areas, and using the native source was secondary.

As these examples show, we regularly identify fish and wildlife management units based on geography, although it is perhaps taken for granted. In some cases, populations may be identified as separate management units because they are geographically separate from other populations. In other cases, a contiguous population may be comprised of different management units because of geographic subdivision by state or international boundaries, land ownership, topographic features or other criteria. The point is that geographically based units are *necessary* because of these

real factors that affect management. Designation of criteria for genetic or subspecies units are not necessary for management and will rely on subjective judgment, as evidenced by the exchange of papers on the Preble's mouse.

Interestingly, my proposal to base fish and wildlife management on geography was preceded by Wilson & Brown's (1953) common sense taxonomic suggestion of simply using the Latin binomial species name with the locality or geographic range instead of subjective trinomial subspecies names. That is, for management and intra-specific classification, the species and geographic location are the primary units of concern and they can usually be defined in an objective, empirical manner. I recognize that some species designations are questionable (see Baker & Bradley, 2006), but for most management applications species identity is not a problem. From this point of view, if the time and money spent on *Z. hudsonius* subspecies, genetic studies, debate, meetings, committees, travel, phone calls and lawyers was spent on purchasing habitat, giving landowners incentives to enhance or maintain habitat, and trans-locating mice to vacant habitat, there probably would not be a Preble's mouse problem at all.

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