

## SPECIATION IN ARID HABITATS: SOME FURTHER COMMENTS

Ford (1974), discussing the speciation of birds in arid habitats, stated that 'no one has proposed geographical pathways that could have allowed species adapted to arid conditions to form, though often such species have clearly been derived from wet-country ancestors'. In an earlier note (Harrison 1973) concerned with the possible evolution of such species in refugia I had, however, pointed out that drier and hotter refuges might pre-adapt species to exploit more arid habitats and that such species might evolve in the drier edges of more moist refuges. This presupposes that there was some factor, such as the presence of a competitor, preventing the species from utilizing the whole of the refuges.

I also suggested that, once a species was adapted to more arid conditions, subsequent climatic amelioration in the region of the refuge might cause the birds to move away from it to the drier interior of the continent, so that their evolutionary origin in the refuge would not be obvious.

I think that this hypothesis should be taken into consideration when dealing with zoogeographical problems involving species now confined to arid habitats. Ford (op. cit.) suggested that the Red-shouldered Wren *Malurus assimilis* might have separated from other forms in the south-eastern region and moved westward, citing as a parallel the 'pathway of speciation' in *Malurus splendens*. Present evidence suggests an early divergence of *M. splendens* and *M. cyaneus* in extreme south-west and south-east respectively, with a secondary eastward spread of the *splendens* complex. I think that there may have been a second arid phase affecting these species and that the present distribution could be explained if *M. s. callainus* and *M. s. melanotus* had been produced in isolation in the Eyre Peninsula and Mount Lofty refuges, which would have been hotter and drier than those of extreme south-east and south-west. These two forms would then have been pre-adapted to extend into their present ranges during climatic amelioration, tending to draw away from the now more modified coastal refuges and allowing *M. cyaneus* to extend westward again in conditions now more suited to it.

My interpretation does not therefore favour a simple pathway of speciation such as Ford appeared to envisage. I still think that *M. assimilis* could have evolved in a hotter and drier refuge in the Hamersley area. No less than nine of the distribution maps used by Ford in his paper, and if carefully analysed probably even more, show the existence of forms that occur through the central western regions

with the western end of their range in the Hamersley area. It could reasonably be argued that these were originally centred on this area and subsequently extended into the more arid central regions to different extents. I question whether there is sufficient uniformity of habitat in this central western region to produce this distributional effect by chance and therefore suspect that a number of species or sub-species might have evolved in a refuge in the Hamersley area. The subsequent spread of these forms into regions that became suitable as a result of the climatic tolerances that the species had acquired could produce the more circumscribed examples of the so-called Eyrean distribution, which would tend to conceal the area of origin.

West of the Great Dividing Range the extent to which forms penetrate into interior Australia would probably be mainly controlled by the tolerance to arid conditions acquired in the refuge. Figure 1 shows a generalized version of the degree of penetration likely from these peripheral refuges as deduced from the present distribution of species. In connexion with distributions of species, it should be remembered that penetration into the interior might be accompanied by withdrawal from the refuges and that the ancestral form might not utilize, or might not survive in, every refuge.

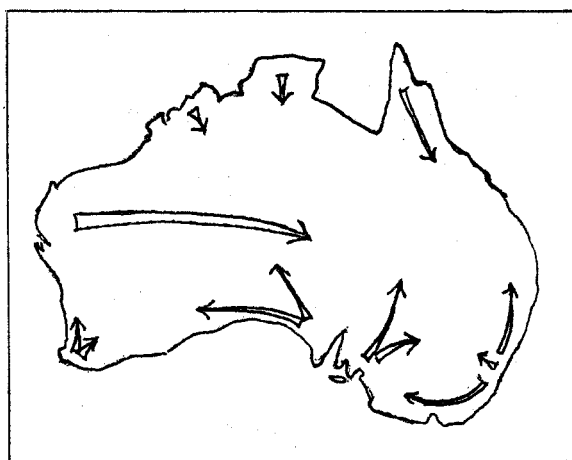


Figure 1. Sketch map of Australia to show suggested extent of penetration into interior from refuges.

### REFERENCES

- FORD, J. 1974. Speciation in Australian birds adapted to arid habitats. *Emu* 74: 161-168.  
 HARRISON, C. J. O. 1973. The origin of the apparent speciation in eastern central Australia. *Emu* 73: 138-139.

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