THE RELATIONSHIPS OF THE AUSTRALO-PAPUAN TREECREEPERS AND SITTELLAS

S. A. PARKER

Received 5 November 1981; accepted 15 January 1982

INTRODUCTION

The taxonomic placement of the treecreepers *Climacteris* and sittellas *Daphoenositta* (including *Neositta*) of Australia and New Guinea has usually been with or near other treecreeping groups beyond Australia, such as the nuthatches *Sitta*, the Spotted Creeper *Salpornis* and the Eurasian treecreepers *Certhia* (e.g. Gadow 1883, Greenway 1967). It is generally conceded (e.g. Mayr & Amadon 1951, Mayr 1963), however, that the resemblances conducing to such an alliance extend little further than the common habit of treecreeping.

Sibley (1976, and *in litt.* 1973) revolutionized thinking on the relationships of the endemic Australo-Papuan passerine genera by suggesting, on biochemical evidence, that these were more closely related to one another than to their ecological or behavioural counterparts elsewhere. He attributed their pronounced diversity to adaptive radiation of one or two basic stocks, a phenomenon already well known from the Australian marsupials.

If Sibley is correct, then the closest living relatives of *Climacteris* and *Daphoenositta* should be sought not beyond but within the Australo-Papuan region. Indeed, such attempts have already been made (see below), though not for the reason embodied in Sibley's comprehensive theory.

In the present article, I discuss the possible relationships of *Climacteris* and *Daphoenositta* in the light of Sibley's theory, and with regard to the latter genus offer an hypothesis that I first mooted, privately, in 1973. In addition, I advance reasons for recognizing the monotypic genus *Cormobates* for the distinctive White-throated Treecreeper *Climacteris leucophaea*.

TREECREEPERS *CLIMACTERIS*

Mayr (1963), dismissing the possibility that *Climacteris* was related to other genera of creepers outside Australia, briefly compared its colour-pattern to that of some species of the Acanthizidae (*Acanthiza, Sericornis* and *Gerygone* spp.) but concluded that such resemblances seemed rather superficial. Harrison (1969b) also drew comparisons between *Climacteris* and the Acanthizidae, but was more impressed by the former's apparent affinity to the honeyeaters, Meliphagidae. The similarities he adduced between *Climacteris* and the Meliphagidae included their locomotion, morphology (feet, tongues, plumage patterns) and egg-shell colouring and pattern. He considered that rather little adaptation of the original meliphagid stock would have been required to produce *Climacteris*, for honeyeaters possess strong feet and several species regularly or habitually move up treetrunks, notably the Strong-billed Honeyeater *Melithreptus validirostris* and the White-eared Honeyeater *Lichenostomus leucotis* (references in Harrison *op.cit.*, also Keast 1968 and Ford & Paton 1976). Harrison suggested, however, that because the treecreeping adaptations and abilities of *Climacteris* were not as developed as in some other scansorial groups (e.g. the nuthatches Sittidae, the true treecreepers Certhiidae and the woodpeckers Picidae), then this habit in *Climacteris* may have evolved rather recently.

Harrison was apparently the first to note that species of *Climacteris* have a brush-tipped tongue. He wrote: 'In *C. erythrops* [Red-browed] and *C. leucophaea* [White-throated] the tongue is split into two for some way from the tip. In other species the bifurcation is less conspicuous. In all species there is a long fringe of filaments on either side of the tip of the tongue, and the upper surface of the tongue is grooved.' McCulloch (1975) figured the tongues of *C. leucophaea* and *C. picumnus* (Brown Treecreeper), and reported *C. leucophaea* drinking prepared nectar from special containers. Baldwin (1972) had earlier noted these two species licking up the sweet melitose sap oozing from wounds in eucalypt bark (see also Bourke 1972). Orenstein (1977) reported individuals of the northern populations of *C. picumnus* spending a considerable amount of time probing among the blossoms of paperbark titrees, and noted that *C. leucophaea* on rare occasions probed into flowers such as those of *Banksia;* whether these birds were using their brush-tongues to extract nectar, or insects, however, was not remarked.

As noted by McCulloch (*op.cit.*), however, the chief food of treecreepers is insects; in fact, it appears to be mainly ants. Of the numerous specimens of *C. leucophaea, C. picumnus, C. melanura* (Black-tailed) and *C. affinis* (White

browed) I have prepared over the last sixteen years, all had the stomach crammed with ants (see also Lea & Gray 1936: 251-253, Mathews 1923-24: 82-133[1], Harrison 1974 and Orenstein 1977, and collection of stomach contents in Bird Section, South Australian Museum). Ants being small and often fast-moving, a brush-tongue would theoretically be more effective than a simple tongue in sweeping them into the bill. In this connexion, it is of interest that the ant-eating passerine *Parmoptila* of Africa also possesses a brush-tipped tongue (Forbes-Watson *in* Hall & Moreau 1970: 322).

Though *Climacteris* differs from the honeyeaters in having the hind surface of the tarsus rounded and unilaminate[2] rather than keeled and bilaminate as in most other passerines (Mathews 1923-24: 82), nevertheless I would still agree with Harrison that it may have descended from the ancestors of the honeyeaters. If this hypothesis is correct, the question is whether ant-eating and treecreeping are derived characters in *Climacteris*, or ancestral traits now more or less confined to that genus through a shift in the habits of the bulk of the meliphagid stock.

RELATIONSHIPS WITHIN *CLIMACTERIS*

There is a further question to be considered with respect to *Climacteris*, namely whether its species are as closely related to one another as is currently assumed. In sexual dimorphism, immature plumages, colour and patterning of eggs, and behaviour, the species fall into two groups (cf Keast 1957, Parker 1978): a) *C. leucophaea* (here including the Little Treecreeper *C. minor* and the New Guinean Treecreeper *C. placens*) and b) *C. affinis, C. erythrops, C. picumnus, C. rufa* and *C. melanura*.

i) Sexual dimorphism. In group *a*, the adult and immature females possess a small orange-brown patch on each side of the throat, absent in males. In group *b*, the adult females show reddish-brown spotting or streaking in the centre of the breast and/or throat, these markings in the males being black or blackish or (as in *erythrops* and *affinis*) absent altogether. In *affinis*, too, the adult females have a red-brown line above the white eyebrow, absent from the males.

ii) Immature plumages. In the immatures of *C. leucophaea* the feathers of the hindneck, sides of neck, back, scapulars and upper wing-coverts may show fine whitish shaft-streaks, absent from the adult plumages (Mathews 1923-24: 105 and pl. opp. p. 104, also specimens in SAM). In addition, immature females of *leucophaea* have a distinctive rufous-cinnamon rump-patch. In immatures of group *b*, the upper surface is unstreaked, and the immature females lack a contrasting rump-patch.

iii) Eggs. The eggs of the two groups differ remarkably. Those of group *a* are a pale yellowish- or ivory-white, sparsely marked with specks and spots of liver brown, purplish brown and grey. Those of group *b* have a pinkish white ground heavily overlain (in some cases almost obscured) by spots and blotches of purplish red and lilac grey. Both types were likened to eggs of certain honeyeaters by Harrison (1969b).

iv) Breeding, non-breeding and foraging behaviour. Species of group *b* regularly engage in co-operative breeding and in the non-breeding season are often found in groups (Noske 1980). In addition, they descend to the ground to feed, *erythrops* and *affinis* occasionally, the others regularly. *C. leucophaea* of group *a*, on the other hand, has never been reported to breed in other than simple pairs, is usually solitary in the non-breeding season, and very rarely descends to the ground, being the most arboreal of the treecreepers (Orenstein 1977, Noske 1980).

The difference between their eggs alone gives one pause whether the two groups should not be regarded as separate genera; certainly Campbell (1913) held this view (see also Noske 1978). Taking the additional differences into consideration, I am indeed persuaded to recognise two genera. For the forms in group *a*, the generic name *Cormobates* Mathews, 1922 is available, the species of group *b* remaining under *Climacteris* Temminck, 1820. Moreover, I offer for consideration the idea that the differences between *Cormobates* and *Climacteris* are of a degree suggesting that the two groups may not be their own closest living relatives, but that they have evolved convergently (cf Schodde 1981) from different

1. G. F. Hill, in Mathews **loc.cit.** wrote of **C. melanura**: 'The crops of all specimens examined contained only numerous remains of one species of ant (**Iridomyrmex detectus** Smith). The nature of their food, I think, accounts for the peculiar odour possessed by these birds.'
2. That this unusual feature may not be of exceptional taxonomic significance is suggested by the fact that it occurs also in some, but not all, species of the vireonid genus **Hylophilus** (Rand 1959).

ancestors within the same (possibly meliphagid) stock.

SITTELLAS *DAPHOENOSITTA*

This genus contains two species, the Varied Sittella *D. chrysoptera* (including *papuana*) of Australia and New Guinea, and the Pink-faced Sittella *D. miranda* of New Guinea alone. Their relationships have always been a subject of debate and uncertainty, the chief point of argument being whether their resemblance to the nuthatches *Sitta* (Sittidae) were the result of relationship or convergence (cf Mayr & Amadon 1951, Mayr 1963, Harrison 1969a). Greenway (1967) actually placed them, together with the Eurasian Wallcreeper *Tichodroma,* in the Sittidae, though the tendency of late has been to separate them in a family of their own (Mayr 1963, Condon 1969, Schodde 1975).

Mayr (1963) wrote: 'There is nothing in the behaviour of [*Daphoenositta*] that would speak against its inclusion in the Sittidae. Yet one must keep in mind that these locomotory similarities may have evolved by convergence.' I would agree, and add that what morphological similarities exist between the sittellas and the nuthatches—broadly similar form and proportions—are no less than one might expect between two groups pursuing the same way of life. Arguably of greater taxonomic importance are certain trenchant *differences* between these two genera, *viz.*:

i) Nesting. The nest of *Sitta* is a concave pad, wholly or largely of bark flakes, placed within a cavity the entrance to which is in some species reduced by a collar of mud. The nest of *Daphoenositta chrysotera* is cup-shaped, again mainly of bark flakes, placed on a branch, and decorated in striking and regular fashion outside with vertically-aligned strips of bark.

ii) Eggs. The eggs of *Sitta* are whitish or pinkish-white, with spots and blotches of reddish-brown, pale olive and grey scattered all over the shell. The eggs of *D. chrysoptera* are whitish with the very faintest greenish-grey tinge, and heavily marked with spots and blotches of pale to very dark purplish grey, the markings often concentrated in a wreath around the larger end.

iii) Immature plumage. The young of *Sitta,* from the nestling age onwards, are similar to the adults (Bent 1948, Ali & Ripley 1973). The young of *Daphoenositta* and *D. miranda,* on the other hand, differ sharply from the adults in being conspicuously streaked and spotted on the head, back and wing-coverts (Orenstein 1977, Schodde pers. comm.).

That both genera built their nests mainly of bark led Harrison (1969a) not to dismiss entirely the possibility that they were related. In addition, he pointed out that co-operative breeding, a characteristic of sittellas, had also been noted in one species of *Sitta.* However, I regard the differences in structure and position of the nest to be of greater significance, and those in eggs and immature plumages even more so.

Mees (1961) believed that the sittellas were in fact the closest relatives of *Climacteris,* and that neither was particularly close to the nuthatches *Sitta* or the true treecreepers *Certhia.* However, the differences between the nests, eggs and immatures of *Climacteris* (*sensu lato*) and the sittellas are considerable (see above). In fact, in their nests, eggs and immature plumages—characters I regard as more conservative than general form, proportions and mode of locomotion and foraging—the sittellas resemble various members of the Australo-Papuan robin-whistler-monarch group, the Pachycephalidae of Boles (1979) (Parker *in litt.* to Sibley 12 March 1973, *in litt.* to Short May 1973)[3]. For instance, the eggs of the Varied Sittella *D. chrysoptera* recall in their colour and markings those of several species of 'robins' *Petroica,* and even more so those of the Shining Flycatcher *Myiagra alecto.* Juveniles of both species of *Daphoenositta* resemble in their spotted and streaked upper-surface those of several species of the Pachycephalidae, especially *Microeca* and *Petroica,* spp. And finally, many species of the Pachycephalidae, including *Petroica, Microeca* and *Myiagra* spp., build open cup-shaped nests decorated with pieces of bark, some species of *Petroica* (*e.g. P. multicolor,* the Scarlet Robin) sometimes building their nests almost entirely of bark, as do sittellas.

CONCLUSIONS

On the above considerations, I suggest that the Australian treecreepers *Climacteris* (*sensu lato*) may have arisen from the ancestors of the Meliphagidae (honeyeaters) (thus agreeing with Harrison 1969b), and the sittellas *Daphoenositta* from the ancestors of the Pachycephalidae (robin-flycatchers and allies), and thus that the similarities of the treecreepers and sittellas to scansorial groups outside Australia may be attributable to convergence

3. Schodde (1978) has independently remarked these resemblances.

resulting from a similar way of life. In addition, I suggest that the White-throated Treecreeper differs sufficiently from the other species of *Climacteris* to be placed in a separate genus, *Cormobates*. One looks forward to the studies in comparative anatomy and biochemistry needed to test these hypotheses.

ACKNOWLEDGEMENTS

For many helpful discussions over the last fifteen years concerning the relationships of the Australo-Papuan treecreepers and sittellas, I extend my warmest thanks to Dr James C. Greenway Jr, Dr Colin J. O. Harrison, Professor Ernst Mayr, Professor Finn Salomonsen, Dr Richard Schodde, Dr Lester L. Short and Professor Charles G. Sibley.

REFERENCES

Ali, S. & S. D. Ripley. 1973. **Handbook of the Birds of India and Pakistan, 9.** Oxford Univ. Press.

Baldwin, M. 1972. Melitose-sap lickers. **Birds** 6: 70-71 (NSW Field Ornithologists' Club).

Bent, A. C. 1948. Life histories of North American nuthatches, wrens, thrashers and their allies. **U.S. Natnl Mus. Bull.** 195.

Boles, W. E. 1979 The relationships of the Australo-Papuan flycatchers. **Emu** 79: 107-110.

Campbell, A. J. 1913. A Commonwealth collection. **Emu** 13: 65-74.

Ford, A. H. & D. C. Paton. 1976 Resource partitioning and competition in honeyeaters of the genus **Meliphaga. Aust. J. Ecol.** 1: 281-287.

Gadow, H. 1883. Certhiomorphae. **Catalogue of Birds in the British Museum,** 8: 322-366. London: British Museum.

Greenway, J. C. 1967. **Hypositta**, Sittidae, Certhiidae, Rhabdornithidae, Climacteridae, in Peters, J. L., **Check-list of Birds of the World,** 12: 124-166 (eds R. A. Paynter & E. Mayr). Worcester, Mass.: Heffernan Press.

Hall, B. P. & R. E. Moreau. 1970. **An Atlas of Speciation in African Passerine Birds.** London: Brit. Mus. (Nat. Hist.).

Harrison, C. J. O. 1969a. The nesting habits of sittellas and nuthatches. **Emu** 69: 106-107.

Harrison, C. J. O. 1969b. The possible affinities of the Australian treecreepers of the genus **Climacteris. Emu** 69: 161-168.

Harrison, C. J. O. 1974. Climacteridae, **in** B. P. Hall (ed.), **Birds of the Harold Hall Australian Expeditions 1962-70:** 270-274. London: Brit. Mus. (Nat. Hist.).

Keast, A. 1957. Variation and speciation in the genus **Climacteris** Temminck (Aves: Sittidae). **Aust. J. Zool.** 5: 474-495.

Keast, A. 1968. Competitive interactions and the evolution of ecological niches as illustrated by the Australian honeyeater genus **Melithreptus** (Meliphagidae). **Evolution** 22: 762-784.

Lea, A. M. & J. T. Gray. 1936. The food of Australian birds, IV. **Emu** 35: 251-280.

McCulloch, E. M. 1975. Tongues of some passerine birds. **Aust. Bird Watcher** 6: 1-3.

Mathews, G. M. 1923-24. **Birds of Australia,** 11. London: Witherby.

Mayr, E. 1963. Comments on the taxonomic position of some Australian genera of songbirds. **Emu** 63: 1-7.

Mayr, E. & D. Amadon. 1951. A classification of recent birds. **Amer. Mus. Novit.** 1496: 1-42.

Mees, G. F. 1961. An annotated catalogue of a collection of bird-skins from West Pilbara, Western Australia. **J. Roy. Soc. W. Aust.** 44 :97-143.

Noske, R. 1978. Comments on some of the scientific names used in the "Interim List of Australian Songbirds". **Aust. Birds** 13: 27-35.

Noske, R. 1980. Co-operative breeding by treecreepers. **Emu** 80: 35-36.

Orenstein, R. I. 1977. Climacteridae, **in** Frith, H. J. (ed.), **Reader's Digest Complete Book of Australian Birds:** 452-457. Sydney: Reader's Digest.

Parker, S. A. 1978. Climacteridae, in Harrison, C.J.O. (ed.), **Bird Families of the World:** 222-223. Oxford: Elsevier.

Rand, A. L. 1959. Tarsal scutellation of songbirds as a taxonomic character. **Wilson Bull.** 71: 274-277.

Schodde, R. 1978. Relations and radiation in Australo-Papuan oscines: the current situation (roneo circulated at XVII Int. Orn. Congress, Berlin, 1978).

Schodde, R. 1981. The taxonomy of the RAOU "Interim List of Australian Songbirds". **Aust. Birds** 15: 63-71.

Sibley, C .G. 1976. Protein evidence of the relationships of some Australian passerine birds. **Proc. XVI int. orn. Congr.:** 557-570.

S. A. Parker, South Australian Museum, Adelaide, South Australia, 5000.