

Appendix B: Calculation of taxonomic distinctiveness scores for species and subspecies

Australia has some of the world's most taxonomically distinctive mammals, and those from the most ancient lineages (Holt *et al.* 2013). Given finite resources and the challenge of trying to conserve many threatened species, some have argued that priority should be given to those most distinctive components of the world's biodiversity (e.g. Vane-Wright *et al.* 1991; Faith 2009; Bottrill *et al.* 2009), and to species ahead of subspecies.

We have not attempted to prioritise taxa for conservation management attention in this Action Plan, but, for each considered taxon, we have calculated consistently a set of relatively simple measures of taxonomic distinctiveness, modelled on that used by Garnett *et al.* (2011).

The taxonomic distinctiveness indices we use are:

- i for global context, $TD_G = \sqrt[3]{1/((\text{no. genera per family}) * (\text{no. species per genus}))}$;
- ii for Australian context, $TD_A = \sqrt[3]{1/((\text{no. Australian genera per family}) * (\text{no. Australian species per genus}))}$
- iii for subspecies, $TD_{SS} = TD_A * (1/\sqrt[3]{(\text{no. Australian subspecies per species})})$

The Australian species (ii) and subspecies (iii) indices included all taxa extant at 1788, and were also recalculated with deletion of all taxa that have become extinct subsequently. The latter values are given only where these are different to the scores calculated based on 1788 inventory.

All of these indices vary from close to 0 (for species in very speciose genera and in families with very many genera) to 1 (for species in monotypic genera). We used a simple ranking system in the accounts rather than absolute values, with Very High = indices of >0.5, High = 0.25–0.5, Medium = 0.1–0.25, and Low = <0.1. The actual values are given in Table 1 (for species) and Table 2 (for subspecies) below.

For mostly Australian groups, there will be little or no difference between the global taxonomic distinctiveness index (i) and the Australian index (ii); however for groups

whose taxonomic diversity lies mostly beyond Australia, the indices will be notably different. The most extreme such case is for the Christmas Island Shrew *Crocidura trichura*, which is the only Australian representative in the moderately diverse Order Soricomorpha (or Eulipotyphla: Beck *et al.* 2006). For this species, its global taxonomic distinctiveness is low (0.015), but its Australian distinctiveness is very high (1.0): prioritisation depends upon context.

These indices of distinctiveness are fluid, being likely to change with changing taxonomic arrangements or discoveries of new taxa. These indices also don't take account of higher level taxonomy. For example, for the Banded Hare-wallaby *Lagostrophus fasciatus*, the index calculated here is 0.302, based on it being the only species in its genus, but one of nine genera in the family Macropodidae. This is the same value as for the Swamp Wallaby *Wallabia bicolor*, based on the same number of species in the genus and number of genera in the family. However *Lagostrophus fasciatus* is recognised to be the only representative in the subfamily Lagostrophinae, whereas all other extant macropod species (including *Wallabia bicolor*) are members of the Macropodinae (Prideaux and Warburton 2010). The two marsupial mole species *Notoryctes caurinus* and *N. typhlops* have Very High distinctiveness scores (0.707), but this does not recognise that together these two species comprise the entire (and extremely old) order Notoryctemorphia.

To some extent these contextual constraints have been resolved with recent derivation of taxonomic supertrees (e.g. Beck *et al.* 2006), which can then form the basis of calculation of distinctiveness that includes phylogenetic information across all levels of the taxonomic hierarchy (e.g. Isaac *et al.* 2007). While this approach may provide more precision and phylogenetic consideration, the results are relatively comparable to the indices used here: at one extreme, the Platypus *Ornithorhynchus anatinus* is highly distinctive; at the other extreme, the Pale Field-rat *Rattus tunneyi* is appreciably less distinctive.